REPORT N^{O} 70023367

TOWER 1
122, OLD HALL STREET LIVERPOOL

AIR QUALITY ASSESSMENT REPORT

NOVEMBER 2016

WSP | PARSONS BRINCKERHOFF

TOWER 1

122, OLD HALL STREET LIVERPOOL

AIR QUALITY ASSESSMENT REPORT

122 Old Hall Street Ltd.

70023367
November 2016

WSP | Parsons Brinckerhoff
6 Devonshire Square
4th Floor
London
EC2M 4YE

Tel: + 44 (0) 20 7113 1700
Fax: + 44 (0) 20 7113 1701
www.wspgroup.com
www.pbworld.com

QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2
Remarks	Draft	Final – customer comments incorporated	
Date	27/10/2016	09/11/2016	
Prepared by	Justin Lingard	Justin Lingard	
Signature			
Checked by	Andy Talbot	Andy Talbot	
Signature		 Digitally signed by Talbot, Andy Date: 2016.11.09 17:59:57 Z	
Authorised by	Andy Talbot	Andy Talbot	
Signature		 Digitally signed by Talbot, Andy Date: 2016.11.09 18:00:14 Z	
Project number	70023367	70023367	
Report number	01	02	
File reference	\\uk.wspgroup.com\central data\Projects\700233xx\70023367 - 122 Old Hall Street, Liverpool\D Design and Analysis\Environmental\AQ\Report\AQ Report – Tower 1, 122, Old Hall Street, Liverpool – draft issue 1.docx	\\uk.wspgroup.com\central data\Projects\700233xx\70023367 - 122 Old Hall Street, Liverpool\D Design and Analysis\Environmental\AQ\Report\AQ Report - Tower 1, 122 Old Hall Street, Liverpool - final issue 2.docx	

TABLE OF CONTENTS

TABLES

APPENDICES

1 INTRODUCTION

1.1.1 WSP | Parsons Brinckerhoff has been commissioned by Indigo Planning Limited to carry out an assessment of the potential air quality impacts arising from the proposed development of Tower 1 at 122 Old Hall Street, Liverpool, hereafter referred to as the 'Proposed Development' or 'Application Site' (shown in **Figure 1**). The adjacent Tower 2 site is subject to a separate planning application.

1.1.2 The Application Site lies within the administrative boundary of Liverpool City Council (LCC). The Proposed Development site is currently a car park which lies near the intersection of the A565 (Great Howard Street), A5053 (Leeds Street) and A5052 (New Quay). The A5053 forms the northern boundary of the Proposed Development. The Back of Leeds Street and Old Leeds Street form the western and southern boundaries. To the east is the railway line from Liverpool Moorfields Station north in the direction of Southport and Ormskirk. To the west of the Proposed Development are the King Edward Industrial Estate and the waterfront. Elsewhere, and in keeping with the central location of the site, the surrounding buildings are composed of offices and commercial units, including hotels, leisure and retail premises. Tower 1 will be given over exclusively to residential development.

1.1.3 This report presents the air quality assessment for the Proposed Development.

1.1.4 A glossary of terms is provided in **Appendix A**.

2 LEGISLATION, POLICY & GUIDANCE

2.1 AIR QUALITY LEGISLATION & POLICY

2.1.1 A summary of the relevant air quality legislation and policy is provided below.

UK AIR QUALITY STRATEGY

2.1.2 The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS)[1]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation.

2.1.3 The AQS also sets standards and objectives for nine key air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3 butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3), and polycyclic aromatic hydrocarbons (PAHs). The standards and objectives for the pollutants considered in this assessment are given in **Appendix B**.

2.1.4 The air quality standards are levels recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) with regards to current scientific knowledge about the effects of each pollutant on health and the environment.

2.1.5 The air quality objectives are medium-term policy based targets set by the Government, which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

2.1.6 For the pollutants considered in this assessment, there are both long-term (annual mean) and short-term standards. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.

2.1.7 The AQS contains a framework for considering the effects of a finer group of particles known as '$PM_{2.5}$' as there is increasing evidence that this size of particles can be more closely associated with observed adverse health effects than PM_{10}. Local Authorities are required to work towards reducing emissions/concentrations of particulate matter within their administrative area. However, there is no statutory objective given in the AQS for $PM_{2.5}$ at this time.

AIR QUALITY REGULATIONS

2.1.8 Many of the objectives in the AQS have been made statutory in England with the Air Quality (England) Regulations 2000[2] and the Air Quality (England) (Amendment) Regulations 2002[3] for the purpose of Local Air Quality Management (LAQM).

[1] Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2).

[2] The Air Quality (England) Regulations 2000 – Statutory Instrument 2000 No.928.

[3] The Air Quality (England) (Amendment) Regulations 2002 – Statutory Instrument 2002 No.3043.

2.1.9 These Regulations require that likely exceedances of the AQS objectives are assessed in relation to:

"…the quality of air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present…"

2.1.10 The Air Quality Standards Regulations 2010[4] transpose the European Union Ambient Air Quality Directive (2008/50/EC)[5] into law in England. This Directive sets legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health such as PM_{10}, $PM_{2.5}$ and NO_2. The limit values for NO_2 and PM_{10} are the same concentration levels as the relevant AQS objectives, and the limit value for $PM_{2.5}$ introduced in this Directive is a concentration of 25µg/m^3 to apply from 2015.

ENVIRONMENTAL PROTECTION ACT 1990 – CONTROL OF DUST AND PARTICULATES ASSOCIATED WITH CONSTRUCTION

2.1.11 Section 79 of the Environmental Protection Act 1990 gives the following definitions of statutory nuisance relevant to dust and particles:

"Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance"; and

"Any accumulation or deposit which is prejudicial to health or a nuisance"

2.1.12 Following this, Section 80 says that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

2.1.13 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Nuisance is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

ENVIRONMENT ACT 1995

2.1.14 Under Part IV of the Environment Act 1995, local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the air quality objectives defined in the Regulations. Where the objectives are not likely to be achieved, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

[4] The Air Quality Standards Regulations 2010 - Statutory Instrument 2010 No. 1001.

[5] 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.

2.2 PLANNING POLICY

2.2.1 A summary of the national and local planning policy relevant to the Proposed Development and air quality is provided below.

NATIONAL PLANNING POLICY

NATIONAL PLANNING POLICY FRAMEWORK

2.2.2 The Government's overall planning policies for England are described in the National Planning Policy Framework[6] (NPPF). The core underpinning principle of the Framework is the presumption in favour of sustainable development, defined as:

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

2.2.3 One of the twelve core planning principles in the NPPF is that planning should 'contribute to conserving and enhancing the natural environment and reducing pollution.'

2.2.4 In relation to air quality, the following paragraphs in the document are relevant:

- Paragraph 109, which states *"The planning system should contribute to and enhance the natural and local environment by:…preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water, or noise pollution..";*
- Paragraph 110, which states *"In preparing plans to meet development needs, the aim should be to minimise pollution and other adverse effects on the local and natural environment. Plans should allocate land with the least environmental or amenity values, where consistent with other policies in this Framework.";*
- Paragraph 122, which states *"…local planning authorities should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities";*
- Paragraph 124, which states *"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan"; and*
- Paragraph 203, which states *"Local Planning authorities should consider where otherwise unacceptable development could be made acceptable though the use of conditions or planning obligations. Planning Obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."*

[6] Department for Communities and Local Government (2012). National Planning Policy Framework.

LOCAL PLANNING POLICY

LIVERPOOL UNITARY DEVELOPMENT PLAN

Chapter 13 of the Liverpool Unitary Development Plan[7], adopted in 2002, deals with, amongst a range of issues, environmental protection. It outlines LCC's objective to promote a safe, clean and healthy environment for the benefit of Liverpool's residents and businesses and, at the same time, help to reduce the harmful impact of the City's activities on the global environment. Policy EP11 sets out the council's approach to the use local planning control to limit and control pollution.

AIR QUALITY IN LIVERPOOL

2.2.5 Liverpool's Air Quality Action Plan presents a series of options for reducing levels of air pollution in the city in order to comply with UK and European health-based air quality standards. The original action plan, covering two specific areas, has been updated as a result of a citywide Air Quality Management Area designated in 2008. The council has developed a city-wide action plan as annual mean NO_2 concentrations across the city exceed the annual mean NO_2 Air Quality Strategy objective (40 µg/m^3). The 2016 Air Quality Annual Status Report[8] details the council's current approach to air quality in Liverpool providing updates on completed and existing measures to improve local air quality.

2.3 GUIDANCE

2.3.1 A summary of the publications referred to in the undertaking of this assessment is provided below.

LOCAL AIR QUALITY MANAGEMENT REVIEW AND ASSESSMENT TECHNICAL GUIDANCE

2.3.2 The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities outside London for in their review and assessment work[9]. This guidance, referred to in this document as LAQM.TG16, has been used with respect to the methodology used in the assessment of operational phase effects.

LAND-USE PLANNING & DEVELOPMENT CONTROL: PLANNING FOR AIR QUALITY

2.3.3 In May 2015 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) published updated guidance[10], which offers comprehensive advice on: when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and, the possible mitigation measures that may be implemented to minimise these impacts.

[7] Liverpool City Council (2002), Liverpool Unitary Development Plan.

[8] Liverpool City Council (2016), 2016 Air Quality Annual Status Report.

[9] Defra (2016) Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance LAQM.TG16.

[10] Environmental Protection UK and Institute of Air Quality Management (2015). Land Use Planning & Development Control: Planning for Air Quality.

GUIDANCE ON THE ASSESSMENT OF DUST FROM DEMOLITION AND CONSTRUCTION

2.3.4 The IAQM provide guidance[11] to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.

NATIONAL PLANNING PRACTICE GUIDANCE – AIR QUALITY

2.3.5 This guidance[12] provides a number of guiding principles on how the planning process can take into account the impact of new development on air quality, and explains how much detail air quality assessments need to include for proposed developments, and how impacts on air quality can be mitigated. It also provides information on how air quality is to be considered by Local Authorities in both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.

[11] Institute of Air Quality Management (Version 1.1 Updated June 2016). Guidance on the Assessment of Dust from Demolition and Construction.

[12] Department of Communities and Local Government (DCLG) (March 2014). National Planning Practice Guidance.

3 SCOPE & METHODOLOGY

3.1 SCOPE

3.1.1 The scope of the assessment has been determined in the following way:

- Consultation with the Operations Manager at the Environmental Protection Unit of LCC to agree the scope of the assessment and the methodology to be applied; and
- Review of LCC's latest review and assessment reports[8] and air quality data for the area surrounding the Application Site, including data from LCC, Defra[13], and the Environment Agency (EA)[14];
- Desk study to confirm the locations of nearby existing receptors that may be sensitive to changes in local air quality, and a review of the masterplan for the Proposed Development to establish the location of new sensitive receptors;
- Review of the traffic data; and
- Consultation with the energy consultant and mechanical engineers for the project to determine the requirement for an on-site energy centre assessment.

3.1.2 The scope of the assessment includes consideration of the potential impacts on local air quality resulting from:

- Dust and particulate matter generated by on-site activities during the construction stage; and
- Increases in pollutant concentrations as a result of exhaust emissions arising from construction traffic and plant.

3.1.3 The following aspects have been scoped-out of the assessment:

- The impact of exhaust emissions arising from traffic generated by the Proposed Development once operational as the development-generated road traffic does not exceed the criteria provided by LCC (see Section 3.1.4); and
- The impact of emissions to air from the on-site energy centre included within the Proposed Development. The LCC's air quality assessment criteria do not consider the potential impacts of the proposed energy plant. It should be noted that at this stage of the development it is unclear as to what type and specification of energy plant would be ultimately installed, however based on consultation with the energy engineer it is understood that Tower 1 will have 1MW gas-fired boiler and CHP may form part of the load. The design will also include a diesel-fuelled 600kVA emergency standby generator. The manufacturers suggest that this should be tested for a 2 hours per month on the site load. An annual 4 hour full load test is also recommended. Based on the 2015 EPUK/IAQM indicative criteria, the rating of the energy plant should be sufficient to require a more detailed air quality assessment. It may be necessary, at a later time, to undertake such an assessment, once the final specification is known.

[13] Defra Local Air Quality Management (LAQM) Support Pages. Available at: http://laqm.defra.gov.uk/. Accessed on 11.10.2016.

[14] Environment Agency. Available at: http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=337500.0&y=391500.0&topic=airpollution&ep=map&scale=4&location=Liverpool,Liverpool&lang=_e&layerGroups=default&distance=&textonly=off#x=333986&y=390590&lg=1,2,3,4,5,7,9,10,&scale=10. Accessed on 10.10.2016.

3.1.4 The air quality assessment criteria provided by the Operations Manager of the council's Environmental Protection Unit on 12/10/2016, against which this assessment has been made, is given below:

- A development that will result in an increase in vehicle trip generation in the local area that increases annual average daily traffic (AADT) flow by more than 5% on roads with an AADT flow of >10,000;
- A proposal that will result in increased congestion and lower vehicle speeds on the existing local road network;
- A proposal that would significantly alter the composition of traffic in the area, i.e. increase in heavy duty vehicles (HDV) by 200 movements or more per day;
- New developments with 50 or more car parking spaces within an existing AQMA, or an increase in existing parking of 50 or more;
- Proposals for coach and lorry parks;
- Proposals that will lead to an increase in exposure to existing residents in adjacent areas;
- Proposals for industrial development that are permitted under environmental permitting regulations or waste management licensing; and
- Proposals with the potential to increase air pollution in areas that are sensitive, e.g. ecological sites, SSSI.

3.1.5 Further details why these aspects have been scoped out of the assessment are outlined in Section 3.2.6 to 3.2.9.

3.2 METHODOLOGY

CONSTRUCTION STAGE

3.2.1 Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited in close proximity to the source of emission. Dust therefore, is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause 'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually short-lived.

3.2.2 The smaller dust particles(less than 10µm in aerodynamic diameter) are known as PM_{10} and represent only a small proportion of total dust released; this includes a finer fraction, known as $PM_{2.5}$ (with an aerodynamic diameter less than 2.5µm). As these particles are at the smaller end of the size range of dust particles they remain suspended in the atmosphere for a longer period of time than the larger dust particles. Consequently, they can therefore be transported by wind over a wider area. PM_{10} and $PM_{2.5}$ are small enough to be drawn into the lungs during breathing, which in sensitive members of the public could have a potential health impacts.

3.2.3 An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and PM_{10} during the construction stage has been undertaken using: the relevant assessment methodology published by the IAQM; the available information for this phase of the Proposed Development provided by the Client and Project Team; and, professional judgement.

3.2.4 The IAQM methodology assesses the risk of potential dust and PM_{10} impacts from the following four sources: demolition; earthworks; general construction activities and track-out. It takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM_{10} levels to assign a level of risk. Risks are described in terms

of there being a low, medium or high risk of dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined. A summary of the IAQM assessment methodology is provided in **Appendix C**.

3.2.5 In addition to impacts on local air quality due to on-site construction activities, exhaust emissions from construction vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access the Application Site and in the vicinity of the Application Site itself. As information on the number of vehicles and plant associated with the construction stage was not available at the time of writing, a qualitative assessment of their impact on local air quality has been undertaken using professional judgement and by considering the following:

- The number and type of construction traffic and plant likely to be generated by this phase of the Development;
- The number and proximity of sensitive receptors to the Application Site and along the likely routes to be used by construction vehicles; and
- The likely duration of the construction stage and the nature of the construction activities undertaken.

OPERATIONAL PHASE

3.2.6 Of the pollutants included in the AQS, concentrations of NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) are those that should be given consideration. Often as road traffic is a major source of these pollutants and their concentrations (predominantly NO_2) tend to be close to, or in exceedance of, the objectives in urban locations, especially at the roadside.

3.2.7 Following consultation with the transport consultant for the project, the following conclusions were determined from the traffic data:

- No parking was proposed as part of the development so there would not be any trips immediate to the site;
- Once operational, the only predicted vehicle flow would be from refuse vehicles and delivery trips. These were estimated to contribute less than 20 trips per day; and
- Changes in LDV and HDV AADT flows on the A565 (Old Hall Street) south of the junction with Old Leeds Street were 105 and 30 vehicles, respectively.

3.2.8 The changes in vehicle flow are significantly below LCC's assessment criteria (see Section 3.1.4), and therefore a detailed road traffic assessment has been scoped out.

3.2.9 The council's air quality assessment criteria do not require the potential impacts of the Proposed Development's energy plant to be considered (see Section 3.1.4).

3.2.10 SELECTION OF SENSITIVE RECEPTORS

3.2.11 Sensitive locations are places where the public or sensitive ecological habitats may be exposed to pollutants resulting from activities associated with the Proposed Development. These will include locations sensitive to an increase in dust deposition and PM_{10} exposure as a result of on-site construction activities, and locations sensitive to exposure to gaseous pollutants emitted from the exhausts of construction traffic associated with the Proposed Development.

CONSTRUCTION STAGE

3.2.12 The IAQM assessment is undertaken where there are: 'human receptors' within 350m of the site boundary, or within 50m of the route(s) used by construction vehicles on the public highway, up to

500m from the site entrance(s); and/or 'ecological receptors' within 50m of the site boundary, 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 within these distances that the impacts of dust soiling and increased particulate matter in the ambient air will have the greatest impact on local air quality at sensitive receptors.

3.3 SIGNIFICANCE CRITERIA

CONSTRUCTION STAGE

3.3.1 The IAQM assessment methodology recommends that significance criteria is only assigned to the identified risk of dust impacts occurring from a construction activity with appropriate mitigation measures in place. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

3.3.2 For the assessment of the impact of exhaust emissions from plant used on-site and construction vehicles accessing and leaving the Site on local concentrations of NO_2 and particulate matter, the significance of residual effects have been determined using professional judgement and the principles outlined in the EPUK/IAQM guidance, which are described below.

3.4 LIMITATIONS & ASSUMPTIONS

CONSTRUCTION STAGE

3.4.1 General assumptions have been made regarding the material volume and type at each stage of construction based on professional judgement.

OPERATIONAL STAGE

3.4.2 It has been assumed that the traffic information provided by the transport consultant is accurate and a detailed assessment of road traffic emissions impacts is not required.

4 BASELINE CONDITIONS

4.1 LIVERPOOL REVIEW & ASSESSMENT OF AIR QUALITY

4.1.1 In 2008 LCC declared a city-wide AQMA due to predicted exceedances of the annual mean NO_2 air quality objective. The council has developed a city-wide action plan as annual mean NO_2 concentrations across the city exceed the annual mean NO_2 Air Quality Strategy objective (40µg/m^3). The 2016 Air Quality Annual Status Report[15] details the council's current approach to air quality in Liverpool providing updates on completed and existing measures to improve local air quality.

LOCAL EMISSION SOURCES

4.1.2 The Application Site is currently a car park which lies near the intersection of the A565 (Great Howard Street), A5053 (Leeds Street) and A5052 (New Quay). The A5053 forms the northern boundary. The Back of Leeds Street and Old Leeds Street form the western and southern boundaries. To the east is the railway line from Liverpool Moorfields Station north in the direction of Southport and Ormskirk. To the west of the Application Site are the King Edward Industrial Estate and the waterfront.

4.2 BACKGROUND AIR QUALITY DATA

4.2.1 As part of the annual national compliance, Defra undertake national air quality modelling to assess air quality against current EU air quality limit values. The estimated modelled air pollutant concentrations are mapped on a 1 x 1 km grid basis. The Application Site lies on the intersection of two of the grid cells. **Table 1** gives the 2015 Defra modelled background NO_2, PM_{10} and $PM_{2.5}$ concentrations in the vicinity of the Application Site: the top row of **Table 1** gives the 2015 annual mean background air pollutant concentration from the grid cell to the north, the bottom row, the south. The annual mean background concentrations of all three air pollutants are below the relevant AQS objectives given in **Appendix 1**.

Table 1: 2015 Defra Modelled Annual Mean Background Air Pollutant Concentrations (µg/m^3)

GRID SQUARE (CENTRE ON O.S. GRID REFERENCE)	NO_2 (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
333500, 391500 (north)	19.6	14.2	9.9
333500, 390500 (south)	19.4	13.6	9.7

4.3 LOCAL AUTHORITY AIR QUALITY MONITORING DATA

4.3.1 Analysis of the annual mean NO_2 and PM_{10} measurements from LCC and Defra's Automatic Urban and Rural Network (AURN) air quality monitoring stations has been undertaken to determine typical background and roadside concentrations. Where long-term observations exist, analysis of these data can also demonstrate trends in air quality pollutants. Ten years of annual mean NO_2 and PM_{10} measurements from 2006 to 2015 from the automatic air quality monitoring stations in Liverpool have been analysed. The results are presented here.

[15] Liverpool City Council (2016), 2016 Air Quality Annual Status Report.

4.3.2 LCC discontinued its automatic air quality monitoring at Liverpool Old Haymarket Roadside and Liverpool Islington in 2012/13. The AURN stations at Wirral Tranmere, Liverpool Speke and Liverpool Queen's Drive Roadside, however, have remained operational throughout this time. The latter became part of the AURN in January 2008[16].

4.3.3 The location of the automatic (NO_2 and PM_{10}) and diffusion tube (NO_2) air quality monitoring stations, within 2km of the Application Site, are shown in **Figure 1**.

4.3.4 **Table 2** and **Table 3** summarise the annual mean NO_2 and PM_{10} concentrations, respectively, for these locations over the past ten year. **Table 3** shows that PM_{10} has only been measured at three air quality monitoring stations (Liverpool Speke, Liverpool Islington and Liverpool Queens Drive) compared to the five locations (Wirral Tranmere, Liverpool Speke, Liverpool Queen's Drive Roadside, Liverpool Old Haymarket Roadside and Liverpool Islington) used to measure NO_2.

Table 2: Local Authority and AURN Automatic NO_2 Monitoring Data for Liverpool (2006 - 2015)

Site Name	Site Type	Annual Mean NO_2 Concentration ($\mu g/m^3$)*/**									
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Wirral Tranmere (UKA00406)	Urban Background	19	19	19	19	n/a	n/a	21	n/a	20	20
Liverpool Speke (UKA00247)	Urban Industrial	22	24	22	22	30	24	25	23	25	22
Liverpool Queen's Drive Roadside (LV5)	Roadside	No data	No data	**40**	38	37	35	30	34	34	34
Liverpool Old Haymarket Roadside (LV4)	Roadside	No data	No data	n/a	**45**	**50**	**46**	n/a	No data	No data	No data
Liverpool Islington (LIV2)	Roadside	n/a	35	32	34	**40**	35	35	n/a	No data	No data

n/a refers to the data capture being below 75%
Bold indicates an exceedance of the annual mean AQS objective ($40\mu g/m^3$)
* LCC data are taken from the Air Quality England website, http://www.airqualityengland.co.uk/.
** AURN data are taken from Defra's UK-AIR website, https://uk-air.defra.gov.uk/.

Table 3: Local Authority and AURN Automatic PM_{10} Monitoring Data for Liverpool (2006 - 2015)

Site Name	Site Type	Annual Mean PM_{10} Concentration ($\mu g/m^3$)*/**									
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Liverpool Speke (UKA00247)	Urban Industrial	22	18	16	16	17	16	13	14	14	14
Liverpool Queen's Drive Roadside (LV5)	Roadside	No data	No data	n/a	n/a	22	23	19	n/a	No data	No data
Liverpool Islington (LIV2)	Roadside	n/a	n/a	No data	n/a	19	21	18	n/a	No data	No data

n/a refers to the data capture being below 75%
Bold indicates an exceedance of the annual mean AQS objective ($40\mu g/m^3$)
* LCC data are taken from the Air Quality England website, http://www.airqualityengland.co.uk/.
** AURN data are taken from Defra's UK-AIR website, https://uk-air.defra.gov.uk/.

4.3.5 Trend analysis has been undertaken on the annual mean NO_2 and PM_{10} concentrations from 2006 to 2015. The annual mean NO_2 concentrations measured at the urban background site at Wirral Tranmere are about half the annual mean NO_2 AQS objective of $40\mu g/m^3$. Annual mean NO_2 concentrations measured at Liverpool Speeke are a few $\mu g/m^3$ greater than those measured at Wirral Tranmere, reflecting the contributions from notable local industrial NO_2 sources including John Lennon Airport.

[16] Liverpool City Council (2012), 2012 Air Quality Updating and Screening Assessment for Liverpool City Council.

4.3.6 The annual mean NO_2 concentrations measured at the roadside sites: Liverpool Queen's Drive Roadside and Liverpool Islington are almost twice those measured at the two background sites, demonstrating the contribution of road traffic emissions to enhanced NO_2 concentrations at roadside sites, especially in urban areas. Broadly speaking, roadside annual mean NO_2 concentrations have remained fairly consistent from 2006 to 2015, though there are year-to-year variations, and have been in the range 30 to 40 µg/m^3.

4.3.7 Exceedances of the annual mean NO_2 AQS objective were measured at Liverpool Old Haymarket Roadside for all three years the site was operational from 2009 to 2011. One exceedance of the annual mean NO_2 AQS objective was measured Liverpool Queen's Drive Roadside in 2008. Likewise a single exceedance was measured at Liverpool Islington in 2011.

4.3.8 During the same period PM_{10} remained fairly stable at both roadside air quality monitoring stations (Liverpool Queen's Drive Roadside and Liverpool Islington), hovering around 20µg/m^3. Analysis of the long-term annual mean PM_{10} trend at Liverpool Speke shows an average reduction in PM_{10} concentrations by about 0.5µg/m^3 per year. No exceedances of the annual mean PM_{10} objective were measured between 2006 and 2015 at any of the air quality monitoring stations in Liverpool.

4.3.9 In addition to the automatic air quality monitoring station measurements, diffusion tubes, measuring NO_2, have been situated in fifty-five locations citywide. The data from 2011 - 2015 are presented in **Table 4** from the eleven sites that lie up to 2km from the Application Site (**Figure 1**). All the sites are at roadside locations.

4.3.10 The nearest monitoring site to the Application Site is 'Leeds Street/Pall Mall Road Sign'. This site is approximately 100m to the east of the Application Site on the opposite side of Leeds Street. Here, annual mean NO_2 concentrations at roadside have exceeded the AQS objective in recent years.

Table 4: Local Authority Annual Mean NO_2 Diffusion Tube Data (2011 - 2015)

Site Name	Annual Mean NO_2 Concentration (µg/m^3)[15]				
	2011	2012	2013	2014	2015
Clarence St/Mount Pleasant J LP o/s JMU	**58**	**53**	**51**	**50**	**48**
Covent Garden/Dale St Lamp Post RH side	**44**	**52**	**50**	**46**	**48**
Crosshall Street Downpipe 2nd Alng from Dale St*	**62**	**68**	**71**	**68**	**74**
Islington AQ Station Traffic Lights*	**46**	**48**	**46**	**46**	**49**
Lamp at jct of Everton Rd / Breck Road	**47**	**49**	**45**	**44**	**45**
Lamp post outside No 55 Everton Road	**52**	**51**	**49**	**47**	**47**
Leeds Street/Pall Mall Road Sign*	**52**	**53**	**53**	**51**	**42**
Lpool Centre Old Haymarket*	**56**	**61**	**61**	**57**	**58**
Pembroke Pl LP o/s main ent Dental Hospital	**59**	**66**	**60**	**54**	**51**
Prescot St/ RLUH Taxi Rank Lamp L7*	**60**	**66**	**66**	**62**	**62**
Strand Street/Water Street Jct-Roadsign L2*	**67**	**70**	**71**	**68**	**66**

Bold indicates an exceedance of the annual mean AQS objective (40µg/m^3)
* Triplicated diffusion tube location. Average concentrations shown

4.3.11 The summary presented in **Table 4** shows that all sites exceed the annual mean NO_2 AQS objective for all years. Trend analysis of the measurements shows little significant decrease in the roadside concentrations, though there are year-to-year variations.

4.4 SUMMARY

4.4.1 Whilst background annual mean NO_2 concentrations are below the AQS objective of 40µg/m^3 at all air quality monitoring stations in Liverpool, and consistent with Defra's modelled 2015 background concentrations, NO_2 is significantly enhanced at the roadside due to road transport emissions. In the vicinity of the Application Site, roadside annual mean NO_2 concentrations on Leeds Street have been in excess of the AQS objective in recent years. Such conditions are not exceptional and have been experienced at other roadside sites in the wider area. There has been little decrease in roadside concentrations over the past ten years, though there are year-to-year variations.

4.4.2 Background and roadside PM_{10} concentrations are below the AQS objective of 40µg/m^3 at all air quality monitoring stations in Liverpool and have exhibited a decreasing trend over the past ten years.

5 ASSESSMENT OF IMPACTS

5.1 CONSTRUCTION PHASE

DUST AND PM_{10} ARISING FROM ON-SITE ACTIVITIES

5.1.1 Construction activities that have the potential to generate and/or re-suspend dust and PM_{10}. include:

- Site clearance and preparation;
- Preparation of temporary access/egress to the Application Site and haulage routes;
- Earthworks;
- Materials handling, storage, stockpiling, spillage and disposal;
- Movement of vehicles and construction traffic within the Application Site (including excavators and dumper trucks);
- Use of crushing and screening equipment/plant;
- Exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;
- Construction of buildings, roads and areas of hard-standing alongside fabrication processes;
- Internal and external finishing and refurbishment; and
- Site landscaping after completion.

5.1.2 The majority of the releases are likely to occur during the 'working week'. However, for some potential release sources (e.g. exposed soil produced from significant earthwork activities) in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

ASSESSMENT OF POTENTIAL DUST EMISSION MAGNITUDE

5.1.3 The IAQM assessment methodology has been used to determine the potential dust emission magnitude for the following four different dust and PM_{10} sources: demolition; earthworks; construction; and, track-out. The findings of the assessment are presented below.

DEMOLITION

5.1.4 No demolition activities will occur at the Application Site as part of the construction phase of the Proposed Development as the site is currently a car park. Therefore, consideration of the impact of this source on dust soiling and ambient PM_{10} is not required.

EARTHWORKS

5.1.5 The total area of the Application Site is less than 2,500m^2. It is anticipated, given the size of the site, that there will be less than 10 heavy earth moving vehicles will be active at any one time. Therefore, the potential dust emission magnitude is considered to be **small** for earthwork activities.

CONSTRUCTION

5.1.6 The total volume of buildings to be constructed on the Application Site will be approximately 30,000m^3 (which is within the IAQM range 25,000 to 100,000 m^3). The structural frame will be concrete. It is assumed that the concrete will be mixed off-site and then transported and poured on-site. Therefore, the potential dust emission magnitude is considered to be **medium** for construction activities.

TRACK-OUT

5.1.7 Information on the number of HDVs associated with this phase of the Proposed Development is not available and therefore professional judgement has been used. It has been assumed that given the size of the development area there are likely to be between 10 and 50 HDV (>3.5tonnes) outward movements in any one day. Given the location of the Proposed Development the surrounding area and roads will be paved. Due to the size of the site, it is also assumed that the length of unpaved roads within Application Site will be about 50m. Therefore, the potential dust emission magnitude is considered to be **medium** for track-out.

5.1.8 **Table 5** provides a summary of the potential dust emission magnitude determined for each construction activity considered.

Table 5: Potential Dust Emission Magnitude

ACTIVITY	DUST EMISSION MAGNITUDE
Demolition	N/A
Earthworks	Small
Construction Activities	Medium
Track-out	Medium

ASSESSMENT OF SENSITIVITY OF THE STUDY AREA

5.1.9 Wind roses have been generated using three years of meteorological observations (2013 - 2015) from Crosby Airport, to the north of Liverpool, and Liverpool (John Lennon) Airport, to the south. These are shown in **Appendix D.** They show a fairly consistent picture: the prevailing wind direction is from the west and to a lesser degree the south-east. Therefore, receptors located to east and north-west of the Application Site are more likely to be affected by dust and particulate matter emitted and re-suspended during the construction phase.

5.1.10 Under low wind speed conditions, it is likely that the majority of dust would be deposited in the area immediately surrounding the source. To the west of the Proposed Development is the King Edward Industrial Estate. Elsewhere, and in keeping with the central location, the surrounding buildings are composed of offices and commercial units, including hotels, leisure and retail premises. The approach roads are lined with a similar mix of properties.

5.1.11 Taking the above into account and following the IAQM assessment methodology, the sensitivity of the area to changes in dust and PM_{10} has been derived for each of the construction activities considered. The results are shown in **Table 6**.

Table 6: Sensitivity of the Study Area

POTENTIAL IMPACT	SENSITIVITY OF THE SURROUNDING AREA			
	DEMOLITION	EARTHWORKS	CONSTRUCTION	TRACK-OUT
Dust Soiling (Medium)	N/A	Medium	Medium	Medium
Human Health	N/A	Low	Low	Low
Ecological	N/A	N/A	N/A	N/A

RISK OF IMPACTS

5.1.12 The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. **Table 7** below provides a summary of the risk of dust impacts for the Proposed Development. The risk category identified for each construction activity has been used to determine the level of mitigation required.

Table 7: Summary Dust Risk Table to Define Site Specific Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	Low risk	Medium risk	Low risk
Human Health	N/A	Negligible	Low risk	Low risk
Ecological	N/A	N/A	N/A	N/A

5.1.13 Based on the summary presented in **Table 7**, dust poses, at worse, a **medium risk** in terms of dust soiling and human health impacts.

CONSTRUCTION VEHICLES & PLANT

5.1.14 The greatest impact on air quality due to emissions from vehicles and plant associated with the construction phase will be in the areas immediately adjacent to the site access. The northern end of Old Hall Street is a one-way street. It is anticipated that construction traffic will access the site via the A5053, turn onto Old Hall Street and then onto Old Leeds Street. Site egress will be in reverse with vehicles leaving by either going south down Old Hall Street or turning west along Brook Street to join the A5052. Due to the size of the site, and its central location, it is considered likely that the construction traffic will be low in comparison to the existing traffic flows on these roads.

5.1.15 Final details of the exact plant and equipment likely to be used on site will be determined by the appointed contractor, though typically plant would include excavators, dump trucks, piling rigs, cranes, compressors and generators. The number of plant and their location within the site are likely to be variable over the construction period.

5.1.16 Based on the current local air quality in the area, the type and proximity of sensitive receptors to the roads likely to be used by construction vehicles, and the implementation of the relevant mitigation (detailed in Section 6), the impacts are considered not to be significant.

6 MITIGATION & RESIDUAL EFFECTS

6.1 CONSTRUCTION PHASE

6.1.1 Based on the assessment results, mitigation will be required. Recommended mitigation measures are given below.

GENERAL COMMUNICATION

- A stakeholder communications plan that includes community engagement before work commences on site should be developed and implemented.
- The name and contact details of person(s) accountable for air quality and dust issues should be displayed on the site boundary. This may be the environment manager/engineer or the site manager. The head or regional office contact information should also be displayed.

GENERAL DUST MANAGEMENT

- A Dust Management Plan (DMP), which may include measures to control other emissions, in addition to the dust and PM_{10} mitigation measures given in this report, should be developed and implemented, and approved by the Local Authority. The DMP may include a requirement for monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.

SITE MANAGEMENT

- All dust and air quality complaints should be recorded and causes identified. Appropriate remedial action should be taken in a timely manner with a record kept of actions taken including of any additional measures put in-place to avoid reoccurrence.
- The complaints log should be made available to the local authority on request.
- Any exceptional incidents that cause dust and/or air emissions, either on- or offsite should be recorded, and then the action taken to resolve the situation recorded in the log book.
- Regular liaison meetings with other high risk construction sites within 500m of the site boundary should be held, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.

MONITORING

- Daily on-site and off-site inspections should be undertaken, where receptors (including roads) are nearby to monitor dust. The inspection results should be recorded and made available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
- Regular site inspections to monitor compliance with the DMP should be carried out, inspection results recorded, and an inspection log made available to the local authority when requested.
- The frequency of site inspections should be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations should be agreed with the Local Authority. Where possible baseline monitoring should start at least three months before work commences on site or, if it a large site, before work on a phase commences.

PREPARING AND MAINTAINING THE SITE

- Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable.
- Where practicable, erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Where practicable, fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover appropriately.
- Where practicable, cover, seed or fence stockpiles to prevent wind whipping.

OPERATING VEHICLE/MACHINERY AND SUSTAINABLE TRAVEL

- Ensure all vehicle operators switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- A maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas should be imposed (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- A Construction Logistics Plan should be produced to manage the sustainable delivery of goods and materials.
- A Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing) should be considered.

OPERATIONS

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

WASTE MANAGEMENT

- Avoid bonfires and burning of waste materials.

MEASURES SPECIFIC TO EARTHWORKS

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.

- Where practicable, only remove the cover in small areas during work and not all at once.
- Stockpile surface areas should be minimised (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) to reduce area of surfaces exposed to wind pick-up.
- Where practicable, windbreak netting/screening should be positioned around material stockpiles and vehicle loading/unloading areas, as well as exposed excavation and material handling operations, to provide a physical barrier between the Application Site and the surroundings.
- Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of the prevailing wind direction.
- During dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up.

MEASURES SPECIFIC TO CONSTRUCTION

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure 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.
- For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
- All construction plant and equipment should be maintained in good working order and not left running when not in use.

MEASURES SPECIFIC TO TRACK-OUT

- Use 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 in frequent use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Where practicable, hard surfaced haul routes should be regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10m from receptors where possible.

RESIDUAL EFFECTS

6.1.2 The residual effects of dust and PM_{10} generated by construction activities following the application of the mitigation measures described above and good site practice are considered to be **not significant**.

6.1.3 The residual effects of emissions to air from construction vehicles and plant on local air quality are considered to be **not significant**.

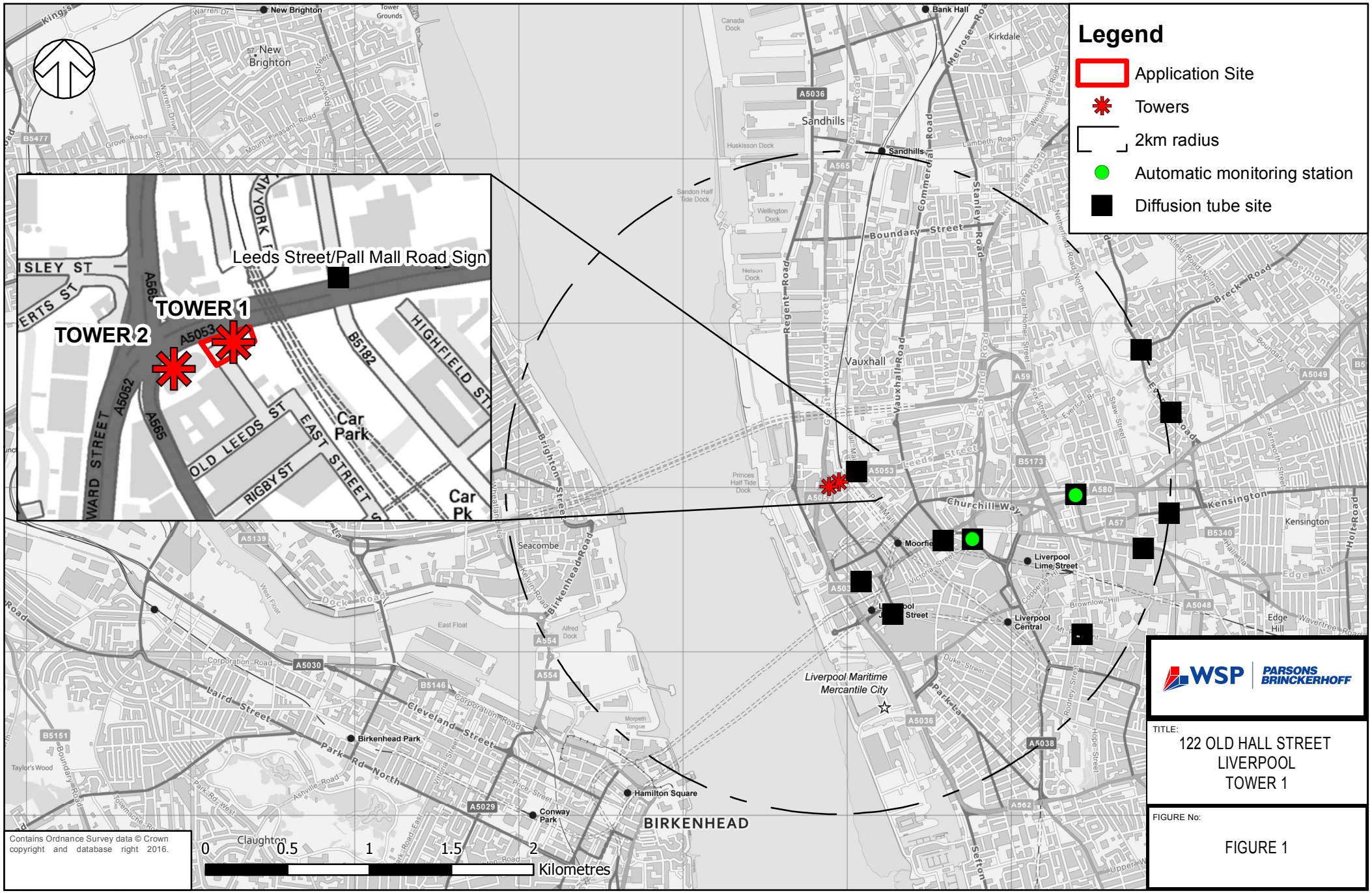
7 CONCLUSIONS

7.1.1 A qualitative assessment of the potential impacts on local air quality from construction activities has been carried out for this phase of the Proposed Development using the IAQM methodology. This identified that there is a Medium Risk of dust soiling impacts and a Low Risk of increases in particulate matter concentrations due to construction activities. However, through good site practice and the implementation of suitable mitigation measures, the effect of dust and PM_{10} releases will be significantly reduced. The residual effects of dust and PM_{10} generated by construction activities on air quality are therefore considered to be **not significant**. The residual effects of emissions to air from construction vehicles and plant on local air quality is considered to be **not significant**.

7.1.2 The Proposed Development will not generate sufficient road traffic once open to cause a significant air quality effect.

7.1.3 It is considered that the development proposals comply with national and local policy for air quality.

FIGURES & APPENDICES


Legend
Application Site
Towers
2km radius
Automatic monitoring station
Diffusion tube site
Leeds Street/Pall Mall Road Sign
TOWER 1
TOWER 2
Contains Ordnance Survey data © Crown copyright and database right 2016.
0
0.5
1
1.5
2
Kilometres
WSP
PARSONS BRINCKERHOFF
TITLE:
122 OLD HALL STREET
LIVERPOOL
TOWER 1
FIGURE No:
FIGURE 1

Appendix A

GLOSSARY

TERM	DEFINITION
AADT Annual Average Daily Traffic	A daily total traffic flow (24 hrs), expressed as a mean daily flow across all 365 days of the year.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year.
AQMA	Air Quality Management Area.
Data capture	The percentage of all the possible measurements for a given period that were validly measured.
DEFRA	Department for Environment, Food and Rural Affairs.
DfT	Department for Transport.
Dust	Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials
Exceedance	A period of time where the concentrations of a pollutant is greater than the appropriate air quality standard.
HDV/HGV	Heavy Duty Vehicle/Heavy Goods Vehicle.
LAQM	Local Air Quality Management.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
Trackout	The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.
$\mu g/m^3$	Micrograms per cubic metre. A measure of concentration in terms of mass per unit volume. A concentration of $1\mu g/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

Appendix B

RELEVANT UK AIR QUALITY STRATEGY OBJECTIVES

National Air Quality Objectives and European Directive Limit Values for the protection of human health						
Pollutant	Applies to	Objective	Measured as	Date to be achieved by and maintained thereafter	European Obligations	Date to be achieved by and maintained thereafter
Nitrogen dioxide (NO_2)	UK	200µg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31.12.2005	200µg/m^3 not to be exceeded more than 18 times a year	01.01.2010
	UK	40µg/m^3	annual mean	31.12.2005	40µg/m^3	01.01.2010
Particulate Matter (PM_{10}) (gravimetric)[A]	UK (except Scotland)	40µg/m^3	annual mean	31.12.2004	40µg/m^3	01.01.2005
	UK (except Scotland)	50µg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004	50µg/m^3 not to be exceeded more than 35 times a year	01.01.2005
Particulate Matter ($PM_{2.5}$)	UK (except Scotland)	25µg/m^3	annual mean	2020	Target value 25µg/m^3	2010

[A] Measured using the European gravimetric transfer sampler or equivalent

µg/m^3 = microgram per cubic metre

Appendix C

IAQM CONSTRUCTION ASSESSMENT METHODOLOGY

STEP 1 – SCREENING THE NEED FOR A DETAILED ASSESSMENT

An assessment will normally be required where there are:

- → 'human receptors' within 350m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or
- → 'ecological receptors' within 50m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is "negligible".

STEP 2A – DEFINE THE POTENTIAL DUST EMISSION MAGNITUDE

The following are examples of how the potential dust emission magnitude for different activities can be defined. (Note that not all the criteria need to be met for a particular class). Other criteria may be used if justified in the assessment.

Table 2A: Examples of Human Receptor Sensitivity to Construction stage Impacts

DUST EMISSION MAGNITUDE	ACTIVITY
Large	**Demolition** >50,000m^3 building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20m above ground level
	Earthworks >10,000m^2 site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously, >8m high bunds formed, >100,000 tonnes material moved
	Construction >100,000m^3 building volume, on site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty surface material (e.g. clay), >100m unpaved roads
Medium	**Demolition** 20,000 - 50,000m^3 building demolished, dusty material (e.g. concrete) 10-20m above ground level
	Earthworks 2,500 - 10,000m^2 site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4m - 8m high bunds, 20,000 -100,000 tonnes material moved
	Construction 25,000 - 100,000m^3 building volume, dusty material e.g. concrete, on site concrete batching
	Trackout 10 - 50 HDVs out / day, moderately dusty surface material (e.g. clay), 50 -100m unpaved roads
Small	**Demolition** <20,000m^3 building demolished, non-dusty material (e.g metal cladding), <10m above ground level, work during wetter months
	Earthworks

Dust Emission Magnitude	Activity
	<2,500m^2 site area, soil with large grain size (e.g. sand), <5 earth moving vehicles active simultaneously, <4m high bunds, <20,000 tonnes material moved, earthworks during wetter months
	Construction <25,000m^3, non-dusty material (e.g. metal cladding or timber)
	Trackout <10 HDVs out / day, non-dusty soil, < 50m unpaved roads

STEP 2B – DEFINE THE SENSITIVITY OF THE AREA

The tables below present the IAQM assessment methodology to determine the sensitivity of the area to dust soiling, human health and ecological impacts respectively. The IAQM guidance provides guidance to allow the sensitivity of individual receptors to dust soiling and health effects to assist in the assessment of the overall sensitivity of the study area.

Table 2Ba: Sensitivity of the Area to Dust Soiling Effects

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
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

Table 2Bb: Sensitivity of the Area to Human Health Impacts

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

Table 2Bc: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Sources (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

STEP 2C – DEFINE THE RISK OF IMPACTS

The dust emissions magnitude determined at Step 2A should be combined with the sensitivity of the area determined at Step 2B to determine the risk of impacts without mitigation applied. For those cases where the risk category is 'negligible' no mitigation measures beyond those required by legislation will be required.

Table 2C: Risk of Dust Impacts

Sensitivity of surrounding area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks and Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

STEP 3 –SITE SPECIFIC MITIGATION

Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is considered to be a low, medium or high risk site. The IAQM guidance details the mitigation measures required for high, medium and low risk sites as determined in Step 2C.

STEP 4 – DETERMINE SIGNIFICANT EFFECTS

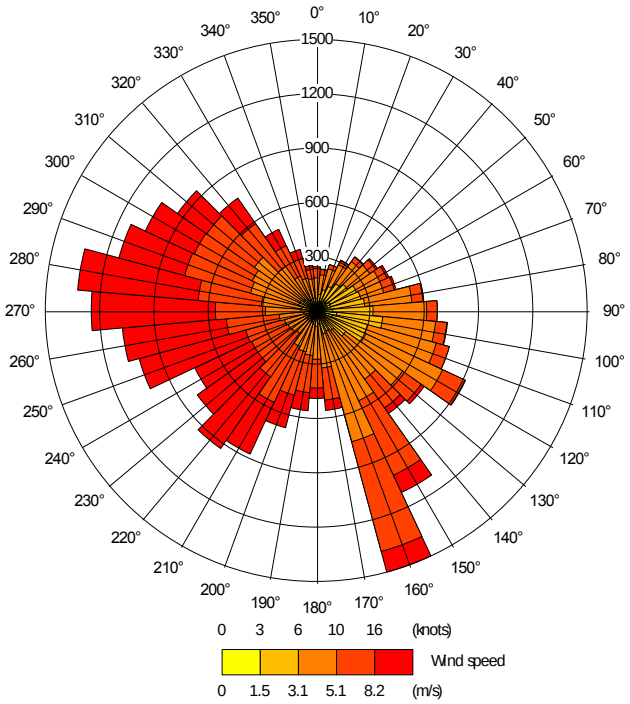
Once the risk of dust impacts has been determined in Step 2C and the appropriate dust mitigation measures identified in Step 3, the final step is to determine whether there are significant effects arising from the construction stage. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

Appendix D

WIND ROSES FOR CROSBY AND LIVERPOOL AIRPORTS (2013-15)

WIND ROSES FOR CROSBY AND LIVERPOOL AIRPORTS (2013-15)

Crosby Airport (2013-15)



Liverpool Airport (2013-15)