SYMMETRY PARK – OXFORD NORTH

Environmental Statement – Chapter 6 Appendices

Prepared for: Tritax Symmetry (Oxford North) Limited

SLR Ref: 422.11899.00001
Version No: v1.0
November 2021

BASIS OF REPORT

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DOCUMENT REFERENCES

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6.0 AIR QUALITY

APPENDIX 6.1 – Road Traffic Emissions Assessment Methodology

Detailed dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS-Roads v5.0.0.1 dispersion model, focussing on concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the following scenarios:

- 2019 Base Case (2019 B) – Base flows for the year (2019);
- 2024 Do Minimum (2024 DM) – Without development flows for the assumed year of opening (2024), inclusive of any relevant committed development flows; and
- 2024 Do Something (2024 DS) – 'Do Minimum' flows, plus all trips associated with the Proposed Development flows for the proposed year of opening (2024).

For the above future year scenarios (2024), concurrent emission factors and background pollutant concentrations have been used.

Traffic Inputs

Traffic data used as input for the road traffic emissions dispersion modelling assessment was provided by Vectos Ltd – the appointed transport consultant. Traffic data used for the purposes of model verification has been sourced from the DfT traffic count points website[1].

The traffic flows used for the future assessment years includes vehicle movements associated with relevant committed developments in the assessment area. As such, the dispersion modelling exercise is inherently cumulative in nature.

The Emissions Factors Toolkit (EFT) version 10.1 developed by Defra[2] has been used to determine vehicle emission factors for input into the ADMS-Roads dispersion model.

Traffic speeds were modelled at the relevant speed limit for each road. However, where appropriate, the speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue in accordance with LAQM.TG(16).

Traffic speeds have been assumed to be consistent across all the modelled scenarios. It is noted that a 50mph speed limit is expected to be implemented for the A41 (currently 70mph) - providing consent is given for the Proposed Development (2024 DS). However, this is not at present a committed measure. To ensure a robust assessment, 70mph has been adopted as represents a conservative assessment, as based upon investigation, a reduction in speed from 70mph to 50mph along this stretch results in a reduction in pollutant concentrations (principally NO_2). This is a function of the vehicle speed emission factors which beyond a certain speed result in increases to vehicle emissions due to increased loading on the engines. Figure 6-1 provides NOx vehicle emission factors as a function of speed – normalised by the value maximum value. This example relates to 2024DS traffic flows along the A41 so is relevant. It can be seen that the adoption of 70mph is conservative, whereby if a 50mph speed limit is adopted, the outcomes associated with the dispersion modelling will be considered to be worst-case, where in reality benefits may be realised. This was confirmed via the testing of two modelled 2024 DS scenarios (50mph vs. 70mph).

Amendments to the 2024 DS modelled scenario were undertaken to reflect the proposed signalised junction at the Site access via the incorporation of appropriate slow down sections (20kph) as per LAQM.TG16 guidance.

[1] https://roadtraffic.dft.gov.uk/#6/55.254/-6.053/basemap-regions-countpoints
[2] Defra, EFT v10.1 (2020).

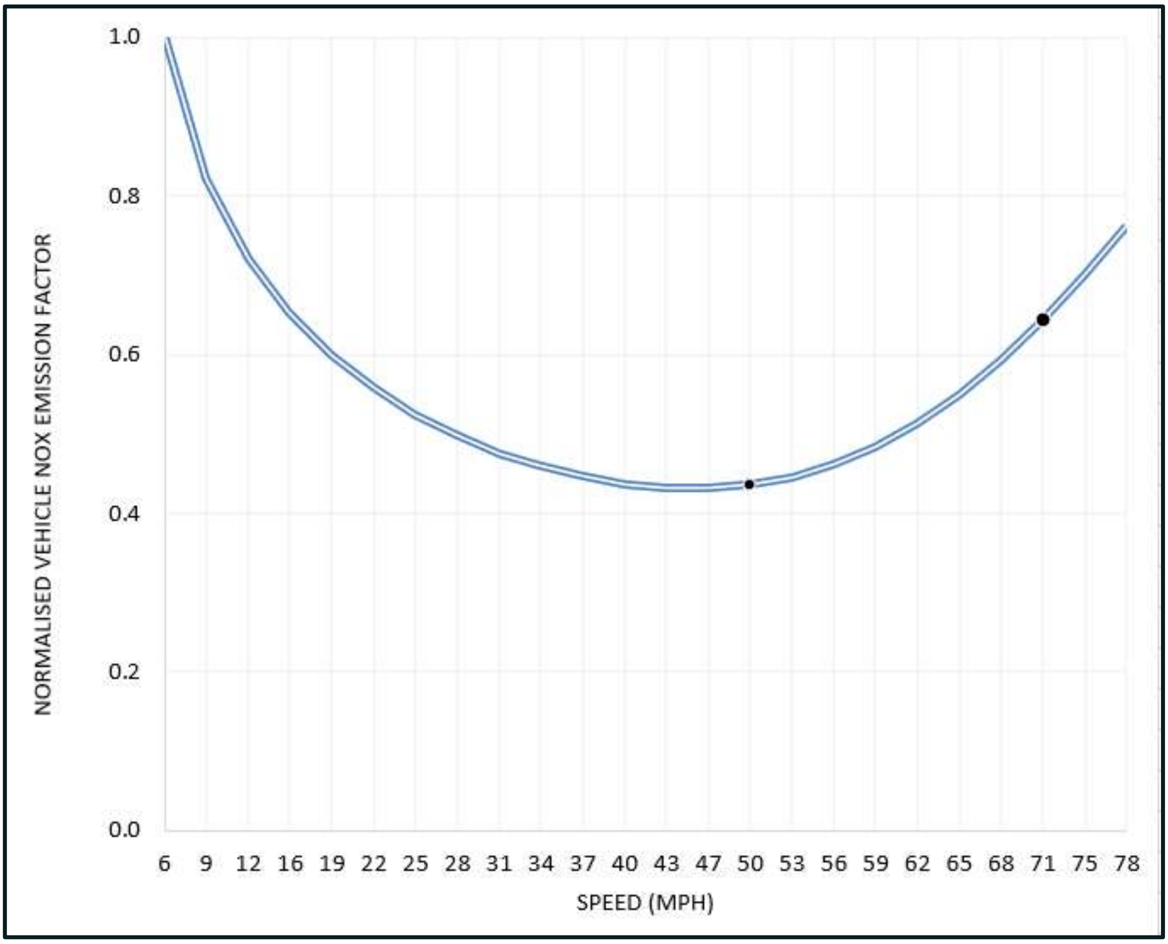

Figure 6-1
Normalised NOx Vehicle Emission Factors as a Function of Speed

To initially inform the spatial extent of the model, changes in traffic volumes on the local road network were compared to screening thresholds provided within EPUK-IAQM guidance, with consideration given to nearby AQMAs (including the AQMA No.4 located within the centre of Bicester). Road traffic flows along the A41 and A34 were found to be above the relevant EPUK-IAQM screening criteria, and therefore assumed the extents of the dispersion study area. Road traffic flows within and adjacent to the AQMA No.4 were below 100 LDVs and/or 25 HDVs as 24-hour annual average daily traffic (AADT) flows.

Details of the traffic flows used in this assessment are provided in Table 6-1, whilst the modelled roads in relation to the Site are presented in Appendix 6.4.

Table 6-1
Traffic Data Used Within the Assessment

Road Link	2019 BC		2024 DM		2024 DS		Speed (mph) (A)
	AADT	% HDV	AADT	% HDV	AADT	% HDV	
A41 Northbound (North Site Access)	18,191	5.9	21,745	4.9	21,895	4.9	70
A41 Southbound (North Site Access)	16,623	6.3	20,106	5.2	20,256	5.2	70
A41 Northbound (South of Site Access)	18,191	5.9	21,745	4.9	22,517	4.8	70

Road Link	2019 BC		2024 DM		2024 DS		Speed (mph) (A)
	AADT	% HDV	AADT	% HDV	AADT	% HDV	
A41 Southbound (South of Site Access)	16,623	6.3	20,106	5.2	20,924	5.0	70
A34 Northbound	31,619	13.1	35,337	11.7	35,952	11.5	70
A34 Southbound	32,908	12.6	36,586	11.4	37,201	11.2	70
Site Access	-	-	-	-	1,900	0.0	20
Model Verification							
A4095 – Howes Lane	13,772	1.4	-	-	-	-	40/50
(A) Traffic speeds have been adjusted to take into account queues and congestion in accordance with LAQM.TG(16).							

Meteorological Data

The dispersion modelling has been undertaken using 2019 data from the Benson meteorological station, located approximately 30km to the south of the Site. Benson meteorological station represents the closest representative station relative to the Site with sufficient collection efficiency for use in the dispersion model.

LAQM.TG(16) recommends that meteorological data should have a percentage of usable hours greater than 85%. 2019 meteorological data from Benson meteorological station includes 8,666 lines of usable hourly data out of the total 8,760 for the year, i.e. 98.9% usable data. This is therefore suitable for the dispersion modelling exercise.

A windrose is presented in Figure 6-2.

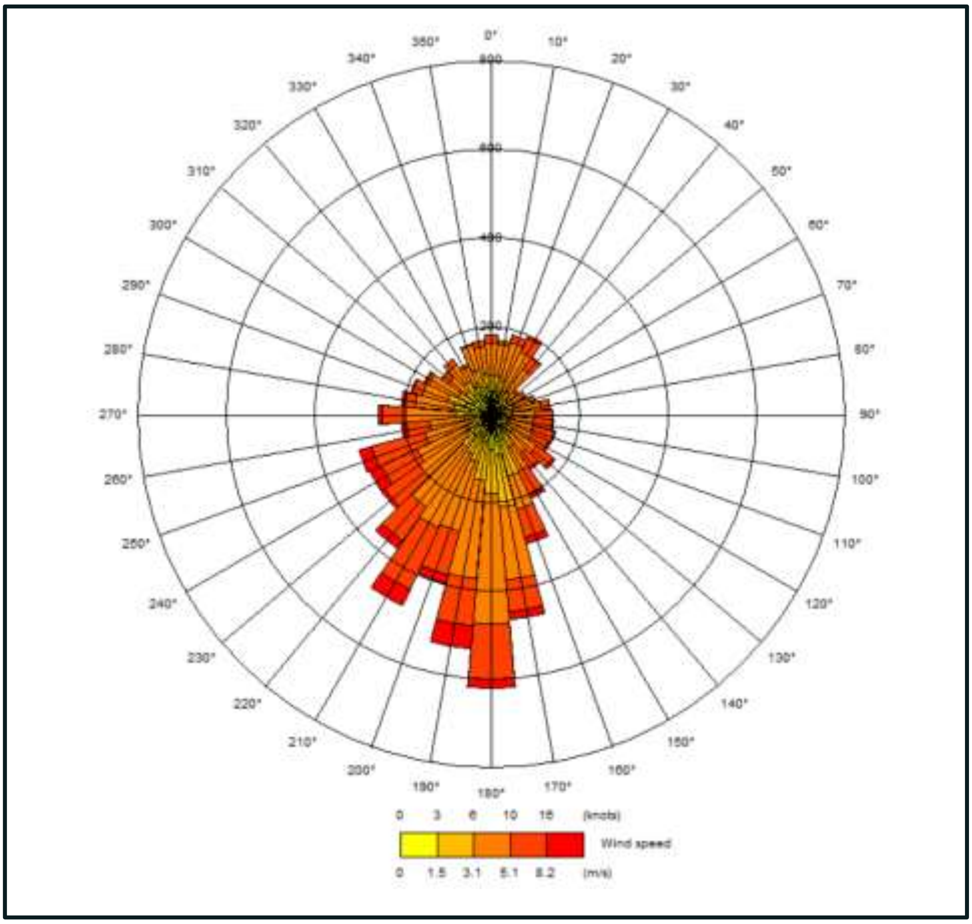

Figure 6-2
Windrose for Benson Meteorological Station (2019)

A surface roughness length of 0.5m was used to represent the surface roughness of the principal study area – i.e. 'parkland, open suburbia'. Whereas a roughness length of 0.0.2m was used to represent the surface roughness of the meteorological site – i.e. 'open grassland'.

Background Concentrations

In the absence of locally representative background monitoring sites, annual mean background concentrations used for the purposes of the assessment have been obtained from the Defra supplied background maps (2018 reference year)[3], based on the 1km grid squares which cover the modelled area. Further detail on these datasets can be found in the Chapter 6 to the ES.

To avoid double counting of potential source contributions already contained within the ADMS-Roads dispersion model, 'Primary A Road in' were removed from each grid square, as recommended in the Defra Background Maps User Guide[4].

As the relationship between NO_2 and NO_x is not linear, the NO_2 Adjustment for NO_x Sector Removal Tool[5] has been used – in accordance with LAQM.TG(16). No adjustment for background concentration variability with height has been made.

[3] Defra Background Maps (2018 Reference Year): https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018
[4] Defra Background Concentration Maps User Guide, August 2020.
[5] Defra NO_2 Adjustment for NO_x Sector Removal Tool (v8.0).

Sensitive Receptors

Human receptors considered in the assessment of emissions from road traffic are shown in Table 6-2, whilst their locations are illustrated in Appendix 6.4.

Receptors R1 – R9 are representative of worst-case exposure locations at existing properties within the development locale, relative to the affected road network.

All receptors were considered in relation to exposure at breathing height relative to the adjacent modelled road. Receptor R5 represents the Sparkling Minds Preschool & Day Nursery, and as such a height of 1.0m has been adopted.

Table 6-2
Modelled Human Receptor Locations

Receptor	X	Y	Modelled Height (m)
R1	456147	219903	1.5
R2	455877	219718	1.5
R3	456102	219820	1.5
R4	455895	219725	1.5
R5	454722	218470	1.0
R6	453729	217819	1.5
R7	456165	219919	1.5
R8	455967	219735	1.5
R9	455843	219702	1.5

Model Outputs

The Defra background pollutant values discussed above have been used in conjunction with the concentrations predicted by the ADMS-Roads model to calculate predicted total annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ for each respective scenario.

For the prediction of annual mean NO_2 concentrations for all modelled scenarios at receptor locations, the road NO_x contributions (adjusted as per Appendix 6.2) have been converted to total NO_2 following the methodology in LAQM.TG(16) using the latest version of Defra's NO_x to NO_2 conversion tool (v8.1)[6]. The modelled NO_2 road contribution was then added to the appropriate NO_2 background concentration value to obtain an overall total annual mean NO_2 concentration.

For the prediction of short term NO_2 impacts, LAQM.TG(16) advises that it is valid to assume that exceedances of the 1-hour mean Air Quality Assessment Level (AQAL) for NO_2 are only likely to occur where the annual mean NO_2 concentration is 60µg/m^3 or greater. This approach has thus been adopted for the purposes of this assessment.

For the prediction of short term PM_{10}, LAQM.TG(16) provides an empirical relationship between the annual mean and the number of exceedances of the 24-hour mean AQAL for PM_{10} that can be calculated as follows:

$$\textit{No. 24-hour mean exceedances} = -18.5 + 0.00145 \times \textit{annual mean}^3 + (206/\textit{annual mean})$$

[6] Defra NO_x to NO_2 Calculator v8.1 (2020).

This relationship has thus been adopted to determine whether exceedances of the short-term PM_{10} AQAL are likely in this assessment.

Verification of the ADMS-Roads assessment has been undertaken, as per Appendix 6.2. All results presented in the assessment are those calculated following the process of model verification, using an adjustment factor of 1.816 for NO_2, PM_{10} and $PM_{2.5}$.

APPENDIX 6.2 – Model Verification

The ADMS-Roads dispersion model has been widely validated for this type of assessment and is specifically listed in the Defra's LAQM.TG(16) guidance as an accepted dispersion model.

Model validation undertaken by the software developer (CERC) will not have included validation in the vicinity of the Site. It is therefore necessary to perform a comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

Prior to undertaking model verification, model setup parameters and input data were reviewed to maximise the performance of the dispersion model in relation to the real-world conditions.

Consistent with advice provided by Defra to local authorities across England, 2019 has been used for the purposes of model verification as relates to the most recent year of monitoring data available which hasn't been impacted by the COVID-19 pandemic. Use of monitoring data recorded in 2020 for the purposes of model verification introduces an element of uncertainty into the final adjusted modelled predictions, as monitoring conditions experienced for the majority of 2020 are not deemed to be representative of long-term baseline conditions, and could lead to a systematic underprediction at modelled receptor locations.

NO_x/NO_2 Verification Calculations

NO_x / NO_2 verification relates to the comparison and adjustment of modelled road-NO_x (as output from the ADMS-Roads dispersion model), relative to monitored road-NO_x.

For NOx / NO_2 model verification, 2019 LAQM CDC monitoring data has been used for those roadside locations situated adjacent to a modelled link i.e. where traffic data exists (Table 6-3). Both DT27 and DT30 are located adjacent to the A4095 – Howes Lane – which is considered representative of the modelled road links within the principal study area, in comparison to other possible locations.

Table 6-3
Local Monitoring Data Used for Model Verification

Site ID	X	Y	2019 Monitored NO_2 Concentration (µg/m^3)	2019 Data Capture (%)
DT27	457956	224362	20.7	83.0
DT30	456937	223586	23.2	100.0

As NO_2 concentrations are solely reported using diffusion tubes, NO_x was back calculated using the latest version of Defra's NO_x to NO_2 Calculator (v8.1). The NO_x to NO_2 Calculator was also used to facilitate the conversion of modelled road-NO_x (as output from the ADMS-Roads dispersion model) into road-NO_2.

Verification was completed using the 2019 Defra background mapped concentrations (2018 base year) for the relevant 1km x 1km grid squares (i.e. those within which the model verification locations are located).

Comparison of the unadjusted modelled vs. monitored road NO_x is provided in Table 6-4. An adjustment factor of 1.816 has been derived, based on a linear regression forced through zero, as shown in Figure 6-3. No further improvement to the ADMS-Roads dispersion model could be achieved.

Table 6-4
NO_x / NO_2 Model Verification (1.816)

Site ID	Monitored Road NOx (µg/m^3)	Modelled Road NOx (µg/m^3)	Ratio (Monitored vs. Modelled Road NOx)	Adjustment Factor	Adjusted Modelled Total NO_2 (µg/m^3)	Monitored Total NO_2 (µg/m^3)	% Difference (Adjusted Modelled NO_2 vs Monitored NO_2)
DT27	21.5	11.7	1.8	1.816	20.6	20.7	-0.5
DT30	26.0	14.4	1.8		23.3	23.2	0.3

LAQM.TG(16) states that:

> "*In order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within 25% of the monitored concentrations as a minimum, preferably within 10%*".

As noted in Table 6-4, the difference between the adjusted modelled NO_2 and monitored NO_2 is within ±10% at all verification locations and therefore within the ideal LAQM.TG(16) prescribed limit. In addition, a verification factor of 1.816 reduces the Root Mean Square Error (RMSE) from a value of 5.5µg/m^3 to 0.1µg/m^3 – within the ideal LAQM.TG(16) prescribed limit (10% of the annual mean AQAL). On this basis, the derived verification factor (1.816) was considered acceptable and was subsequently applied to all road-NO_x concentrations predicted (as output of the ADMS Roads dispersion model).

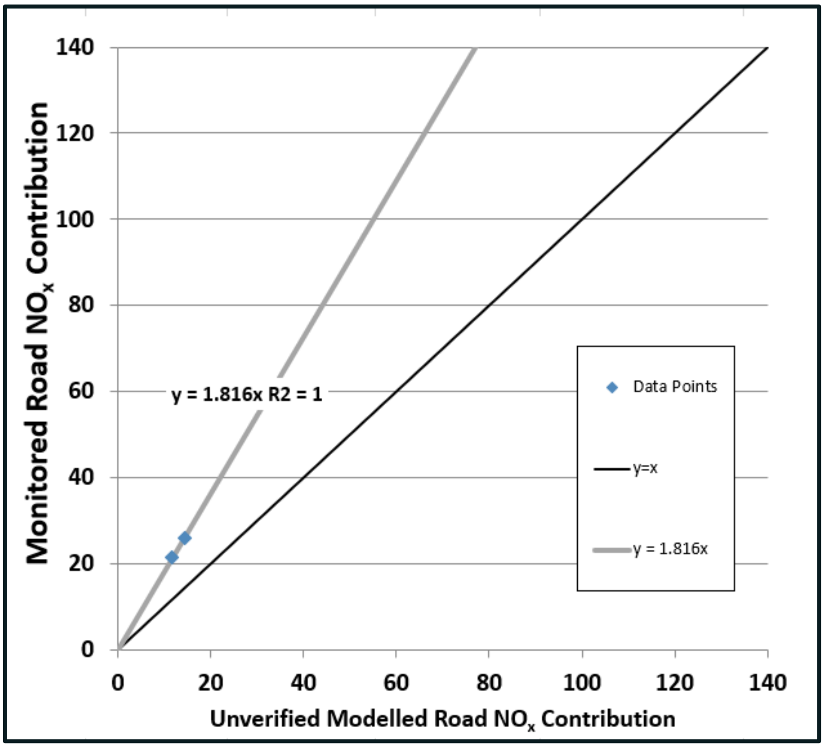

Figure 6-3
Comparison of Modelled vs. Monitored Road NO_x Contribution (1.816)

PM_{10}/$PM_{2.5}$ Verification Calculations

In the absence of suitable PM_{10} and $PM_{2.5}$ roadside monitoring locations, the verification factor of 1.892 was applied to road-PM_{10} and road-$PM_{2.5}$, as recommended by LAQM.TG(16), and following the same reasoning as above.

APPENDIX 6.3 – Construction Dust Mitigation Measures

Table 6-5 presents the recommended construction dust mitigation measures, on the basis of the construction dust assessment undertaken.

Table 6-5
Construction Dust Mitigation Measures

Site Application	Mitigation Measures
Highly Recommended	
Communications	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
Monitoring	Carry out regular site 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.
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 mains electricity or battery powered equipment where practicable.
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.
Preparing and Maintaining the Site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
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.

Site Application	Mitigation Measures
	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Waste Management	Avoid bonfires and burning of waste materials.
Desirable	
Communications	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document.
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.
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) 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 as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
Operating Vehicle/Machinery and Sustainable Travel	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (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).
Operations	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.
Preparing and Maintaining the 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.
	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 described below.
	Cover, seed or fence stockpiles to prevent wind whipping.
Trackout	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 continuously in use.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
	Record all inspections of haul routes and any subsequent action in a site logbook.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

APPENDIX 6.4 – Figures

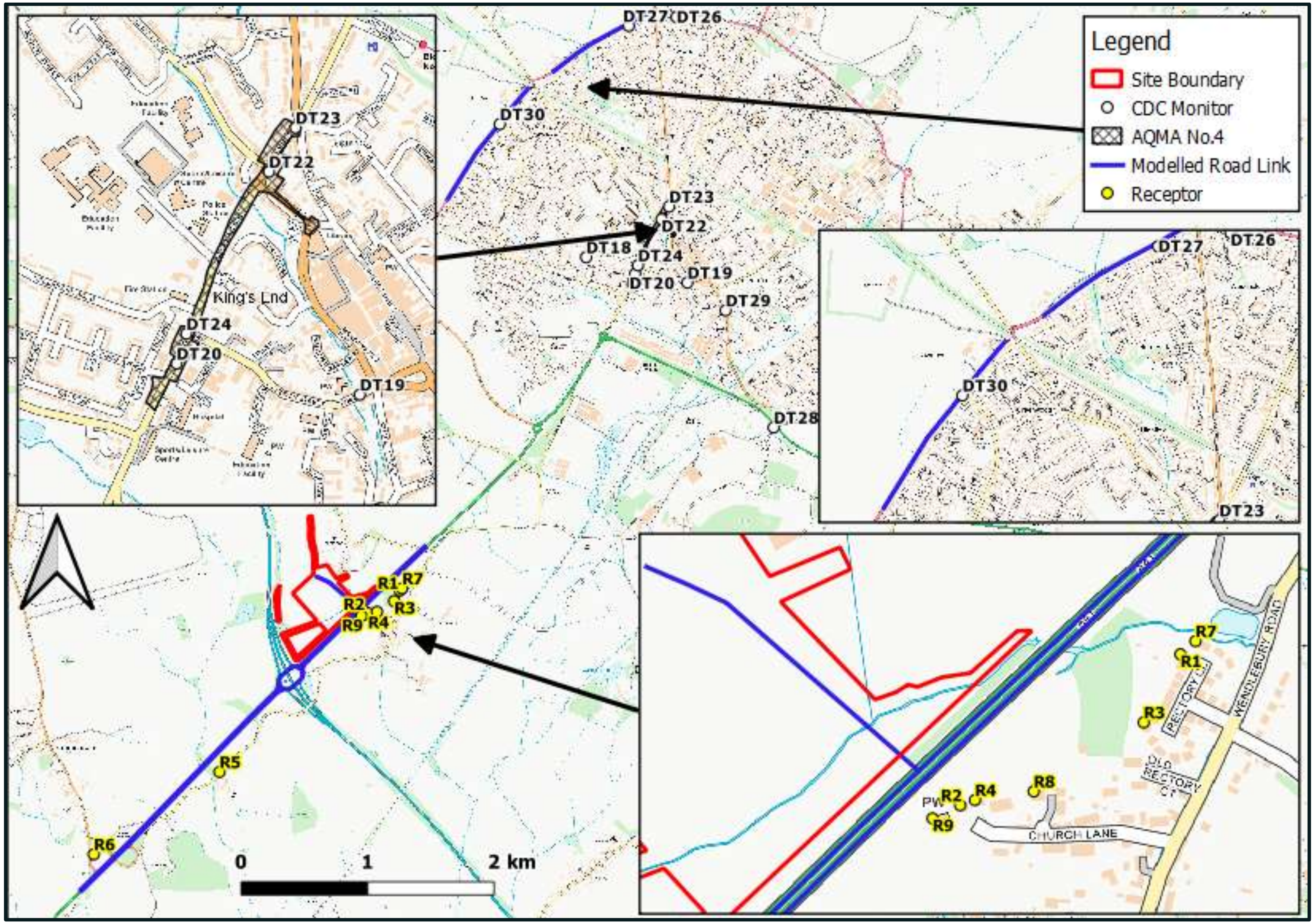

Figure 6-4
Modelled Human Receptor and Monitoring Locations Relative to the Site

Figure 6-5
Construction Dust Assessment Buffers

APPENDIX 6.5 – Consultation

[redacted]

From: Trevor Dixon [redacted]
Sent: 16 July 2021 08:58
To: Morgan Fitzpatrick [redacted]
Subject: RE: Consultation request (Air Quality) - Symmetry Park Oxford North

Dear Morgan,

The only thing I would add is that we will require Damage Costs to be included in the assessment, otherwise the scope and approach of the assessment looks fine.

Regards

Trevor Dixon
Environmental Protection & Enforcement Manager
Regulatory Services and Community Safety
Cherwell District Council
[redacted]
Visit us online www.cherwell.gov.uk
Find us on Facebook www.facebook.com/cherwelldistrictcouncil
Follow us on Twitter @Cherwell Council

From: Morgan Fitzpatrick [redacted]
Sent: 21 June 2021 14:28
To: Trevor Dixon [redacted]>
Subject: Consultation request (Air Quality) - Symmetry Park Oxford North

Dear Trevor

I've been provided your contact details by Bernadette Owens (Principal Planning Officer), as the appropriate person to consult regards an Air Quality Assessment for the above project.

I am seeking your views on our scope and approach to the Air Quality Assessment to accompany the planning application (anticipated to be submitted in July).

APPLICATION SITE AND PROPOSED DEVELOPMENT

The application site is situation at J9 of the M40. The proposed development for manufacturing of parts for medical equipment, will include approximately 300 parking spaces. The facility may include a small CHP unit (energy centre).

SCOPE AND APPROACH

Baseline

A review of baseline air quality conditions at the site, and within the study area, will be undertaken with reference to:

- Local Air Quality Management (LAQM) Air Quality Annual Status Reports (ASR) for Cherwell District Council (CDC) and monitoring data in the public domain; and
- Online air quality tools (e.g. Defra background pollution concentration mapping).

Construction phase dust assessment

The assessment of potential dust and fine particulate matter impacts, and determination of significance of effect, will be assessed using the approach defined in *Guidance on the Assessment of Dust from Demolition and Construction* published by the Institute of Air Quality Management (IAQM).

Road traffic emissions

The development vehicle trips will be compared against air quality assessment screening criteria, published by Environmental Protection UK (EPUK) and the IAQM, to inform the spatial extent of the assessment. Trip distribution is draft but it is anticipated that the majority of vehicle trips will use the motorway.

A dispersion modelling assessment using ADMS-Roads will assess the potential impact on air quality arising from development trips associated with the operational phase of the scheme. Modelling will assess NO_2, PM_{10} and $PM_{2.5}$ concentrations.

The model will be verified against CDC diffusion tube (DT) data in line with the methodology outlined within LAQM.TG(16). It is proposed to use DT data from year 2019 (given the effect of Covid lockdowns in 2020 and 2021) with meteorological data from Benson.

Road traffic emissions of oxides of nitrogen (NO_x) and fine particulate matter (PM_{10} and $PM_{2.5}$) will be calculated from the most recent version of the Emission Factor Toolkit published by the Defra. Modelling will be undertaken for the opening year (full build out operation) of the development. The potential impact and significance of effect will be determined in accordance with EPUK and IAQM guidance '*Land-use planning and development control: planning for air quality*'.

Energy Centre (CHP) Emissions (if present)

A staged approach will be undertaken to assess potential impacts associated with the onsite energy centre, to be powered by combustion of natural gas. Initially, an appropriate conservative screening methodology will be applied (e.g. CHP air quality screening tool as advised in Defra LAQM.TG(16)), followed if necessary by more detailed approaches, e.g. atmospheric dispersion modelling.

CLOSURE

I'd be grateful if you could advise whether you agree with the scope and approach. If any clarifications are required then please let me know.

Best Regards

Morgan

Morgan Fitzpatrick
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