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Project

ERADE
Air Quality Assessment

Prepared for

Castleoak Care Developments Limited and
RST Topsham Road (Exeter) Ltd

By

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Summary

SRL Technical Services Limited has been commissioned by Acorn Property Group to prepare an air quality assessment for the proposed redevelopment of the existing Exeter Royal Academy for Deaf Education (ERADE), hereafter referred to as the 'Proposed Development' or 'Site'. The proposals include 149 residential dwellings, assisted living units and a care home, with associated car parking.

The Site lies within the Exeter City Council (ECC) administrative area. ECC have declared an Air Quality Management Area (AQMA) covering a network of major roads in Exeter for exceedances of the annual and hourly mean nitrogen dioxide (NO_2) objectives. The Proposed Development is located adjacent to Topsham Road, which is one of the roads included in the AQMA.

There is a risk that changes to traffic as a result of the Proposed Development will impact on air quality at existing sensitive receptors. As the Proposed Development is located adjacent to an AQMA, there is also a risk that future residents of the Site will be exposed to poor air quality.

This report considers the potential air quality impacts associated with both the construction and operation of the Proposed Development. Construction phase impacts can be effectively managed through the implementation of best practice mitigation measures. Appropriate measures are recommended based on the identified level of risk.

The impact of traffic emissions generated by the Proposed Development once operational on local air quality has been assessed, and found to be negligible. Additionally, air quality for future residents of the Proposed Development has been assessed and found to be suitable.

Based on the results of the assessment, the Proposed Development complies with local and national policy and no air quality constraints have been identified.

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1.0 Introduction

The potential air quality impacts relating to the Proposed Development of the ERADE site, Topsham Road, Exeter (**Figure 1**) have been assessed. This report sets out the findings.

The potential air quality impacts associated with the Proposed Development relate to:

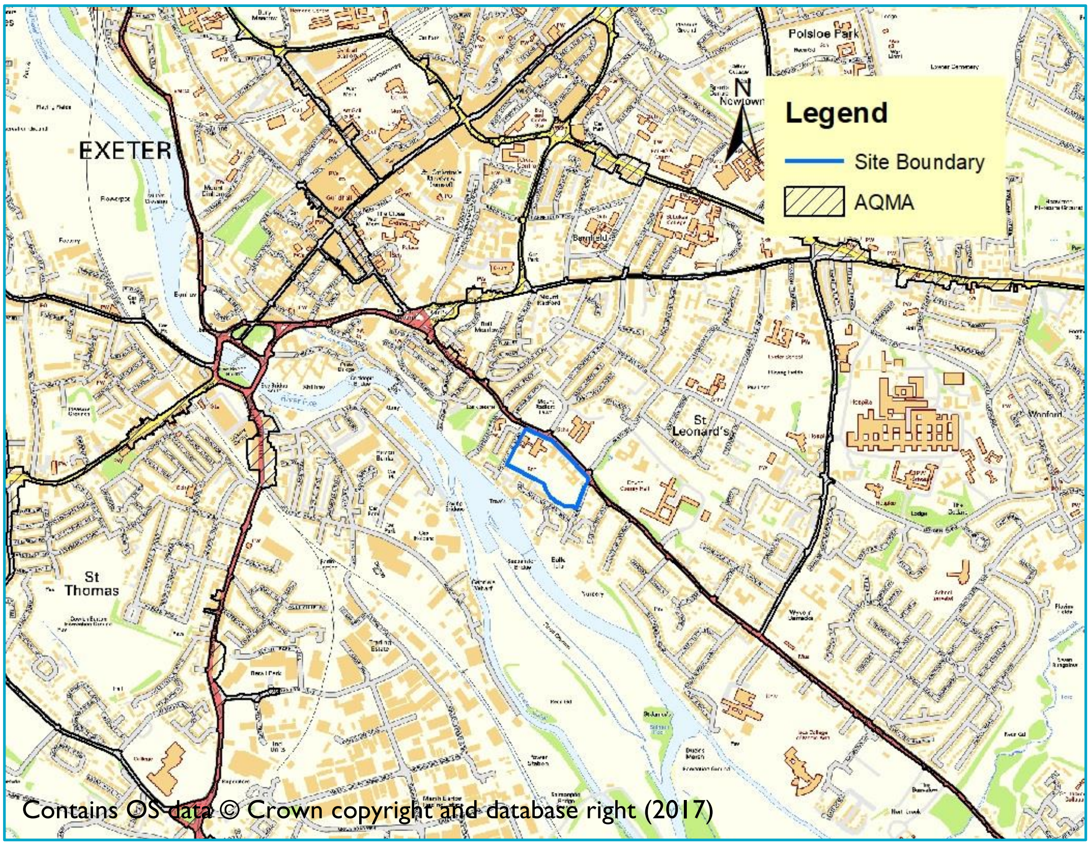
- dust and particulate matter generated by construction activities
- increase in concentrations of NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) due to emissions generated by the Proposed Development once operational

The potential exposure of future residents of the Site to poor air quality has also been assessed.

This report looks at the existing air quality conditions around the Site, the potential impacts on local air quality at existing sensitive receptors, exposure of future residents of the Site to poor air quality and the likelihood of significant impacts. Mitigation measures are recommended where the assessment identifies potentially adverse effects.

The assessment takes account of relevant local and national policy and guidance. A glossary of terms used in this report is provided in **Appendix A**.

Figure 1 - Site Location



2.0 Relevant Policy and Guidance

The Air Quality Strategy

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland[1] sets out air quality objectives (**Appendix B**) and policy options to improve air quality in the UK. The main aim of the Strategy is to ensure that ambient air quality is of an acceptable level to protect human health and the environment. It takes account of the Limit Values set out in EU legislation.

Local Air Quality Management (LAQM)

The Environment Act 1995 introduced the LAQM system, whereby local authorities have a duty to review and assess air quality within their areas against the air quality objectives defined in the Air Quality Strategy. Where exceedances of the objectives are identified, the authority must then declare an Air Quality Management Area (AQMA) and define the measures which will be implemented to improve air quality.

National Planning Policy Framework

The National Planning Policy Framework (2012)[2] sets out the Government's planning policies for England and outlines how they are expected to be applied to achieve the Government's aim of sustainable development. The NPPF states that:

"*To prevent unacceptable risks from pollution….. planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account.*"

Exeter Local Development Framework

The Local Development Framework for Exeter comprises the Core Strategy (adopted in 2012) which describes the vision, objectives and strategy for the spatial development of the city up to 2026, and saved policies from the Exeter Local Plan adopted in 2005. Policies from this Plan were saved in 2008 whilst the Local Development Framework (LDF) was developed. Policy EN3 - Air and Water Quality of the Local Plan states:

"*Development that would harm air or water quality will not be permitted unless mitigation measures are possible and are incorporated as part of the proposal*".

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

Guidance

The following guidance documents have also been used where appropriate, in this assessment:

- Local Air Quality Management Technical Guidance (LAQM.TG(16))[3]
- Land-Use Planning and Development Control: Planning for Air Quality. V1.2[4]
- Guidance on the Assessment of Dust from Demolition and Construction[5]
- National Planning Practice Guidance - Air Quality[6]

[3] Defra (2016). Part IV of the Environment Act 1995 Environment (Northern Ireland) Order 2002 Part III Local Air Quality Management Technical Guidance (TG16)

[4] Environmental Protection UK / Institute of Air Quality Management (2017).

[5] Institute of Air Quality Management (2014).

[6] Department of Communities and Local Government (DCLG) (2014).

3.0 Assessment

3.1 Existing Conditions

Existing air quality conditions near to the Site have been defined based on a review of the following sources of data:

- ECC's Review and Assessment reports and monitoring data;
- Defra's Local Air Quality Management (LAQM) Support Pages, including background maps;
- Environment Agency website; and
- Maps and plans of the Site and surrounding area.

ECC has declared an AQMA covering a network of major roads in Exeter for exceedances of the annual and hourly mean NO_2 objectives. The Site is located adjacent to Topsham Road which forms part of the AQMA.

A review of the data provided by the Environment Agency indicates that there are no industrial pollution sources in the immediate vicinity of the Site that will influence the local air quality; the main influence is emissions from road transport using the local road network.

Table 1 summarises the background pollutant concentrations of NO_2, PM_{10} and $PM_{2.5}$ used in the assessment. Background concentrations of PM_{10} and $PM_{2.5}$ have been taken from the maps provided by Defra. Background concentrations of NO_x and NO_2 have been taken from Defra background maps and calibrated following guidance[7] to address the uncertainty surrounding future background concentrations of these pollutants. In each assessment year, the annual mean background concentrations are well below the relevant objectives.

Table 1: Background Pollutant Concentrations (µg/m^3)

Grid Square	NO_2		PM_{10}		$PM_{2.5}$	
	2016	2022	2016	2022	2016	2022
292500, 91500	13.7	12.4	13.3	12.8	9.2	8.7
292500, 92500	14.0	12.6	13.3	12.7	9.3	8.8
293500, 91500	12.1	10.9	13.7	13.1	9.4	8.9
Objective	**40**		**40**		**25**	

7 Air Quality Consultants (2016) Deriving Background Concentrations of NO_x and NO_2 for use with the CURED V2a

ECC monitor concentrations of NO_2 using diffusion tubes at a number of locations within their administrative area. Monitoring data from two representative sites located within 700m of the Site is set out in **Table 2**.

Table 2: Monitoring Data

Monitoring Site	Site Type	Annual Mean NO_2 Concentrations (µg/m³)				
		2012	**2013**	**2014**	**2015**	**2016**
DT 16 - Holloway Street	Roadside	36.4	39.2	35.9	28.8	33.4
DT 65 - Topsham Road (Barrack)	Roadside	27.5	26.9	27.6	24.1	25.0
Objective		**40**				

The data show that concentrations have been below the annual mean NO_2 objective for the past five years. Overall, measured concentrations have reduced over this period.

ECC monitor PM_{10} concentrations at two automatic monitoring locations; concentrations have been well below the relevant objectives for the past five years.

3.2 Construction Impacts

During the construction phase, activities may generate dust and particulate matter, as well as exhaust emissions from construction vehicles and plant, which could result in complaints of nuisance and human health effects.

The likely level of risk has therefore been assessed following guidance published by the Institute of Air Quality Management (IAQM). The assessment takes into account the nature and scale of the construction activities and the sensitivity of the surrounding area. Mitigation measures proportionate to the level of risk are then set out.

Additionally, 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 Site and near the Site itself. As precise information on the number of vehicles and plant associated with each part of the construction phase is not yet known, a qualitative assessment of their impact on local air quality has been done using professional judgement and by considering the following:

- The likely number and type of construction traffic and plant;
- The number and proximity of sensitive receptors to the Site;
- The likely duration of the construction period; and
- The nature of the activities undertaken.

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, trackout.

Demolition

- The total volume of buildings to be demolished is estimated to be less than 20,000m^3. Therefore, the dust emission magnitude is judged to be **small** for demolition activities.

Earthworks

- The total area of the Site is larger than 10,000m^2, therefore, the potential dust emission magnitude is judged to be **large** for earthwork activities.

Construction

- The total volume of buildings to be constructed on the Site is estimated to be between 25,000m^3 and 100,000m^3, therefore, the potential dust emission magnitude is judged to be **medium** for construction activities.

Trackout

- On average, is anticipated that there will be fewer than 10 Heavy Duty Vehicle (HDV) outward movements per day over an unpaved road length of between 50 and 100m. Therefore, as a worst case, it is judged that the potential dust emission magnitude is **medium** for trackout.

Sensitivity of the Study Area

A windrose generated using the meteorological data used for the dispersion modelling is provided in **Appendix C**. This shows that the prevailing wind direction is from the northwest with a significant contribution from the south. Therefore, receptors located to the southeast and north of the Site are more likely to be affected by dust and particulate matter emitted and suspended during the construction phase.

Most dust will be deposited in the area immediately surrounding the source. The area surrounding the Site is mainly residential, with approximately 20 residential dwellings located within 20m of the Site boundary, and St Leonard's Primary School within 50m. These receptors are considered to be of high sensitivity to dust soiling and human health effects.

Using the IAQM guidance, the overall sensitivity of the local area is:

- High for dust soiling due to the number of sensitive receptors close to the Site; and
- Low sensitivity to human health effects due to the low background PM_{10} concentrations.

There are no designated ecological sites within 50m of the Site boundary nor within 50m of roads potentially affected by trackout so an assessment of the impact of the construction phase on ecological sites is not required.

Impact Assessment

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 3** provides a summary of the risk of construction phase impacts for the Proposed Development. The risk category identified for each construction activity has been used to determine the level of mitigation required.

Table 3: Dust Risk Summary to Define Site Specific Mitigation

Potential Impact	**Risk**			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	High Risk	Medium Risk	Medium Risk
Human Health	Negligible	Low Risk	Low Risk	Low Risk

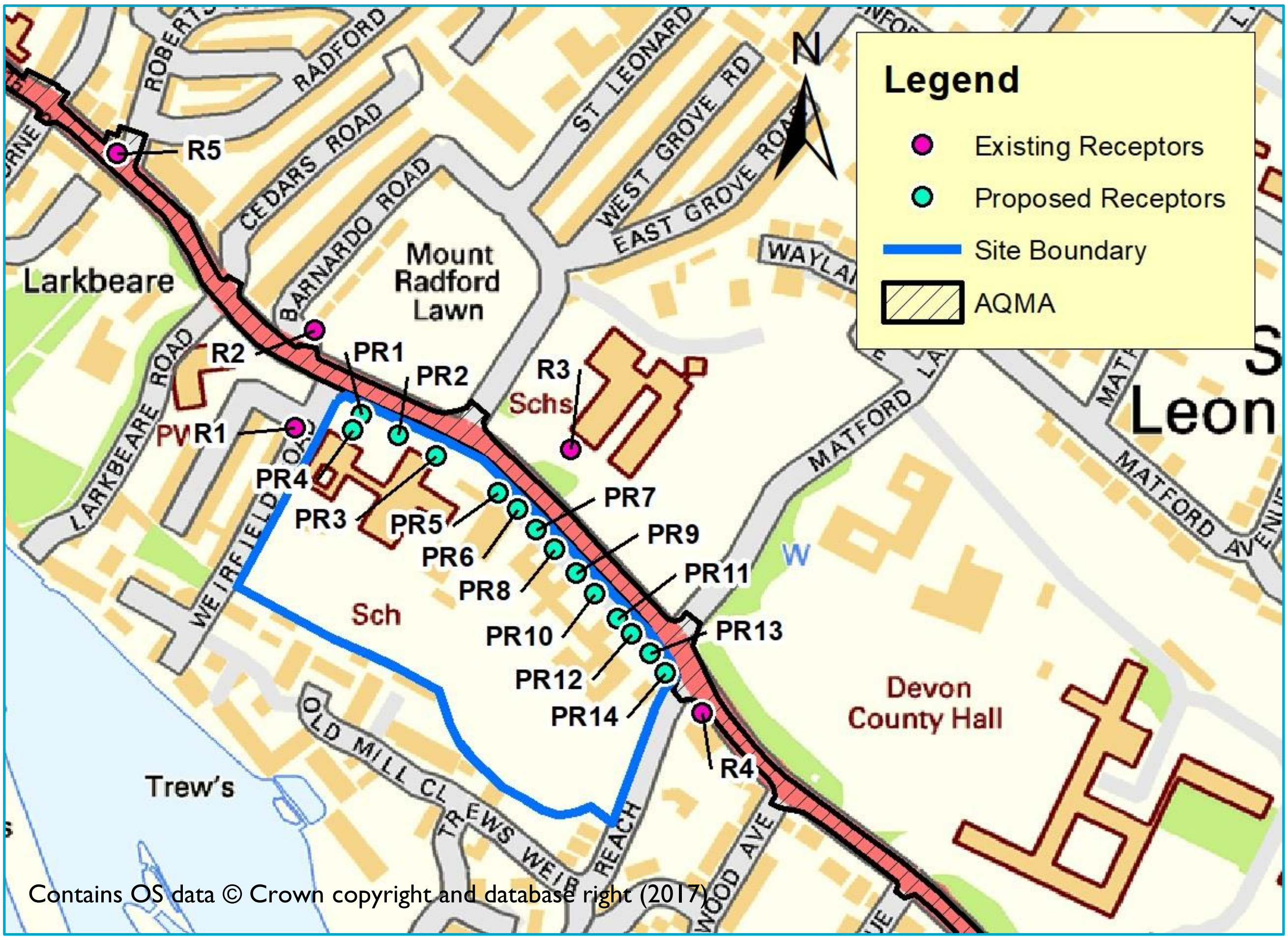
Construction Vehicles and Plant

The number of HDVs generated by the Site during the construction phase will fluctuate over the construction period depending on activities being undertaken however, it is anticipated that on average, the Site will generate fewer than 20 HDV movements per day, which is below the threshold defined in the Environmental Protection UK (EPUK) / IAQM guidance of 25 HDVs within, or adjacent to, an AQMA. Based on this, the impacts are judged to be **negligible**.

3.3 Operational Road Traffic Impacts

During the operational phase, local air quality could be impacted by emissions from road traffic generated by the Proposed Development. The impact of emissions associated with the Proposed Development on air quality at existing sensitive receptors locations has been assessed using the atmospheric dispersion model ADMS Roads (version 4.1.1.0). Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at a number of existing receptors at worst-case locations close to the Proposed Development, in line with EPUK / IAQM guidance and thresholds. Additionally, concentrations were predicted at a number of locations within the Site, representing worst-case exposure adjacent to Topsham Road. These locations are shown in **Figure 2** and described in **Appendix D**.

Figure 2 - Receptor Locations



Three assessment scenarios have been considered:

- 2016 - Model verification, and Baseline;
- 2022 - Future Baseline; and
- 2022 - Future year with entire development in place.

Further details of the methodology used in the assessment are set out in **Appendix D**. Traffic data and emissions used in the assessment are set out in **Appendix E**. Full results of the assessment are detailed in **Appendix F** and are summarised below.

Annual and Hourly Mean NO_2 Concentrations

The results of the impact assessment show that the annual mean NO_2 objective of 40µg/m^3 is met at all receptor locations in all scenarios modelled. The highest annual mean NO_2 concentrations were predicted in each scenario at R5, located at 1 Robert's Road, adjacent to Topsham Road. An annual mean NO_2

concentration of 29.7μg/m^3 was predicted at this receptor in the 2022 baseline scenario, whilst a concentration of 29.8μg/m^3 was predicted in the 2022 with development scenario.

The greatest predicted change in annual mean NO_2 concentrations as a result of additional traffic emissions associated with the Proposed Development was 0.2μg/m^3 at R1, located at 1 Weirfield Road. The total predicted annual mean NO_2 concentration at R1 with the Proposed Development in operation was 16.1μg/m^3 which is 40% of the annual mean objective, and therefore, using the significance criteria set out in **Appendix D Table D4,** the impact of the Proposed Development at this receptor is negligible. The Proposed Development is predicted to have a **negligible** impact at all receptors considered in the assessment.

As all predicted annual mean concentrations are well below 60μg/m^3, based on the relationship between hourly and annual mean NO_2 concentrations[8], it is unlikely that the hourly mean NO_2 objective will be exceeded.

Therefore, in line with the significance criteria set out in **Appendix D Table D4**, the impact of the Proposed Development on hourly mean NO_2 concentrations is judged to be **negligible**.

Annual and Daily Mean PM_{10} Concentrations

The annual and daily mean PM_{10} objectives are predicted to be met at all existing receptors in all scenarios assessed, with the highest concentration predicted at R5. The highest annual mean PM_{10} concentration was 16.4μg/m^3 in both the 2022 baseline and 2022 with development scenarios. There were no days exceeding 50μg/m^3 predicted in either the 2022 baseline or 2022 with development scenario.

The predicted change in annual mean PM_{10} concentrations as a result of the Proposed Development was less than 0.5% of the relevant objective at all receptors. Therefore, using the significance criteria in **Appendix D Table D4**, the impact of the Proposed Development on annual PM_{10} concentrations is **negligible**.

There is no change in the number of days where PM_{10} concentrations exceed 50μg/m^3 and therefore, the impact of the development on daily mean PM_{10} concentrations is judged to be **negligible**.

8 The hourly mean objective is unlikely to be exceeded where the annual mean NO_2 concentration is less than 60μg/m^3.

Annual Mean $PM_{2.5}$ Concentrations

The predicted annual mean $PM_{2.5}$ concentrations were below the objective of 25µg/m^3 at all existing receptors in all scenarios assessed. The highest annual mean $PM_{2.5}$ concentration was 10.8µg/m^3 at R5 in both the 2022 baseline and 2022 with development scenarios. The change in annual $PM_{2.5}$ concentrations was less than 0.5% of the objective at all receptors, therefore, using the significance criteria in **Appendix D Table D4,** the impact of the Proposed Development on annual mean $PM_{2.5}$ concentrations is **negligible**.

Proposed Receptors

The highest annual mean NO_2 concentration predicted at any of the receptors chosen to represent worst-case exposure within the Proposed Development was 22.5µg/m^3 at receptor PR14, located adjacent to Topsham Road, close to the signalised junction with Matford Lane. All predicted annual mean NO_2 concentrations are well below the objective. As all predicted annual mean concentrations are well below 60µg/m^3, it is also unlikely that the hourly mean NO_2 objective will be exceeded within the Site.

The highest predicted annual mean PM_{10} concentration within the Site is 14.6µg/m^3 at receptors PR1 and PR14, both adjacent to Topsham Road. There were no predicted days exceeding 50µg/m^3 at any receptor. This highest predicted $PM_{2.5}$ annual mean concentration within the Site is 9.7µg/m^3.

The predicted concentrations are all well below the relevant objectives for each pollutant; air quality is therefore suitable for future residents.

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4.0 Mitigation

4.1 Construction Phase

The assessment of potential construction phase impacts has found that the Proposed Development is medium to high risk for dust soiling, and negligible to low risk for human health effects. **Appendix G** presents the mitigation measures recommended to reduce the risk of air quality impacts during the construction phase of the Proposed Development.

4.2 Operational Phase

The results of the impact assessment demonstrate that the Proposed Development will have a negligible impact on air quality at existing sensitive receptor locations, and that air quality for future residents of the Site will be acceptable. Consequently, no specific mitigation is required.

5.0 Discussion

A qualitative assessment of the potential impacts on local air quality from construction activities has been carried out for the Proposed Development. This assessment identified that the Proposed Development is medium to high risk for dust soiling, and negligible to low risk for human health effects. Through good site practice and the implementation of suitable mitigation measures, these effects will be reduced; the residual effects are therefore considered to be negligible.

A quantitative assessment of the potential impacts on local air quality from the additional road traffic emissions associated with the operation of the Proposed Development has been performed. The results of air quality modelling show that the Proposed Development will have a negligible impact on local pollutant concentrations at existing receptors. The results of the exposure assessment show that air quality for future residents of the Proposed Development is compliant with relevant objectives and therefore no mitigation is required.

Based on the results of the assessment, it is considered that with appropriate construction phase mitigation in place, the Proposed Development complies with relevant national and local planning policies and that there are no air quality constraints.

Appendix A - Glossary

Term	Definition
AADT	Annual Average Daily Traffic.
Annual mean	The average of the hourly mean concentrations measured for one year.
AQMA	Air Quality Management Area.
CURED	Calculator Using Realistic Emissions for Diesels.
Defra	Department for Environment, Food and Rural Affairs.
EFT	Emissions Factor Toolkit.
EPUK	Environmental Protection UK.
ETO	Environmental Technical Officer.
Exceedance	Where the concentration of a pollutant is greater than the appropriate air quality objective.
HDV / HGV	Heavy Duty Vehicle / Heavy Goods Vehicle.
IAQM	Institute of Air Quality Management.
LAQM	Local Air Quality Management.
NO_2	Nitrogen dioxide.
NO_x	Oxides of nitrogen.
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.

Appendix B - Air Quality Objectives

Pollutant	Objective	Averaging Period
Nitrogen dioxide (NO_2)	$40\mu g/m^3$	Annual mean
	$200\mu g/m^3$ not to be exceeded more than 18 times per year	Hourly mean
Particulate Matter (PM_{10})	$40\mu g/m^3$	Annual mean
	$50\mu g/m^3$ not to be exceeded more than 35 times per year	Daily mean
Particulate Matter ($PM_{2.5}$)	$25\mu g/m^3$	Annual mean

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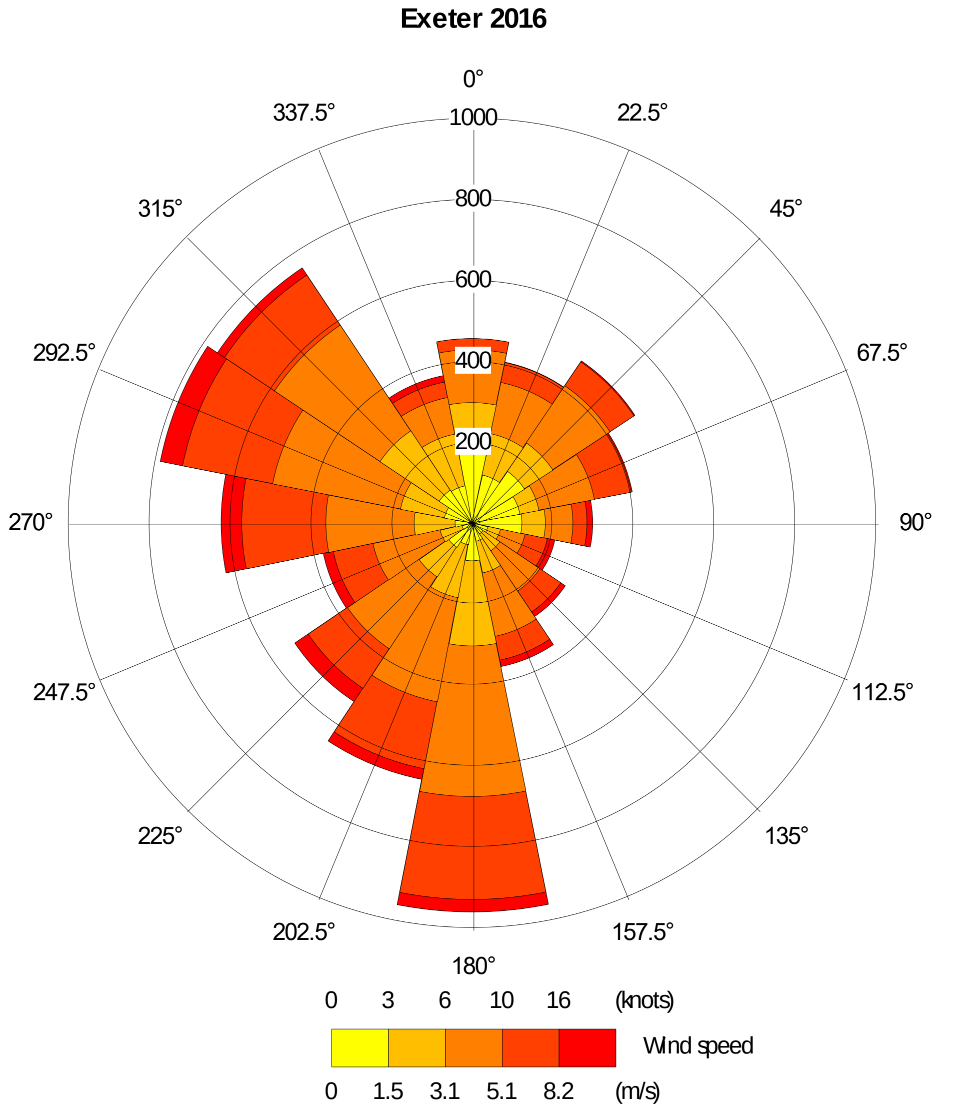
Appendix C - Windrose



Appendix D - Assessment Methodology and Results

Pollutant concentrations have been predicted at a number of existing and proposed receptor locations using the dispersion model ADMS Roads (version 4.1.1.0) which is widely used for this type of modelling. The model allows concentrations to be predicted at user defined locations (receptors), taking account of local conditions (road geometry, width and height, and local meteorological conditions). The approach to the assessment was agreed with the Environmental Technical Officer (ETO) at ECC.

Meteorological data from Exeter for 2016 has been used in the model as this is considered to be most representative of conditions at the Site and in the study area. Traffic data (AADT flows and percentage of HDVs) have been obtained from the Project Transport Consultants, Vectos for all modelled scenarios. Traffic speeds have been estimated from local speed limits taking account of the proximity to junctions. The following scenarios were modelled:

- 2016 - Model Verification and Existing Baseline;
- 2022 - Future Baseline; and
- 2022 - Future year with entire development in place.

2016 is the most recent year for which a full year of monitoring and meteorological data are available. 2022 is the anticipated opening year of the Proposed Development.

D1. Vehicle Emission Factors

Vehicle emission factors for PM_{10} and $PM_{2.5}$ used in the assessment were taken from Defra's Emissions Factor Toolkit (EFT) (version 7) which predicts emissions from 2008 to 2030. Emission factors for NO_x were taken from the CURED tool[9], which has been developed by Air Quality Consultants (AQC) to address the uncertainty surrounding the rate of NO_x emissions reduction and to adjust for the apparent under-prediction of NO_x emissions in Defra's EFT. The use of these emissions is considered to provide the most realistic assessment of future concentrations.

D2. Background Concentrations

Defra's background maps were used to obtain background concentrations for the assessment. These provide estimated background concentrations in the UK at 1km x 1km grid resolution for years between 2013 and 2030. As there is limited evidence that background concentrations of NO_x and NO_2 have reduced at the rate predicted by the maps, the background concentrations of NO_x and NO_2 from the maps

[9] AQC. 2016. New Calculator to Support Emissions Sensitivity Test. Available at http://www.aqconsultants.co.uk/News/March-2016/New-Calculator-to-Support-Vehicle-Emissions-Sensit.aspx]

have been calibrated following guidance published by AQC[10] before use in the assessment. This approach is consistent with that used for emissions factors and provides the most realistic future year background concentrations for use in the assessment.

D3. Model verification

Whilst ADMS Roads is widely validated for use in this type of assessment, model verification for the area around the Site will not have been included. To determine model performance at a local level, a comparison of modelled results with monitored results in the study area was done in line with methodology specific in LAQM.TG(16). This process of verification aims to minimise modelling uncertainty by correcting modelled results by an adjustment factor to give greater confidence to the results.

The model was run to predict the 2016 annual mean road-NO_x contribution at two monitoring locations within the study area. The model output of road-NO_x has been compared to the 2016 'measured' road-NO_x, which was determined from the nitrogen dioxide concentrations measured at the monitors, utilising the NO_x from NO_2 calculator provided by Defra and the adjusted NO_2 background concentrations. **Table D1** presents the data used in the verification.

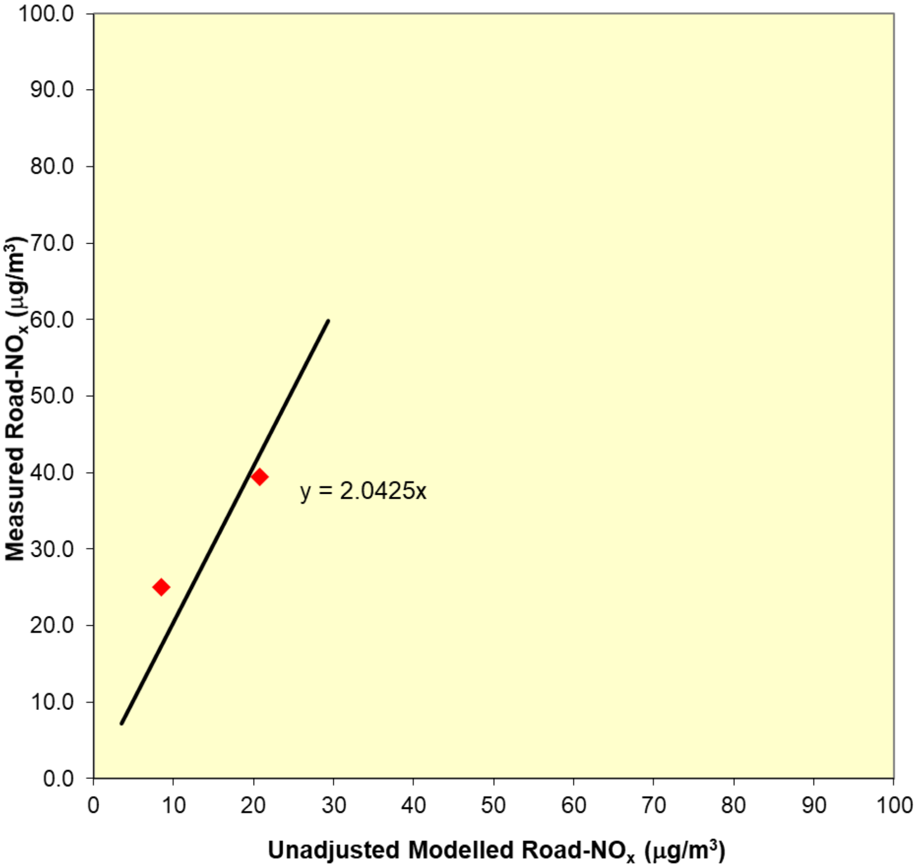
Table D1: Verification Data

Monitoring Site	Measured Annual Mean NO_2 Concentrations ($\mu g/m^3$)	Background NO_2 ($\mu g/m^3$)	Measured Road-NO_x ($\mu g/m^3$) (from NO_x:NO_2 Calculator)	Modelled Road-NO_x	Ratio
DT 16 - Holloway Street	33.4	14.0	39.4	20.8	1.89
DT 65 - Topsham Road (Barrack)	25.0	12.1	25.0	8.5	2.94

A road-NOx adjustment factor of **2.043** was determined as the ratio of the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (**Figure D1**) . This factor was then applied to the modelled road-NO_x concentration at each receptor, before conversion to NO_2 concentrations using the NO_x to NO_2 calculator provided by Defra and the adjusted NO_2 background concentration.

[10] AQC, 2016. Deriving Background Concentrations of NO_x and NO_2 for Use with 'CURED V2A'. Available at: http://www.aqconsultants.co.uk/getattachment/Resources/Download-Reports/Adjusting-Background-NO2-Maps-for-CURED-September-2016.pdf.aspx

Figure D1: Comparison of Measured Road-NOx with Unadjusted Modelled Road-NOx



As there are no appropriate PM_{10} or $PM_{2.5}$ monitoring locations within the study area, the predicted road-PM_{10} and road-$PM_{2.5}$ components have been adjusted using the road-NO_x factor before adding the appropriate background concentration. The number of days where PM_{10} concentrations were greater than 50µg/m^3 was estimated using the relationship with the annual mean concentration described in LAQM.TG(16).

Processed results were compared against the relevant objectives set out in **Appendix B**. LAQM.TG(16) advises that, where road traffic is the predominant source, an exceedance of the 1 hour mean NO_2 objective is unlikely to occur where the annual mean concentration is below 60µg/m^3. This concentration has been used to screen whether the hourly mean NO_2 objective is likely to be achieved.

D4. Sensitive Receptors

Relevant sensitive receptor locations for the assessment are places where the public may be expected to be regularly present for the averaging period of the objective. Based on guidance in LAQM.TG(16), existing and proposed residential dwellings, and the proposed care home, are sensitive receptors to the annual mean and short term objectives.

Several existing receptors were chosen at worst case locations adjacent to the local road network affected by traffic associated with the Proposed Development; several receptors within the Proposed Development were also chosen. The receptors are summarised in **Table D3** and are shown in **Figure 2**.

Table D3: Receptor Locations

Receptor ID	Receptor Description	Height (m)	X	Y
Existing Receptors				
R1	1 Weirfield Road	1.5	292486.9	91872.0
R2	2 Barnado Road	4.5	292498.9	91930.7
R3	St Leonard's Primary School	3.5	292653.1	91858.8
R4	78 Topsham Road	1.5	292731.9	91700.2
R5	1 Roberts Road	1.5	292380.1	92037.1
Proposed Receptors				
PR1	Proposed Care Home	1.5	292526.6	91879.6
PR2	Proposed Care Home	1.5	292549.1	91867.3
PR3	Proposed Care Home	1.5	292571.7	91854.7
PR4	Proposed Care Home	1.5	292521.3	91870.3
PR5	Proposed Residential Dwelling	1.5	292609.3	91832.7
PR6	Proposed Residential Dwelling	1.5	292620.8	91822.8
PR7	Proposed Residential Dwelling	1.5	292631.9	91810.5
PR8	Proposed Residential Dwelling	1.5	292643.1	91798.7
PR9	Proposed Residential Dwelling	1.5	292656.4	91784.3
PR10	Proposed Residential Dwelling	1.5	292667.5	91771.9
PR11	Proposed Residential Dwelling	1.5	292680.8	91756.8
PR12	Proposed Residential Dwelling	1.5	292689.2	91747.9
PR13	Proposed Residential Dwelling	1.5	292700.4	91736.0
PR14	Proposed Residential Dwelling	1.5	292709.8	91724.0

D5. Significance Criteria

The principles set out in the IAQM / EPUK guidance have been used within this assessment, along with professional judgement, to describe the impact of the Proposed Development on local air quality once operational. The guidance states that the judgement of significance should take into account relevant factors, including:

- The extent to which an objective or limit value is exceeded; and
- The influence and validity of any assumptions adopted when undertaking prediction of concentrations, including the extent to which any assumptions are worst-case.

Table D4 sets out the significance criteria used in this assessment.

Table D4: Impact Descriptors for Individual Receptors

Long term average concentration at receptor in assessment year	% 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	Significant	Substantial	Substantial

Notes:

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

The table is only designed to be used with annual mean concentrations.

When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme' concentration for an increase. Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.

The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.

D6. Limitations and Assumptions

There are uncertainties associated with both measured and predicted concentrations. The model relies on input data (including projected traffic flows), which also have uncertainties associated with them. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the ADMS Roads model will not take into account.

To reduce the uncertainty associated with predicted concentrations, model verification has been carried out following guidance set out in LAQM.TG(16), which recommends the use of roadside monitoring for this process. As the model has been verified against 2016 measured concentrations and has been adjusted to take account of the apparent under-prediction, there can be reasonable confidence in the predicted concentrations.

Due to the uncertainty surrounding the accuracy of future year vehicle emissions and background concentrations of NO_x and NO_2, the CURED methodology has been used to obtain emission factors and to calibrate background concentrations. This approach is considered to provide the most realistic assessment of future year concentrations.

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Appendix E - Traffic Data and Emissions

2016 Verification and Baseline

Road Name	AADT	HDV%	Speed (kph)	NO_x Emissions (g/km/s)	PM_{10} Emissions (g/km/s)	$PM_{2.5}$ Emissions (g/km/s)
Weirfield Road	336	0.0	40.32	0.001336	0.000133	0.000078
Topsham Road East of Site	22706	4.2	48.28	0.121958	0.010147	0.005994
Topsham Road West of Weirfield Road	22706	4.2	48.28	0.121958	0.010147	0.005994
Weirfield Road junction	336	0.0	24.14	0.001623	0.000137	0.000083
Topsham Road adjacent to Site	22706	4.2	48.28	0.121958	0.010147	0.005994
Topsham Road at junction with Matford Lane	22706	4.2	24.14	0.167023	0.010725	0.006544
Topsham Road East of Matford Lane	22706	4.2	24.14	0.167023	0.010725	0.006544
Topsham Road near Barrack Road	22706	4.2	48.28	0.121958	0.010147	0.005994

2022 Future Baseline

Road Name	AADT	HDV%	Speed (kph)	NOx Emissions (g/km/s)	PM_{10} Emissions (g/km/s)	$PM_{2.5}$ Emissions (g/km/s)
Weirfield Road	376	0.0	40.32	0.001262	0.000136	0.000076
Topsham Road East of Site	25388	4.2	48.28	0.093561	0.010273	0.005667
Topsham Road West of Weirfield Road	25388	4.2	48.28	0.093561	0.010273	0.005667
Weirfield Road junction	376	0.0	24.14	0.001512	0.000138	0.000078
Topsham Road adjacent to Site	25388	4.2	48.28	0.093561	0.010273	0.005667
Topsham Road at junction with Matford Lane	25388	4.2	24.14	0.123388	0.010514	0.005897

Road Name	AADT	HDV%	Speed (kph)	NOx Emissions (g/km/s)	PM_{10} Emissions (g/km/s)	$PM_{2.5}$ Emissions (g/km/s)
Topsham Road East of Matford Lane	25388	4.2	24.14	0.123388	0.010514	0.005897

2022 Future With Development

Road Name	AADT	HDV%	Speed (kph)	NOx Emissions (g/km/s)	PM_{10} Emissions (g/km/s)	$PM_{2.5}$ Emissions (g/km/s)
Weirfield Road	651	0.2	40.32	0.002199	0.000131	0.000236
Topsham Road East of Site	25710	4.2	48.28	0.094575	0.005732	0.010388
Topsham Road West of Weirfield Road	25565	4.2	48.28	0.094119	0.005703	0.010336
Weirfield Road junction	651	0.2	24.14	0.002639	0.000135	0.00024
Topsham Road adjacent to Site	25710	4.2	48.28	0.094575	0.005732	0.010388
Topsham Road at junction with Matford Lane	25710	4.2	24.14	0.124684	0.005963	0.010632
Topsham Road East of Matford Lane	25710	4.2	24.14	0.124684	0.005963	0.010632

Appendix F - Results

Annual Mean NO_2 Concentrations (µg/m^3)

Receptor ID	2016	2022 Baseline	2022 With Development	Change*	% Change relative to AQAL	% of AQAL	Significance
R1	18.4	16.0	16.1	0.2	0	40	Negligible
R2	19.9	17.2	17.2	0.0	0	43	Negligible
R3	18.9	16.3	16.3	0.0	0	41	Negligible
R4	31.3	25.9	26.0	0.1	0	65	Negligible
R5	35.7	29.7	29.8	0.1	0	75	Negligible
PR1	-	-	20.6	-	-	52	Negligible
PR2	-	-	20.1	-	-	50	Negligible
PR3	-	-	19.6	-	-	49	Negligible
PR4	-	-	17.7	-	-	44	Negligible
PR5	-	-	20.1	-	-	50	Negligible
PR6	-	-	20.4	-	-	51	Negligible
PR7	-	-	20.1	-	-	50	Negligible
PR8	-	-	20.2	-	-	50	Negligible
PR9	-	-	20.3	-	-	51	Negligible
PR10	-	-	20.6	-	-	52	Negligible
PR11	-	-	21.2	-	-	53	Negligible
PR12	-	-	21.5	-	-	54	Negligible
PR13	-	-	22.2	-	-	56	Negligible
PR14	-	-	22.5	-	-	56	Negligible

* Change based on unrounded numbers

SRL

Annual Mean PM_{10} Concentrations ($\mu g/m^3$)

Receptor ID	2016	2022 Baseline	2022 With Development	Change	% Change relative to AQAL	% of AQAL	Significance
R1	14.0	13.6	13.6	0.0	0	34	Negligible
R2	14.2	13.8	13.8	0.0	0	35	Negligible
R3	14.1	13.6	13.6	0.0	0	34	Negligible
R4	15.7	15.3	15.3	0.0	0	38	Negligible
R5	17.0	16.4	16.4	0.0	0	41	Negligible
PR1	-	-	14.6	-	-	36	Negligible
PR2	-	-	14.4	-	-	36	Negligible
PR3	-	-	14.3	-	-	36	Negligible
PR4	-	-	13.9	-	-	35	Negligible
PR5	-	-	14.4	-	-	36	Negligible
PR6	-	-	14.5	-	-	36	Negligible
PR7	-	-	14.4	-	-	36	Negligible
PR8	-	-	14.4	-	-	36	Negligible
PR9	-	-	14.4	-	-	36	Negligible
PR10	-	-	14.4	-	-	36	Negligible
PR11	-	-	14.4	-	-	36	Negligible
PR12	-	-	14.4	-	-	36	Negligible
PR13	-	-	14.5	-	-	36	Negligible
PR14	-	-	14.6	-	-	36	Negligible

Number of Days with PM_{10} Concentrations Exceeding 50µg/m³

Receptor ID	2016	2022 Baseline	2022 With Development	Change	Significance
R1	0	0	0	0	Negligible
R2	0	0	0	0	Negligible
R3	0	0	0	0	Negligible
R4	0	0	0	0	Negligible
R5	1	0	0	0	Negligible
PR1	-	-	0	-	Negligible
PR2	-	-	0	-	Negligible
PR3	-	-	0	-	Negligible
PR4	-	-	0	-	Negligible
PR5	-	-	0	-	Negligible
PR6	-	-	0	-	Negligible
PR7	-	-	0	-	Negligible
PR8	-	-	0	-	Negligible
PR9	-	-	0	-	Negligible
PR10	-	-	0	-	Negligible
PR11	-	-	0	-	Negligible
PR12	-	-	0	-	Negligible
PR13	-	-	0	-	Negligible
PR14	-	-	0	-	Negligible

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Annual Mean $PM_{2.5}$ Concentrations (µg/m^3)

Receptor ID	2016	2022 Baseline	2022 With Development	Change	% Change relative to AQAL	% of AQAL	Significance
R1	9.7	9.1	9.1	0.0	0	37	Negligible
R2	9.8	9.3	9.3	0.0	0	37	Negligible
R3	9.7	9.2	9.2	0.0	0	37	Negligible
R4	10.7	10.1	10.1	0.0	0	40	Negligible
R5	11.5	10.8	10.8	0.0	0	43	Negligible
PR1	-	-	9.7	-	-	39	Negligible
PR2	-	-	9.6	-	-	38	Negligible
PR3	-	-	9.6	-	-	38	Negligible
PR4	-	-	9.3	-	-	37	Negligible
PR5	-	-	9.6	-	-	38	Negligible
PR6	-	-	9.6	-	-	39	Negligible
PR7	-	-	9.6	-	-	38	Negligible
PR8	-	-	9.6	-	-	38	Negligible
PR9	-	-	9.6	-	-	38	Negligible
PR10	-	-	9.6	-	-	38	Negligible
PR11	-	-	9.6	-	-	38	Negligible
PR12	-	-	9.6	-	-	38	Negligible
PR13	-	-	9.7	-	-	39	Negligible
PR14	-	-	9.7	-	-	39	Negligible

Appendix G - IAQM Construction Phase Mitigation Measures

The following mitigation measures are recommended to reduce the identified risk associated with dust soiling and human health effects during the construction phase.

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary as well as the head or regional office contact information.
- Develop and implement a Dust Management Plan (DMP) as part of the Construction Management Plan.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or emissions to air, either on or off-site and the action taken to resolve the situation in the log book.

Monitoring

- Undertake daily on- and off-site inspections, here receptors are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such street furniture, cars, window sills within 100m of site boundary, with cleaning to be provided if necessary.
- Carry out regular inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- 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 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 as appropriate.

Operating vehicle / machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol-powered generators and use main electricity or battery powered equipment where practicable.
- Impose a maximum speed limit of 15mph on surfaced, and 10mph on unsurfaced haul roads and work areas.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations

- Only use cutting, grinding or sawing equipment fitted or alongside suitable dust suppression techniques such as water sprays or local extraction.
- 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 as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials

Demolition

- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually operated can produce fine water droplets that effectively bring dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

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.
- Only remove the cover in small areas during work and not all at once.

Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for particular process, in which case ensure that appropriate additional control measures are in place.

Trackout

- Use water-assisted dust sweepers 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.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials.
- 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.
- Install hard surfaced haul routes, which are 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 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.

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