

St Tydfil's Hospital Air Quality Assessment

August 2020

Prepared by

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EXECUTIVE SUMMARY

The Proposed Development at St Tydfil's Hospital was assessed with regards to the air quality impact on local sensitive receptors, as a result of both construction phase dust and PM₁₀ emissions, and changes in NO₂ and PM₁₀ emissions due to the operation of the Proposed Development.

The short-term impact of the construction phase was assessed qualitatively, following the IAQM guidance. This determined that demolition and construction activities within the Application Site, prior to mitigation being implemented, would have a Low to Medium risk of dust soiling, and a Negligible to Low risk of human health impacts. However, following the implementation of recommended mitigation measures, the impact of the Proposed Development's construction phase is anticipated to be negligible.

The long-term impact of the operational phase was assessed quantitatively using a modelling software to predict future concentration of NO₂ and PM₁₀. The results of the predictions indicate that the short term and long term NAQOS would be achieved at the existing receptors located within and outside the AQMA. There would be a Slight Adverse impact on two receptors locations (6 and 7) on NO₂ concentrations and a Negligible impact at all other locations. All impacts for PM₁₀ concentrations were predicted to be Negligible. The overall significance of the impact of the Proposed Development due to changes in traffic was deemed Not Significant at all existing receptors within and outside the AQMA.

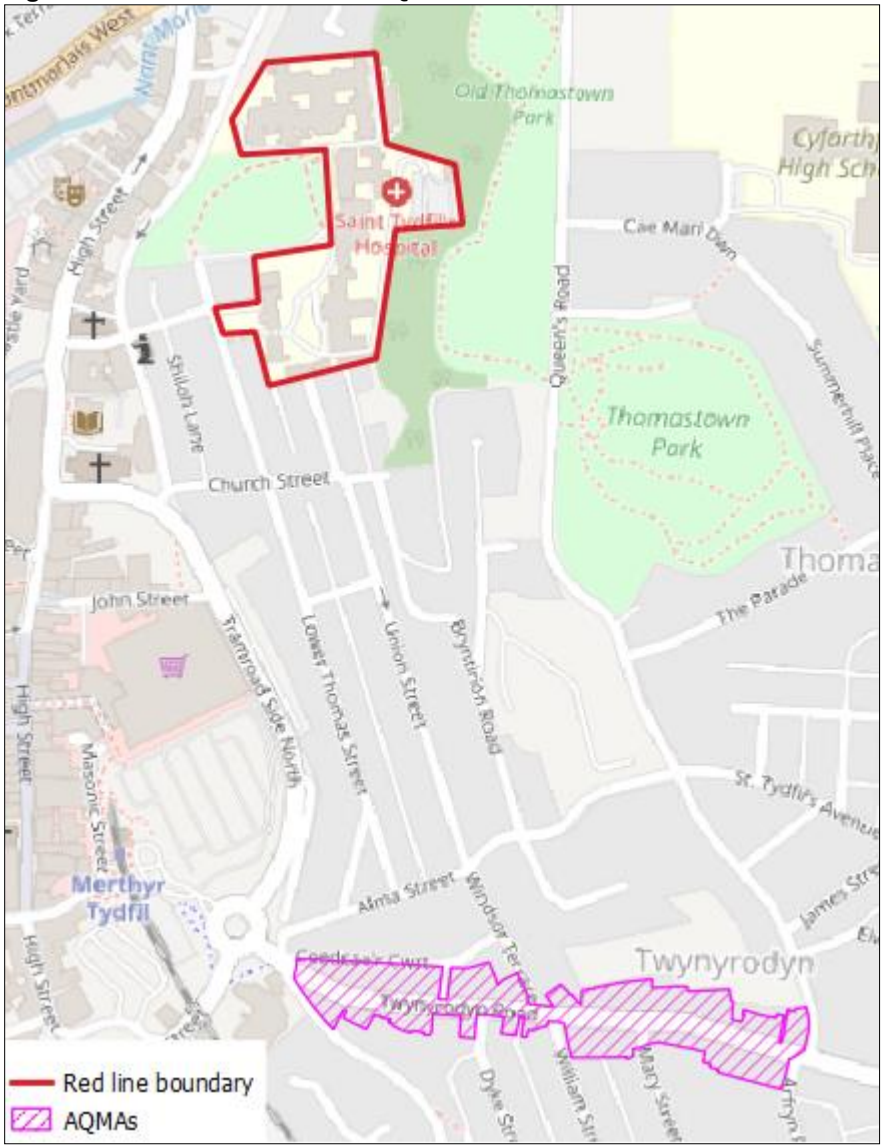
Both the short term and long term NAQOs for NO₂ and PM₁₀ would be met at the Application Site, therefore, the Application Site is deemed suitable in air quality terms for the future users.

On this basis, the Proposed Development is considered to comply with national and local air quality policy.

1 INTRODUCTION

- 1.1 GL Hearn has been commissioned to undertake an air quality assessment to support the planning of the proposed development at St Tydfil's Hospital, Merthyr Tydfil, hereafter referred to as the 'Proposed Development' or 'Application Site'. The development proposals are for 70 residential units with associated parking.
- 1.2 The Application Site is located within the administrative boundary of Merythr Tydfil County Borough Council (MTCBC). MTCBC have declared one air quality management area (AQMA), the Twynrodryn Road AQMA, for the exceedance of the annual mean NO₂ air quality standard. The Application Site lies approximately 430m from the AQMA.
- 1.3 It is considered that the Proposed Development may have a temporary effect on local air quality during the construction phase, as a result of the generation and dispersion of dust and particulate matter from demolition and construction activities. The operation of the Proposed Development may also have longer term effects, as a result of changes to road traffic emissions. The potential exposure of future users of the Proposed Development to poor air quality has also been considered, given the Application Site's proximity to the AQMA.
- 1.4 The location of the Application Site is illustrated below in Figure 1 as well as the location of the AQMA.

Figure 1: Site Location and AQMA



2 LEGISLATION, POLICY AND GUIDANCE

Legislation and Policy

- 2.1 Air quality is governed by a series of local, regional and national legislation and policies. A summary of the relevant legislation and policies relevant to this assessment is provided below. The full details can be seen in Appendix A.
- 2.2 With regards to the potential effect of the Proposed Development, the legislation is the National Air Quality Objectives (NAQOs), as set out in the Air Quality Strategy¹ (2015) the Air Quality Standards (Wales) Regulations² (2010) and the Air Quality Standards (England) Regulations³ (2015), which lay out the Air Quality Objectives (NAQOs). The 2010 and 2015 regulations are the latest update to the legislation which transposes into UK law the requirements of European Directives 2008/50/EC and 2004/107/EC, which apply legal responsibility to the NAQOs. The NAQOs include targets for nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}) concentrations, as presented in Table 1 below.

Table 1: National Air Quality Objectives (NAQO)

Pollutant	Measured As	Objective
Nitrogen dioxide (NO ₂)	Annual Mean	40µg/m ³
	1 Hour Mean	200µg/m ³ not to be exceeded more than 18 times a year
Particles (PM ₁₀)	Annual Mean	40µg/m ³
	24 Hour Mean	50µg/m ³ not be exceeded more than 35 times a year
Particles (PM _{2.5})	Annual Mean	25µg/m ³

Source: Air Quality Strategy 2015

- 2.3 These air quality objectives are aimed at the protection of human health. The annual mean NAQOs apply at locations where the public may be regularly exposed, such as building facades of residential properties, schools, hospitals and care homes. The 1 hour and 24 hour mean NAQOs apply at locations where it is reasonable to expect members of the public to spend at least these periods of time, such as busy shopping streets and school playgrounds for the 1 hour mean, and hotels or residential gardens for the 24 hour mean. For full details, see Box 1.1 of LAQM TG(16)⁴.
- 2.4 Air Quality Standards are concentrations recorded over a given time period, which are considered to be acceptable in terms of what is scientifically known about the effects of each pollutant on health

¹ Department for Environment, Food and Rural Affairs (Defra) (2015). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)

² Defra (2010) Air Quality Standards (Wales) Regulations

³ Defra (2015) Air Quality (England) Regulations

⁴ Defra (April 2016) Local Air Quality Management Technical Guidance (TG16)

and on the environment. They can also be used as a benchmark to indicate whether air pollution is getting better or worse.

- 2.5 An exceedance is a period of time (defined for each standard) where the concentration is higher than that set out in the Standard. In order to make useful comparisons between pollutants (the Standards may be expressed in terms of different averaging times), the number of days of which an exceedance has been recorded is often reported.
- 2.6 The Clean Air Strategy⁵ (January 2019) sets out a plan for Government and society to tackle all sources of air pollution. The government plans to work with local authorities and public health sectors to enable them to make more informed decisions to improve air quality.
- 2.7 Planning policy in the UK is governed by the National Planning Policy Framework, published in 2012 and revised in February 2019⁶. It advises that planning considerations should prevent: *“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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans”*
- 2.8 MTCBC adopted The Merthry Tydfil Replacement Local Development Plan (LDP) 2016-2031 in January 2020 and is the basis for planning decisions across the County Borough. Policy EnW4 Environmental Protection of the LDP states:

“Development proposals will be required to demonstrate they will not result in an unacceptable impact on people, residential amenity, property and / or the natural environment from either:

- Pollution of land, surface water, ground water and the air;*
- Land contamination;*
- Hazardous substances;*
- Land stability;*
- Noise, vibration, dust, odour nuisance and light pollution; or*
- Any other identified risk to public health and safety.*

Where impacts are identified the Council will require applicants to demonstrate that appropriate measures have been incorporated to reduce, or minimise the impact identified to the lowest possible acceptable level. Planning conditions may be imposed or legal obligation entered into, to secure any necessary mitigation and monitoring processes.”

⁵ Defra (January 2019) Clean Air Strategy 2019

⁶ Department for Communities and Local Government (2019), National Planning Policy Framework

Guidance

A summary of the guidance documents that have been used and / or referred to within this assessment is provided below. The full details can be seen in Appendix A.

- National Planning Practice Guidance – Air Quality⁷;
- Local Air Quality Management Technical Guidance (LAQM.TG(16))**Error! Bookmark not defined.**;
- Land-Use Planning & Development Control: Planning for Air Quality⁸; and,
- Local Air Quality Policy Guidance for Wales⁹.

⁷ Department for Communities and Local Government (March 2014)

⁸ EPUK / IAQM (January 2017) Land-Use Planning & Development Control: Planning for Air Quality v1.2

⁹ Local Air Quality Policy Guidance for Wales [LAQM.PG (17)(W) (June 2017)

3 METHODOLOGY

Consultation with MTCBC

- 3.1 The assessment methodology presented below has been discussed and agreed with the Environmental Protection Officer at MTCBC¹⁰ following consultation in June 2020.

Baseline Assessment

- 3.2 A baseline desk study has been undertaken, utilising available data from MTCBC air quality progress report. Furthermore, information on the location of nearby Air Quality Management Areas (AQMAs) and designated ecological habitats (e.g. Sites of Special Scientific Interest (SSSIs)) from the Department for Environment, Food and Rural Affairs (Defra), and aerial mapping and satellite imagery, have been used to establish locations of potential human and ecological receptors sensitive to impacts on air quality arising from the Proposed Development.

Assessment of Short-Term Impacts

- 3.3 A desk-based risk assessment of impacts to air quality and dust soiling during the construction phase has been undertaken in accordance with the guidance published by the IAQM, as presented in Appendix B.
- 3.4 The assessment considers the effects of local meteorological conditions on the dispersion of fugitive emissions of dust, the sensitivity and proximity of surrounding receptors to construction activities and the scale of construction activities (demolition, earthworks, construction and trackout). The risk of dust soiling and PM₁₀ impacts on human health is determined by taking all these factors into consideration.
- 3.5 Based on the outcome of the assessment, the IAQM guidance recommends certain mitigation measures to be implemented. Any other mitigation measures issued within local authority / national government guidance should also be considered. Mitigation measures stipulated within the IAQM guidance have been recommended if deemed necessary, based on the conclusions of the assessment.
- 3.6 Information on HDV (Heavy Duty Vehicle, i.e. HGVs and buses with a gross vehicle weight over 3.5 tonnes) movements during construction stated that there would be fewer than 10 outward movements per day.

¹⁰ Email correspondence with Environmental Protection Officer. Consultation began 01/06/2020 and final correspondence was on 16/06/2020.

Assessment of Long-Term Impacts

- 3.7 Annual-mean oxides of nitrogen (NO_x - a mixture of nitrogen oxide (NO) and NO₂) and PM₁₀ concentrations have been predicted at selected sensitive receptors using the modelling software ADMS-Roads (v4.1.1.0) and information on road traffic and railway emissions detailed below. Predicted NO_x concentrations are then converted to NO₂ using NO_x to NO₂ calculator v7.1 (April 2019) provided by Defra and also taking into account background concentrations. Predicted PM₁₀ concentrations are added directly to relevant background concentrations.

Impact of Additional Road Traffic Emissions

- 3.8 The EPUK / IAQM guidance provides criteria for when an air quality assessment is required. The criteria recommends that an assessment is required when there is a change of:
- LDV (Light Duty Vehicle) flows of more than 100 AADT inside an AQMA or 500 AADT outside an AQMA ; or
 - HDV flows of more than 25 AADT inside an AQMA or 100 AADT outside an AQMA.
- 3.9 The Proposed Development does not lie within an AQMA, however, some of the traffic associated with the Proposed Development is expected to travel through the Twynrodryn Road AQMA.
- 3.10 The Proposed Development is expected to generate more than 100 AADT and as such an impact assessment is required. The Transport Consultants have provided traffic data which have been used in the modelling and is detailed in Appendix C.

Impact of Energy Sources

- 3.11 The energy source for the residential units are proposed to be individual gas boilers. As is standard practice, it is expected that these will be low NO_x and are not, therefore, expected to cause any significant impacts on local air quality and so have not been assessed any further.

Sensitive Receptors

- 3.12 Locations of receptors sensitive to changes in pollutant concentrations (particularly NO₂ and PM₁₀) have been identified and included within the assessment. Particular attention has been paid to areas where the annual mean NO₂ and annual and daily PM₁₀ NAQOs have the potential to be exceeded.

Model Verification

- 3.13 LAQM.TG(16) recommends using a combination of automatic and diffusion tube monitoring data to verify modelled concentrations of NO₂ and PM₁₀. Model verification has been undertaken using a combination of local automatic stations and diffusion tube locations. Full details of model verification are shown in Appendix C.

Significance Criteria

Construction Phase

- 3.14 The IAQM guidance for the control of demolition and construction sites includes criteria to determine the potential dust emission magnitude of construction activities based on the scale of the anticipated works (Appendix B). These are split into:
- Demolition;
 - Earthworks;
 - Construction; and
 - Trackout.
- 3.15 These criteria, along with consideration of local meteorological conditions, and the sensitivity and proximity of receptors, have been used to determine and assess the Proposed Development's potential to lead to dust soiling and human health impacts during the construction phase. The assessment provides an overall 'risk rating' for the Proposed Development, which then advises the mitigation to be implemented.
- 3.16 Step 4 of the guidance is the step at which the significance of effects is established, which follows the risk and mitigation determination steps. As the implementation of construction phase mitigation aims to reduce the magnitude of all potential impacts, *"it is assumed that mitigation...will ensure that a potential significant adverse effect will not occur, so the effect will normally be not significant."*

Operational Phase

- 3.17 The predicted total annual mean NO₂ and PM₁₀ concentrations were assessed against the relevant NAQOs (see Table 1).
- 3.18 The EPUK / IAQM guidance provides impact descriptors to define the magnitude of the impacts of annual mean pollutant concentrations, in relation to the total pollutant concentration and the NAQO. These are presented below in Table 2. These are designed only to be used with annual mean concentrations and not hourly or 24 hour mean concentrations.
- 3.19 Substantial and moderate air quality impacts are considered to be significant. Any change of less than 1% is deemed negligible in accordance with the IAQM guidance.

Table 2: EPUK / IAQM Impact Descriptors for Individual Receptors

Long-term average Concentration at receptor in assessment year	% Change in Concentration Relative to NAQO			
	1	2-5	6-10	>10
75% or less of NAQO	Negligible	Negligible	Slight	Moderate
76-94% of NAQO	Negligible	Slight	Moderate	Moderate
95-102% of NAQO	Slight	Moderate	Moderate	Substantial
103-109% of NAQO	Moderate	Moderate	Substantial	Substantial
110% or more of NAQO	Moderate	Substantial	Substantial	Substantial

3.20 The 1 hour mean NO₂ and 24 hour mean PM₁₀ NAQOs have been assessed using the following LAQM.TG (16)⁴ approach:.

- For NO₂, research undertaken as part of the LAQM.TG(16) indicates that the hourly NO₂ objective is unlikely to be exceeded where the annual-mean NO₂ concentration is predicted to be less than 60 µg/m³.
-
- For PM₁₀, to calculate the number of exceedances of the 24-hour mean NAQO in a year, the following equation (from LAQM.TG(16)) has been applied to the total PM₁₀ annual mean concentration:

$$No. of Exceedances = -18.5 + 0.00145 \times Annual Mean^3 + \left(\frac{206}{Annual Mean} \right)$$

3.21 This relationship suggests that the 24-hour mean NAQO is likely to be met if the predicted annual-mean PM₁₀ concentration is 31.8 µg/m³ or less. The Air Quality Strategy Volume 2: Evidence Base¹¹ states, throughout the document, that an annual-mean PM₁₀ concentration of 31.5 µg/m³ is approximately equivalent to the 24-hour mean NAQO.

3.22 On this basis, the 1-hour NO₂ NAQO is considered to be met where the annual-mean NO₂ concentration is less than 60 µg/m³ while the 24-hour mean PM₁₀ NAQO is considered to be met where the annual-mean PM₁₀ concentration is less than 31.5 µg/m³.

¹¹ Defra (2007) Air Quality Strategy Volume 2.

4 BASELINE CONDITIONS

Local Air Quality Management

4.1 MTCBC have declared one air quality management area (AQMA), the Twynrodryn Road AQMA, for the exceedance of the annual mean NO₂ air quality standard. The Application Site lies approximately 430m from the AQMA.

4.2 The 2019 Annual Status Report (ASR) states:

“On 28th May 2019 traffic flow was reversed along Pontmorlais High Street and Church Street. This provided alternative routes away from Tesco and the Town Centre than Twynyrodryn Road. Traffic build-up appears to have shifted with fewer queues developing on Twynyrodryn Road.”

4.3 Whilst there is currently no monitoring data available to reflect the traffic flow reversal, it is expected than 2019 and 2020 monitored concentrations as a result of the changes in traffic build up would be lower than previous years.

Local Emissions Sources

4.4 The site is located in an area where air quality is mainly influenced by road traffic, particularly vehicles using the A4102 Pontmorlais West. There are no known sources of significant industrial emissions in the vicinity of the Application Site which may influence local air quality.

Defra Background Mapping

4.5 Defra provides modelled background concentrations for each 1x1km grid across all local authority areas from a base year of 2017. This data is projected up to 2030. Table 3 presents the estimated background concentrations for 1 km around the Application Site in 2020.

Table 3: 2020 Defra Background Modelled Concentrations

Defra Grid Square Coordinates (X, Y)	Defra Background Concentration (µg/m ³)		
	NO ₂	PM ₁₀	PM _{2.5}
305500, 206500	8.0	10.5	7.2
304500, 206500	8.7	10.5	7.2
306500, 206500	7.2	10.4	6.9
305500, 207500	7.5	10.7	7.4
305500, 205500	8.1	10.6	7.3

4.6 2020 background concentrations for the grid squares around the Application Site are all well below the annual mean NAQOs.

MTCBC Monitoring

Automatic Monitoring

- 4.7 MTCBC currently undertake automatic monitoring at two locations, ECC which is a roadside location within the AQMA and measures NO₂ and APM1 which is a suburban background location and measures PM₁₀ and PM_{2.5}. Both are located within 750m of the Application Site.
- 4.8 The results are shown in Table 4 below, exceedances of the NAQOs are shown in bold.

Table 4: MTCBC Automatic Station Results

Site ID		2014	2015	2016	2017	2018
ECC	Annual Mean NO ₂ Concentration (µg/m ³)	52.3	46.1	39.7	41.1*	39.9*
	No. of hourly mean NO ₂ Concentration >200 µg/m ³	1	0	0	1	1
APM1	Annual Mean PM ₁₀ Concentration (µg/m ³)	9.6	9.3	8.4	11.3	8.7
	No. of 24-hourly mean PM ₁₀ Concentration >50 µg/m ³	0	0	0	0	0
	Annual Mean PM _{2.5} Concentration (µg/m ³)	5.8	5.0	3.8	4.5	4.5

Source: MTCBC Air Quality Progress Report 2019

*annualised data

(a) standard is exceeded if hourly mean NO₂ Concentration >200 µg/m³ is exceeded more than 18 times a year

(b) standard is exceeded if 24-hourly mean PM₁₀ Concentration >50 µg/m³ is exceeded more than 35 times a year

- 4.9 The results from Table 4 show that the annual mean NO₂ was exceeded the NAQO of 40µg/m³ at ECC in 2014, 2015 and 2017, and was close to the objective in 2016 and 2018. The station is located within the AQMA. The short term hourly NO₂ objective was met across all years.
- 4.10 The results show that the annual mean PM₁₀ and PM_{2.5} objectives were met across all years. The short term 24 hourly mean PM₁₀ objective was also met.

Diffusion Tube Monitoring

- 4.11 MTCBC currently monitors annual mean NO₂ concentrations using passive diffusion tube monitoring at a range of locations across the city. There are 22 sites within approximately 1.5km of the Application Site. They are mainly located within the Twynrodryn Road area. Details of the data collected at these monitoring sites are presented below in Table 5.

Table 5: MTCBC NO₂ Diffusion Tube Monitoring Data

Site ID	Grid Location (X, Y)	Distance from Study Area (km)	In AQMA?	Type*	Annual Mean NO ₂ Concentration (µg/m ³)				
					2014	2015	2016	2017	2018
1	305042,206524	63	R	N	23.1	23.2	21.2	21.3	20.8
2	304743,206261	385	UB	N	19.4	16.4	18.1	17.9	15.2
3	305832,205941	810	S	N	12.4	12.5	13.0	11.4	10.7
4	305001,205763	563	UC	N	28.7	26.5	25.3	26.9	29.3
5	305140,205910	416	R	Y	19.7	19.7	19.8	18.5	18.1
6	305183,205945	388	R	N	17.1	16.3	17.0	15.9	17.3
7	305431,205863	576	R	Y	36.5	38.0	37.8	38.3	34.7
8	304866,206137	295	UC	N	24.3	23.6	22.9	22.2	20.4
10	305236,205964	387	K	N	17.8	17.7	17.7	16.3	17.3
11	305382,205872	528	R	Y	43.3	42.5	40.9	40.5	40.3
13	305156,205881	445	R	Y	-	-	-	28.3	30.6
17	305382,205873	523	R	Y	35.4	36.7	36.0	35.6	33.0
18	305217,205880	457	R	Y	29.1	28.5	25.9	26.2	26.3
20	305149,205906	418	R	Y	30.6	29.6	31.1	28.6	29.4
21	305394,205871	540	R	Y	45.9	45.1	48.5	46.2	47.0
22	305147,205906	418	R	Y	33.4	33.4	31.5	31.8	29.2
23	305521,205836	636	R	N	22.3	21.0	23.2	21.9	22.3
24	305415,205863	555	R	Y	23.1	23.5	24.5	25.2	23.7
25	306260,205941	1220	S	N	-	-	-	16.1	17.7
26	305296,205895	462	S	N	-	-	-	16.6	17.7
27	305447,205956	500	S	N	-	-	-	12.6	13.4
28	305715,205933	721	S	N	-	-	-	15.7	15.9

Source: MTCBC Air Quality Progress Report 2019

*R= Roadside, K= Kerbside, UB= Urban Background, UC= Urban Centre, S= Suburban

Bold = Exceeds NAQO

4.12 Table 5 shows that the NO₂ concentrations have exceeded the annual mean NAQO at two locations, Site 11 and Site 21 at all years 2014-2018. Both locations are located within the Twynrodryn Road AQMA. The NO₂ concentrations at all location have not exceeded the annual mean NO₂ NAQO across all years 2014-2018.

4.13 The closest roadside monitoring location to the Application Site is location 1 which has monitored concentrations well below the NAQO. The closest background monitoring location to the Application

Site is location 2 which also monitored concentrations well below the NAQO, indicating that onsite concentrations are well below the NAQO.

Summary

- 4.14 Local monitoring and Defra background mapping indicate that concentrations of NO₂, PM₁₀ and PM_{2.5} are likely to be below the NAQOs within the Application Site, although there are certain areas in the AQMA in which exceedances of the annual mean NO₂ NAQO occur.

5 ASSESSMENT OF SHORT-TERM IMPACTS

Construction Dust Assessment

Assessment of Potential Dust Emission Magnitude

- 5.1 The potential dust emission magnitude has been determined based on information provided by the project team, and (where data is not available) assumptions based on projects of similar size and nature.
- 5.2 It is anticipated that the total volume of buildings to be demolished is less than 20,000m³, with the majority of demolition activities occurring below 10m above ground and potentially dusty material. Therefore, the overall potential dust emission magnitude is considered to be **small** for demolition.
- 5.3 The site area is more than 10,000m² with the potential for dust generation. It is estimated that there will be between 5 and 10 heavy earth moving vehicles active at any one time and between 20,000 and 100,000 tonnes of material is expected to be moved. Therefore, irrespective of the site area, it is considered that the dust emission magnitude for earthworks is **medium** for earthworks.
- 5.4 The total building volume to be constructed will be between 25,000m³ – 100,000 m³. Therefore, the dust emission magnitude is **medium** for construction.
- 5.5 It is anticipated that there will be fewer than 10 HDV outward movements per day during construction, surface material will have the potential for dust release and there will be an unpaved road length of no more than 50m within the Application Site. Therefore, the dust emission magnitude is **small** for trackout.

Sensitivity of the Area

- 5.6 There are between 10 and 100 highly sensitive receptors within 20m of the Application Site. Based on the information set out in Appendix B, the area is considered to be of **High** sensitivity to dust soiling impacts.
- 5.7 Defra background data from Table 4 suggests that annual mean PM₁₀ concentrations are likely to be below 24µg/m³ the vicinity of the Application Site. As there are between 10 and 100 highly sensitive receptors within 20m of the Application Site boundary, the sensitivity of the area to human health impacts is **Low**.
- 5.8 There are no ecological receptors within 50m of the Application Site boundary or along the likely routes of construction vehicles up to 500m from the Application Site entrance.

Risk of Impacts

- 5.9 Step 2C in Appendix B has been followed using the above designations of dust emission magnitude and area sensitivity. The risks have been summarised in Table 6 below.

Table 6: Summary of Dust Risk

Activity	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	Medium Risk	Medium Risk	Low Risk
Human Health	Negligible	Low Risk	Low Risk	Negligible

6 ASSESSMENT OF LONG TERM IMPACTS

Impact Assessment

- 6.1 Annual mean concentrations of NO₂ and PM₁₀ have been modelled at relevant existing sensitive receptors located within and outside the AQMA for the 2018 Baseline, 2021 Do Minimum (DM) and 2021 Do Something (DS) opening year scenarios.

Annual Mean NO₂

- 6.2 Table 7 presents the predicted annual mean NO₂ concentrations at the worst-case facades of considered receptors within the study area, for the 2018 Baseline, 2021 DM and 2021 DS scenarios, in line with EPUK / IAQM significance criteria.

Table 7: 2018 Baseline, 2021 DM and 2021 DS Modelled Annual Mean NO₂ Concentrations

Receptor No.	Annual Mean NO ₂ Concentrations (µg/m ³)				Change (as % of NAQO)	EPUK / IAQM Impact
	2018 Baseline	2021 DM	2021 DS	Change in conc.		
1	9.2	8.1	8.6	0.5	1.0	Negligible
2	10.7	9.4	10.1	0.7	2.0	Negligible
3	11.9	10.3	10.9	0.6	2.0	Negligible
4	24.7	20.6	21.3	0.7	2.0	Negligible
5	32.8	27.2	28.0	0.8	2.0	Negligible
6	38.5	31.9	32.8	0.9	2.0	Slight Adverse
7	39.1	32.4	33.3	0.9	2.0	Slight Adverse
8	25.6	21.2	21.8	0.6	2.0	Negligible

- 6.3 The annual mean NO₂ NAQO is 40µg/m³. The annual mean NO₂ concentrations predicted at all receptors are below the NAQOs both in the 2021 DM and 2021 DS opening year scenarios. The impact is Slight Adverse at two receptors (6 and 7) and Negligible at all other receptor locations. The annual mean NO₂ concentrations predicted at all receptors is less than 60 µg/m³, therefore the hourly mean NO₂ NAQO is unlikely to be exceeded.
- 6.4 Using professional judgement, the impact of the Proposed Development on air quality is therefore expected to be Negligible.

Annual Mean PM₁₀

- 6.5 Table 8 presents the predicted annual mean PM₁₀ concentrations at the worst-case facades of considered receptors within the study area, for the 2018 Baseline, 2021 DM and 2021 DS scenarios, in line with EPUK / IAQM significance criteria.

Table 8: 2018 Baseline, 2021 DM and 2021 DS Modelled Annual Mean NO₂ Concentrations

Receptor No.	Annual Mean NO ₂ Concentrations (µg/m ³)				Change (as % of NAQO)	EPUK / IAQM Impact
	2018 Baseline	2021 DM	2021 DS	Change in conc.		
1	10.9	10.5	10.5	0.0	0.0	Negligible
2	11.1	10.7	10.8	0.1	0.0	Negligible
3	11.1	10.7	10.8	0.1	0.0	Negligible
4	12.2	11.7	11.8	0.1	0.0	Negligible
5	13.1	12.6	12.7	0.1	0.0	Negligible
6	13.4	12.9	13.0	0.1	0.0	Negligible
7	13.5	13.0	13.1	0.1	0.0	Negligible
8	12.2	11.8	11.8	0.0	0.0	Negligible

- 6.6 The annual mean PM₁₀ NAQO is 40µg/m³. The annual mean PM₁₀ concentrations predicted at all receptors are below the NAQOs both in the 2021 DM and 2021 DS opening year scenarios. The impact is Negligible at all receptor locations. The annual mean NO₂ concentrations predicted at all receptors is less than 50 µg/m³, therefore the 24-hour mean PM₁₀ NAQO is unlikely to be exceeded.
- 6.7 Using professional judgement, the impact of the Proposed Development on air quality is therefore expected to be Negligible.

Exposure Assessment

- 6.8 Background concentrations as shown in Table 3 indicate that away from major roads sources air quality concentrations are well below the NAQOs. The Application site is not situated adjacent to any busy road sources, therefore it is expected that concentrations on Site are heading towards background levels. The site is, therefore, expected to be suitable for residential use.

7 MITIGATION

Short-Term Impacts

- 7.1 The risk assessment of dust from the demolition and construction phase of the Proposed Development concluded that there is a:
- Low to medium risk of dust soiling; and a
 - Negligible to low risk of human health effects.
- 7.2 Using the results from the dust and construction assessment, mitigation measures are decided generally *“and the highest risk category should be applied. For example, if the site is medium risk for earthworks and construction, but a high risk for demolition and track-out, the general measures applicable to a high-risk site should be applied.”*
- 7.3 As a result, **medium risk** mitigation measures from the IAQM guidance documents provided in Table B.10 Appendix B, are recommended to reduce risks to negligible impact.

Long-Term Impacts

- 7.4 The assessment has shown that the Proposed Development is unlikely to lead to long-term impacts on local air quality within and outside the AQMA, and concentrations of NO₂ and PM₁₀ are anticipated to be below their respective NAQOs in the opening year within the Proposed Development.
- 7.5 Therefore, no mitigation is required for the operational phase of the Proposed Development on air quality grounds.

8 CONCLUSION

- 8.1 The Proposed Development at St Tydfil's Hospital was assessed with regards to the air quality impact on local sensitive receptors, as a result of both construction phase dust and PM₁₀ emissions, and changes in NO₂ and PM₁₀ emissions due to the operation of the Proposed Development.
- 8.2 The short-term impact of the construction phase was assessed qualitatively, following the IAQM guidance. This determined that demolition and construction activities within the Application Site, prior to mitigation being implemented, would have a Low to Medium risk of dust soiling, and a Negligible to Low risk of human health impacts. However, following the implementation of recommended mitigation measures, the impact of the Proposed Development's construction phase is anticipated to be negligible.
- 8.3 The long-term impact of the operational phase was assessed quantitatively using a modelling software to predict future concentration of NO₂ and PM₁₀. The results of the predictions indicate that the short term and long term NAQOS would be achieved at the existing receptors located within and outside the AQMA. The impact on NO₂ concentrations is predicted to be Slight Adverse at two receptor locations (6 and 7) and Negligible at all other locations. The impact on PM₁₀ concentrations is predicted to be Negligible at all locations. The overall significance of the impact of the Proposed Development due to changes in traffic was deemed Not Significant at all existing receptors within and outside the AQMA.
- 8.4 Both the short term and long term NAQOs for NO₂ and PM₁₀ would be met at the Application Site, therefore, the Application Site is deemed suitable in air quality terms for the future users.
- 8.5 On this basis, the Proposed Development is considered to comply with national and local air quality policy.

Appendices

APPENDIX A: REVIEW OF LEGISLATION, POLICY AND GUIDANCE

Air Quality Strategy

Part IV of the Environment Act 1995 introduced a system of Local Air Quality Management (LAQM). This requires Local Authorities to regularly and systematically review and assess air quality within their boundaries against a series of objectives and appraise re-development and transport plans against these assessments.

The Air Quality Strategy (2007) establishes the policy for ambient air quality for the UK. Its primary objective is to ensure that everyone can enjoy a level of ambient air quality in public places that poses no significant risk to health or quality of life, and to protect the environment. The Strategy sets out the National Air Quality Objectives (NAQOs). Those included in LAQM are prescribed in the Air Quality Standards (Wales) Regulations 2010 and the Air Quality Standards (England) Regulations 2015.

The NAQOs applied in this assessment for NO₂ and PM₁₀ are shown in Table A.1.

Table A.1 National Air Quality Objectives (NAQO)

Pollutant	Measured As	Objective
Nitrogen dioxide (NO ₂)	Annual Mean	40µg/m ³
	1 Hour Mean	200µg/m ³ not to be exceeded more than 18 times a year
Particles (PM ₁₀)	Annual Mean	40µg/m ³
	24 Hour Mean	50µg/m³ not be exceeded more than 35 times a year

Source: Air Quality Strategy 2015

The air quality objectives for the protection of human health apply to outdoor locations where people are regularly present, and where they might reasonably be expected to be exposed over the relevant averaging times (which vary from 15 minutes to a year). The air quality objectives do not apply to occupational, indoor or in-vehicle exposure.

Where a NAQO is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the objectives within its AQMA. Land use and transport planning are major components of effective AQAPs.

Local authorities' approach to establishing an AQMA may differ. Some declare the whole district/borough an AQMA, others have declared AQMAs at specific areas where NAQOs have been shown or predicted to be exceeded. The latter approach can lead to the declaration of multiple AQMAs, so some authorities have declared a whole area an AQMA, around exceedances of the relevant NAQO. Over 230 local authorities have declared AQMAs. Table A.2 presents a summary of recent Review and Assessments undertaken by MTCBC.

Table A.2 Summary of Recent MTCBC Reviews and Assessments

Review and Assessment	Summary
Updating and screening assessment and progress reports (2012-2014)	No new developments or proposed developments that could be considered to adversely affect air quality 1 exceedance of NO₂ at 55 Twynyrodyn Road Progress report 2013 found action to reduce NO₂ levels at 55 Twynyrodyn Road, has reduced it to below AQS objective Additional monitoring found further location on same road link where NO₂ levels exceeded AQS objective Progress report 2014 identified new bus station development proposed may adversely affect NO₂. Environmental Health Department liaised with Regeneration Group to ensure air quality considered in planning process NO₂ levels on Twynyrodyn Road had increased to exceed AQS objective. Unclear if temporary and related to ongoing changes to traffic flow. Further monitoring proposed Detailed assessment and declaration of AQMA on Twynyrodyn Road necessary.
Detailed assessment (2015)	Considered necessary to declare AQMA from Western End of Twynyrodyn Road to 147 Gilfach Cynon. MTCBC declared AQMA on 30th January 2017
Updating and screening assessment and progress reports (2015-2017)	Proposed bus station could adversely affect air quality. Modelling indicates likely to comply with AQS objectives, to be monitored with diffusion tubes prior to bus station opening as modelling based on limited data. NO₂ exceedances were contained within AQMA on Twynyrodyn Road . Action plan under development for public consultation, on options to improve traffic flow and reduce traffic numbers . Additional monitoring in Swansea Road area in anticipation of Trago Mills opening, attracting additional traffic to Swansea Road area .
Annual report (2018)	NO₂ exceedances were contained within AQMA on Twynyrodyn Road Action plan to reverse traffic flow along Pontmorlais High Street and Church approved by Welsh Government following public consultation and Council approval.

	Impact of Trago Mills on Swansea Road has not resulted in annual mean within 10% of AQS objective. Monitoring network reviewed and as of January 2019 network will be extended to include traffic reversal area.
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Source: MTCBC – ASR 2019

The UK government has recently prepared a Clean Air Strategy^{Error! Bookmark not defined.} in 2019 to show how they will tackle all sources of air pollution in order to making our air healthier to breathe, protecting nature and boosting the economy.

The Strategy sets out the comprehensive action that is required from across all parts of government and society to meet these goals. New legislation will create a stronger and more coherent framework for action to tackle air pollution. This will be underpinned by new England-wide powers to control major sources of air pollution, in line with the risk they pose to public health and the environment, plus new local powers to take action in areas with an air pollution problem. These will support the creation of Clean Air Zones to lower emissions from all sources of air pollution, backed up with clear enforcement mechanisms.

Air Quality Standards Regulations

The Air Quality (Standards) (England) Regulations 2015 and the Air Quality (Wales) Regulations 2010 transpose into English and Welsh law the requirements of European Directives 2008/50/EC and 2004/107/EC on ambient air quality respectively. They include limit values for NO₂. These limit values are numerically the same as the NAQO values, but differ in terms of compliance dates, locations where they apply and legal responsibility.

The limit values are applicable at all locations except:

- Where members of the public do not have access and there is no fixed habitation;
- On factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply;
- On the carriageway of roads; and
- On the central reservations of roads except where there is normally pedestrian access.

Planning Policy

National Planning Policy

Planning policy in the UK is governed by the National Planning Policy Framework which was published in July 2018 and updated in February 2019^{Error! Bookmark not defined.}. It has an emphasis on economic, social and environmental sustainability at the forefront of the policy. It states that:

“Planning policies and decisions should contribute to and enhance the natural and local environment by:

[...]

preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and ...”

This is to be achieved whilst maintaining adherence to the NAQOs and taking into account the presence of AQMAs. Developments in AQMAs should also be consistent with the local air quality action plan.

Local Policy

MTCBC Replacement Local Development Plan (LDP) (2016-2031)

MTCBC adopted The Merthyr Tydfil Replacement Local Development Plan (LDP) 2016-2031 in January 2020 and is the basis for planning decisions across the County Borough. Policy EnW4 Environmental Protection of the LDP states:

“Development proposals will be required to demonstrate they will not result in an unacceptable impact on people, residential amenity, property and / or the natural environment from either:

- Pollution of land, surface water, ground water and the air;*
- Land contamination;*
- Hazardous substances;*
- Land stability;*
- Noise, vibration, dust, odour nuisance and light pollution; or*
- Any other identified risk to public health and safety.*

Where impacts are identified the Council will require applicants to demonstrate that appropriate measures have been incorporated to reduce, or minimise the impact identified to the lowest

possible acceptable level. Planning conditions may be imposed or legal obligation entered into, to secure any necessary mitigation and monitoring processes.”

MTCBC Air Quality Action Plan 2018

This Air Quality Action Plan (AQAP) states:

“Whilst our main aim has been to reduce traffic movement in the Twynyrodyn Road AQMA we have sought to achieve this primarily by modifying the town centre transport infrastructure to provide more direct traffic routes and lower traffic congestion. Doing so reduces journey times and distances overall; producing a wider reduction in vehicle emissions, and public exposure to them, rather than just in the AQMA. Our key priorities were firstly local road traffic emissions and, secondly, general town centre traffic emissions. In this AQAP we outline how we plan to effectively tackle air quality issues within our control. However, we recognise that there are a large number of air quality policy areas that are outside of our influence (such as vehicle emissions standards agreed in Europe), but for which we may have useful evidence, and so we will continue to work with regional and central government on policies and issues beyond Merthyr Tydfil’s direct influence.”

Guidance

Local Air Quality Management Technical Guidance

Published by the Defra, the Local Air Quality Management Technical Guidance (LAQM.TG(16)) was produced to aid local authorities in their local air quality management. This guidance also acts as guidance for planning officials and consultants.

Land-Use Planning & Development Control: Planning for Air Quality (2017)

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) published updated guidance, detailing when a detailed air quality assessment is required, in relation to traffic generation (both light and heavy-duty vehicles), speed, road realignment, car park ventilation, energy and heating provision plant. The guidance also provides impact descriptors to aid in assessing the significance of the impact, as well as what should be included in the assessment and associated report.

Guidance on the Assessment of Dust from Demolition and Construction

IAQM has produced this guidance to provide developers, consultants and local authorities with a means of qualitatively assessing the impact of the construction dust on dust soiling, human health, and designated ecological sites. The aim is to assign a risk rating to each activity and impact, based

on the scale of construction activities and proximity to receptors. Once determined, the relevant level of mitigation (also provided) is recommended.

National Planning Practice Guidance – Air Quality

The Government's Planning Practice Guidance provides information on the level of detail required in an air quality assessment and mitigation for reducing negative air quality impacts.

Local Air Quality Policy Guidance for Wales

The Welsh Government's Air Quality Planning Guidance provides information on the review and assessment of air quality in the local authorities against standards and objectives. The local authorities in Wales must then declare any AQMAs in their area and produce a plan and specific mitigation measures to reduce negative air quality impacts.

APPENDIX B: IAQM Construction Dust Assessment Methodology

The IAQM criteria divide activities on construction sites into four categories:

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

The dust risk assessment is split into four steps as set out in the IAQM guidance and outlined below.

Step 1: Screen the Need for Detailed Assessment

A detailed assessment is required where there is a human receptor within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), or where there is an ecological receptor within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

If the requirement for detailed assessment is screened out, it can be concluded that the level of risk is negligible and that any effects will not be significant. No mitigation measures beyond those required by legislation will be required.

Step 2: Assess the Risk of Dust Impacts

A site is allocated to a risk category based on two factors:

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

These two factors are combined in Step 2C to determine the risk of dust impacts with no mitigation applied. The risk category assigned to the site can be different for each of the four potential activities demolition, earthworks, construction and trackout.

Step 2A: Define the Potential Dust Emission Magnitude

The dust emission magnitude is based on the scale of the anticipated works and should be classified as Small, Medium, or Large.

i) Demolition

The scale of potential dust emissions from this phase should be determined using the following criteria. Developers should use the highest category their development falls within.

Table B.1 Demolition Dust Emission Variables

Dust Emission	Example Definition
Large	• Total building volume >50,000m³ • Potentially dusty construction material (e.g. concrete) • On-site crushing and screening • Demolition activities >20 m above ground level
Medium	• Total building volume 20,000-50,000m³ • Potentially dusty construction material (e.g. concrete) • Demolition activities 10-20 m above ground level
Small	• Total building volume <20,000m³ • Construction material with low potential for dust release (e.g. metal cladding or timber) • Demolition activities <20m above ground level • Demolition during wetter months

ii) Earthworks

Earthworks primarily cover excavation, haulage, tipping and stockpiling of soil type materials. This includes levelling the site and landscaping. The scale of potential dust emissions from this phase should be determined using the following criteria.

Table B.2 Earthworks Dust Emission Variables

Dust Emission	Example Definition
Large	• Total site area >10,000m² • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • >10 heavy earth moving vehicles active at any one time • Formation of bunds >8 m in height • Total material moved >100,000 tonnes
Medium	• Total site area 2,500-10,000m² • Moderately dusty soil type (e.g. silt) • 5-10 heavy earth moving vehicles active at any one time • Formation of bunds 4-8 m in height • Total material moved 20,000-100,000 tonnes
Small	• Total site area <2,500m² • Soil type with large grain size (e.g. sand) • <5 heavy earth moving vehicles active at any one time • Formation of bunds <4 m in height • Total material moved <20,000 tonnes

iii) Construction

The key issues when determining the potential scale of dust emission during the construction phase include the size of the building(s)/infrastructure, method of construction, construction materials, and the duration of build. The criteria below should be used to determine the potential scale of dust emission for the construction phase.

Table B.3 Construction Dust Emission Variables

Dust Emission	Example Definition
Large	• Total building volume >100,000 m³ • On-site concrete batching • Sandblasting
Medium	• Total building volume 25,000-100,000 m³ • Potentially dusty construction material (e.g. concrete) • On-site concrete batching
Small	• Total building volume <25,000 m³ • Construction material with low potential for dust release (e.g. metal cladding or timber)

iv) Trackout

Factors which determine the risk of dust emissions from trackout are vehicle size, vehicle speed, vehicle numbers, geology and duration. Only receptors within 50m of the route(s) used by vehicles on the public highway and up to 500m from the site entrance(s) are considered to be at risk from the effects of dust.

Table B.4 Trackout Dust Emission Variables

Dust Emission	Example Definition
Large	• >50 HDV (>3.5t) outward movements in any one day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length >100 m
Medium	• 10-50 HDV (>3.5t) outward movements in any one day • Moderately dusty surface material (e.g. high clay content) • Unpaved road length 50-100 m
Small	• <10 HDV (>3.5t) outward movements in any one day • Surface material with low potential for dust release • Unpaved road length <50 m

Step 2B: Define the Sensitivity of the Area

The sensitivity of the area takes account of a number of factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM₁₀, the local background concentration; and
- Site-specific factors, such as whether there are natural shelters, such as trees or other vegetation, to reduce the risk of wind-blown dust.

For the sensitivity of people and their property to soiling, the IAQM recommends that the air quality practitioner uses professional judgement to identify where on the spectrum between high and low sensitivity a receptor lies, taking into account the following general principles:

Table B.5 Receptor Sensitivity

Receptor Sensitivity	Principles	Indicative Examples
Sensitivity of People to Dust Soiling Effects		
High	Users can reasonably expect an enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.	Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms.
Medium	Users would expect to enjoy a reasonable level of amenity but would not reasonably expect to enjoy the same level of amenity as in their home. The appearance, aesthetic or value of their property could be diminished by soiling. The people or property would not reasonably be expected to be present there continuously or regularly for extended periods as part of the normal pattern of use of the land.	Parks and places of work.
Low	The enjoyment of amenity would not reasonably be expected. Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling. There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.	Playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.
Sensitivities of People to Health Effects of PM₁₀		
High	Locations where members of the public are exposed over a time period relevant to the air quality objective for PM ₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	Residential properties, hospitals, schools and residential care homes.
Medium	Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality	Office and shop workers, but will

	objective for PM ₁₀ (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	generally not include workers occupationally exposed to PM ₁₀ , as protection is covered by Health and Safety at Work legislation.
Low	Locations where human exposure is transient.	Public footpaths, playing fields, parks and shopping streets.
Sensitivities of Receptors to Ecological Effects		
High	Locations with an international or national designation and the designated features may be affected by dust soiling. Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List for Great Britain.	Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown. Locations with a national designation where the features may be affected by dust deposition.	Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	Locations with a local designation where the features may be affected by dust deposition.	Local Nature Reserve with dust sensitive features

Table B.6 Sensitivity of the Area to Dust Soiling Effects on People and Property^{AB}

Receptor Sensitivity	Number of Receptors	Distance from the Source ^C (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
A The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout. See Step 2B.					
B Estimate the total number of receptors within the stated distance. Only the highest level of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors <20m of the source and 95 high sensitivity receptors between 20 and 50m, then the total of number of receptors <50m is 102. The sensitivity of the area in this case would be high.					

C For trackout, the distances should be measured from the side of the roads used by construction traffic. Without site specific mitigation, trackout may occur from roads up to 500m from large sites, 200m from medium sites and 50m from small sites, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50m from the edge of the road.

Table B.7 Sensitivity of the Area to Human Health Impacts^{AB}

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

A The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout. See Step 2B.

B Estimate the total within the stated distance (e.g. the total within 350m and not the number between 200 and 350m), noting that only the highest level of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors <20m of the source and 95 high sensitivity receptors between 20 and 50m, then the total of number of receptors <50m is 102. If the annual mean PM₁₀ concentration is 29µg/m³, the sensitivity of the area would be high.

C Most straightforwardly taken from the national background maps, but should also take account of local sources. The values are based on $32 \mu\text{g}/\text{m}^3$ being the annual mean concentration at which an exceedance of the 24-hour objective is likely in England, Wales and Northern Ireland. In Scotland there is an annual mean objective of $18 \mu\text{g}/\text{m}^3$.

D In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

E For trackout, the distances should be measured from the side of the roads used by construction traffic. Without site specific mitigation, trackout may occur from roads up to 500m from large sites, 200m from medium sites and 50m from small sites, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50m from the edge of the road.

Table B.8 Sensitivity of the Area to Ecological Impacts^{AB}

Receptor Sensitivity	Distance from the Source ^C (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low
A The sensitivity of the area should be derived for each of the four activities: demolition, construction, earthworks and trackout. See STEP 2B.		
B Only the highest level of area sensitivity from the table needs to be considered.		
C For trackout, the distances should be measured from the side of the roads used by construction traffic. Without site specific mitigation, trackout may occur from roads up to 500m from large sites, 200m from medium sites and 50m from small sites, as measured from the site exit. The impact declines with distance from the site.		

Step 2C: Define the Risk of Impacts

The dust emission magnitude determined in Step 2A should be combined with the sensitivity of the area determined in Step 2B to determine the risk of impacts with no mitigation applied.

The matrices in Table below provide a method of assigning the level of risk for each activity. These should be used to determine the level of site-specific mitigation that must be applied.

Table B.9 Risk Determination Table

Sensitivity of Area	Dust Emissions 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			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
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: Determine Site-Specific Mitigation Requirements

The IAQM provides a suite of recommended and desirable mitigation measures which are organised according to whether the outcome of Step 2 indicates a low, medium, or high risk. The list provided by the IAQM has been used as the basis for the requirements set out mitigation requirements.

Step 4: Determine Significant Effects

A method for assessing the significance of effects before mitigation is not available, and IAQM advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant'.

Guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance. The scale of this would not normally be considered sufficient to change the conclusion that the effects will be 'not significant'.

Step 5: Mitigation

Key to tables:

- H – Highly Recommended

- D – Desirable
- N – Not required

Table B.10 IAQM Mitigation Measures

Mitigation Measure	Low Risk	Medium Risk	High Risk
Communication			
1. Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	N	H	H
2. 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.	H	H	H
3. Display the head or regional office contact information.	H	H	H
Dust Management			
4. 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. The desirable measures should be included as appropriate for the site. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, realtime PM ₁₀ Continuous monitoring and/or visual inspections.	D	H	H
Site Management			
5. 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.	H	H	H
6. Make the complaints log available to the local authority when asked.	H	H	H
7. Record any exceptional incidents that cause dust and/or air missions, either on- or offsite, and the action taken to resolve the situation in the log book.	H	H	H
8. Hold regular liaison meetings with other high-risk construction sites within 500m of the site boundary, 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.	N	N	H
Monitoring			
9. 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.	D	D	H

10. 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.	H	H	H
11. 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.	H	H	H
12. Agree dust deposition, dust flux, or real-time PM ₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	H	H	H
Preparing and maintaining the site			
13. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H	H	H
14. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	H	H	H
15. Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period	D	H	H
16. Avoid site runoff of water or mud.	H	H	H
17. Keep site fencing, barriers and scaffolding clean using wet methods.	D	H	H
18. 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.	D	H	H
19. Cover, seed or fence stockpiles to prevent wind whipping.	D	H	H
Operating vehicle/machinery and sustainable travel			
20. Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable.	H	H	H
21. Ensure all vehicles switch off engines when stationary - no idling vehicles.	H	H	H
22. Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.	H	H	H
23. 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)	D	D	H
24. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	N	H	H
25. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	N	D	H
Operations			

26. 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.	H	H	H
27. Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H	H	H
28. Use enclosed chutes and conveyors and covered skips.	H	H	H
29. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H	H	H
30. 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.	D	H	H
Waste management			
31. Avoid bonfires and burning of waste materials.	H	H	H
Demolition			
32. Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D	D	H
33. 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 controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	H	H	H
34. Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H	H	H
35. Bag and remove any biological debris or damp down such material before demolition.	H	H	H
Earthworks			
36. Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	N	D	H
37. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable	N	D	H
38. Only remove the cover in small areas during work and not all at once.	N	D	H
Construction			
39. Avoid scabbling (roughening of concrete surfaces) if possible.	D	D	H
40. 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.	D	H	H

41. 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.	N	D	H
42. For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	N	D	D
Trackout			
43. 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.	D	H	H
44. Avoid dry sweeping of large areas.	D	H	H
45. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D	H	H
46. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	N	H	H
47. Record all inspections of haul routes and any subsequent action in a site log book.	D	H	H
48. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsters and regularly cleaned.	N	H	H
49. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	D	H	H
50. 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.	N	H	H
51. Access gates to be located at least 10m from receptors where possible.	N	H	H

APPENDIX C: ASSESSMENT OF EFFECTS TO AIR QUALITY DURING OPERATION

Dispersion Model

The contribution of emissions from the road traffic to NO_x and PM₁₀ concentrations are predicted using the ADMS-Roads (v4.1.1.0) model. This model is widely used in the UK for this type of assessment.

The model of the Proposed Development is based on traffic data provided by the appointed transport consultants. The simulations apply the traffic data in conjunction with a surface roughness to replicate the local built environment, and meteorological statistics to predict resulting concentrations at key specified sensitive receptors.

Sensitive receptors are locations where members of the public have the potential to be exposed to exceedances of the NAQO's, as a result of the Proposed Development. These locations correspond with the relevant mean timescales, i.e. a member of the public is likely to be present at a residential dwelling for the majority of a year, and so the annual mean is considered, whereas, areas where the public generally spend shorter amounts of time (such as restaurants) the 1-hour mean is more relevant. Box 1.1 of LAQM.TG (16) provides further details and examples of where NAQOs should or should not apply.

Receptors included in the assessment are located on the 'worst case' facades of properties (i.e. closest to the emission source). Table C.1 and Figure C.1 present the sensitive receptors included in the modelling assessment.

Table C.1 Key Air Quality Receptors

ID	Ordinance Survey Grid Reference		
	X(m)	Y(m)	Z(m)
R1	305065	206361	2
R2	305104	206238	2
R3	305156	206242	2
R4	305305	205878	2
R5	305133	205903	2
R6	305375	205865	2
R7	305330	205874	2
R8	305271	205882	2

Road Traffic

The assessment considers effects on air quality due to road traffic at properties within 200m of any roads which experience a change in traffic flow as a result of the Proposed Development. Traffic data used in this assessment was provided by the Transport Consultants. Data was provided in one-way format, so two-way AADT, %HDV and average speeds were calculated for each link.

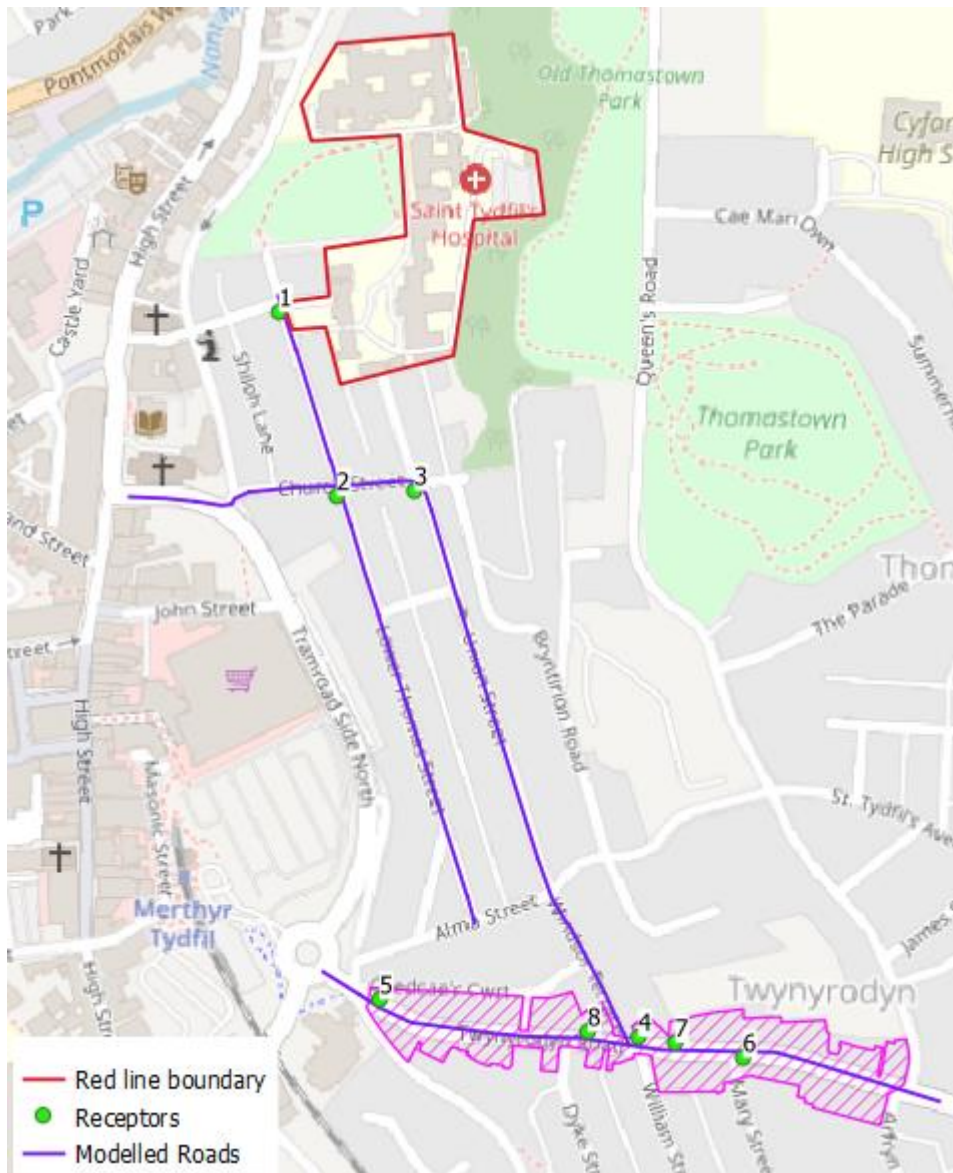
Motor vehicle emissions were estimated in accordance with the Emission Factor Toolkit (EFT) v9.0 (May 2019) provided by Defra. The gradient tool within the EFT was utilised for relevant road links where gradients were greater than 10%.

Table C.2 and Figure C.1 present the traffic data included within the modelling assessment. Junctions have been slowed down to 5kph where appropriate.

Table C.2 Modelled Traffic Data (AADT, %HDV and Speed (km/h))

Link ID	Speed (kph)	2018 Baseline		2021 DM		2021 DS	
		AADT	%HDV	AADT	%HDV	AADT	%HDV
Upper Thomas Street	27	292	0%	300	0%	720	0%
Lower Thomas Street	27	220	0%	225	0%	245	0%
Church St West of Upper Thomas Street	27	1650	1%	1700	1%	1860	1%
Union St / Courtland Terrace East of Upper Thomas Street	27	1530	2%	1575	2%	1885	2%
Twynyrodyn Road	27	7175	2%	7375	2%	7685	2%

Figure C.1 Modelled Roads and Receptors



NO_x to NO₂

Predicted oxides of nitrogen (NO_x, a mixture of nitrogen oxide (NO) and NO₂) concentrations were converted to NO₂ using NO_x to NO₂ calculator v7.1 (April 2019) provided by Defra.

Meteorological Conditions

Hourly sequential meteorological data for 2018 from Rhose (Cardiff Airport) has been applied to the current assessment. This is located approximately 40km to the south of the Application Site. The wind rose for the meteorological data used in the assessment is presented in Figure C.2.

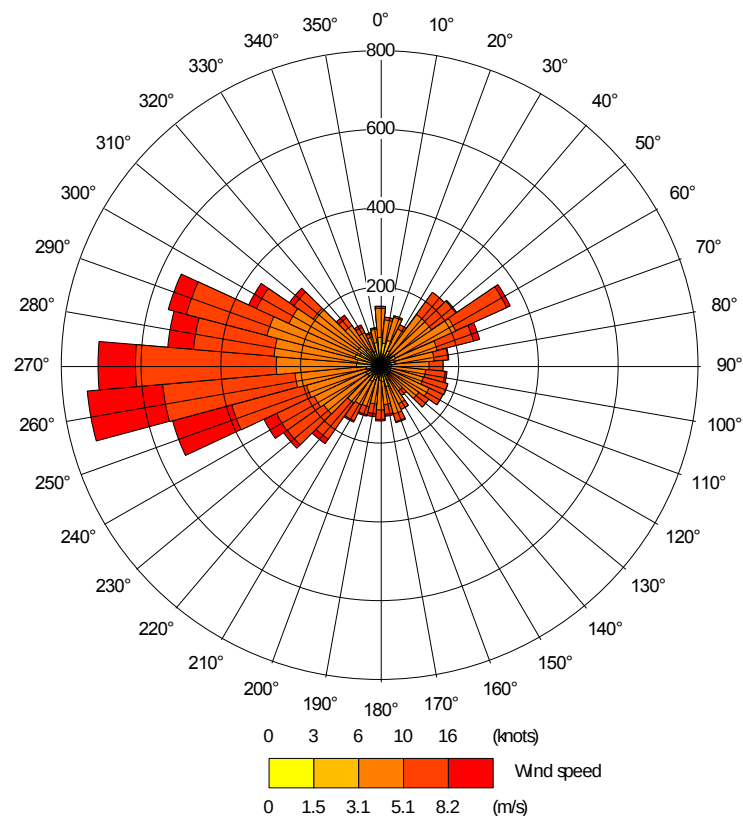


Figure C.2 Rhose 2018

Model verification

Model verification has been undertaken following the methodology presented in Defra's guidance document LAQM.(TG16), Box 7.15. This guidance is widely recognised and followed throughout the air quality industry by local authorities and consultants alike. The process followed and data used is presented below.

An initial review of available local monitoring data was undertaken to assess the suitability of nearby sites for use in model verification. For each potential site, its proximity to the road (e.g. kerbside locations within 1m of the roadside are not recommended for verification), data capture for the

relevant period and relevance to the model area, and the availability of traffic data at the site were all taken into account. Of the monitoring sites in the vicinity of the development with data for 2018, six locations (13, 18, 17, 21, 7 and ECC) were selected for model verification.

The selected verification locations were then included in the 2018 Baseline model scenario as receptor points, to provide the modelled road contribution of NO_x at each location. This value was then compared with the monitored NO_x at each site. However, as the only data available regarding the verification sites is the total annual mean NO₂ concentration, the monitored road NO_x concentration was calculated using Defra's NO_x to NO₂ calculator and background concentrations of NO₂ and NO_x taken from Defra's background mapping. The relevant year and location is also user defined. Once processed, the calculator provides the monitored road NO_x contribution for each site.

The modelled road NO_x is then converted to the total modelled annual-mean NO₂ and compared with the monitored annual-mean NO₂ concentrations to determine whether adjustment of the model is necessary.

Table D1 provides a comparison of the monitored and modelled annual-mean NO₂ concentrations.

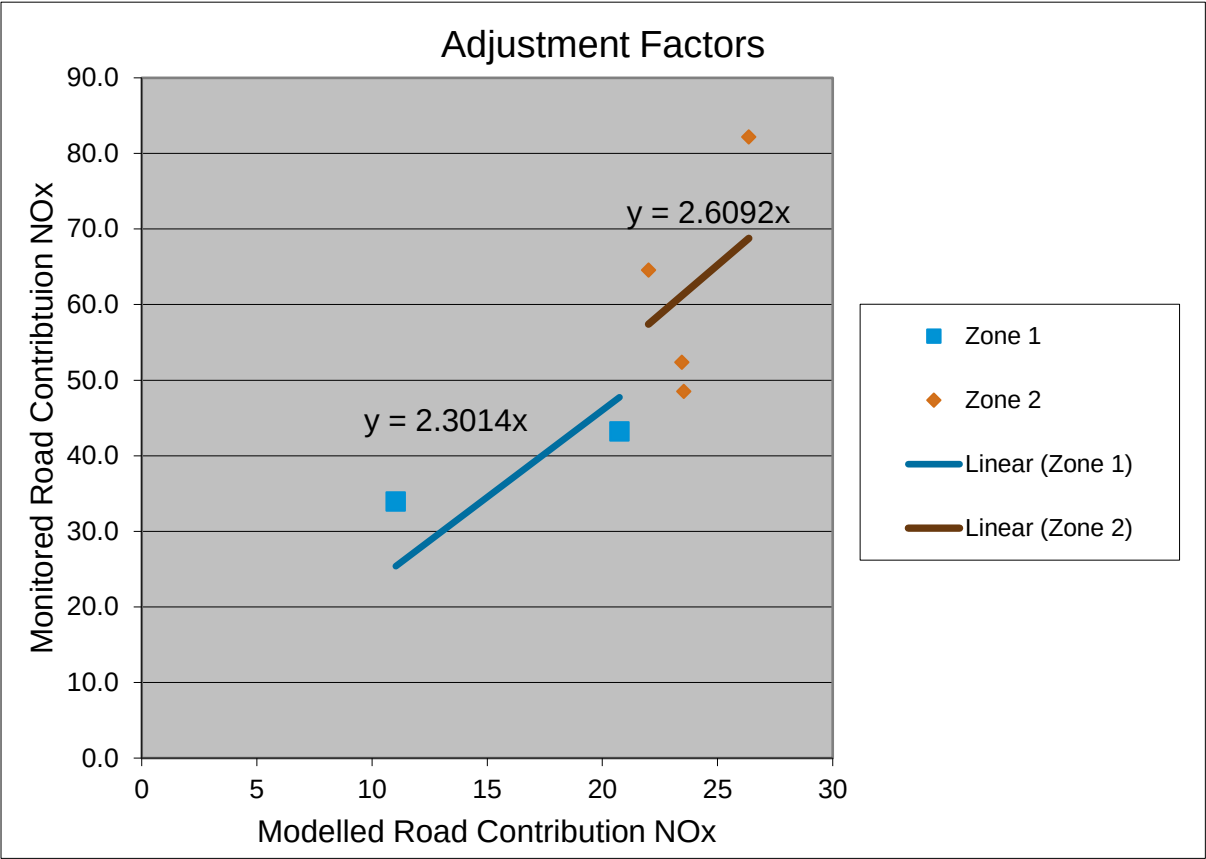
Table D.1 Verification Process

Site ID	Monitored Total NO ₂	Background Nox	Background NO ₂	Monitored Road Contribution NO _x (total - background)	Modelled Road Contribution NO _x (excludes background)	Ratio of monitored road Contribution Nox/modelled road contribution Nox	Difference
13	30.6	11.8	8.90	43.2	20.7	2.1	-35
18	26.3	11.8	8.90	33.9	11.0	3.1	-44
17	33.0	11.8	8.90	48.5	23.5	2.1	-36
21	47.0	11.8	8.90	82.2	26.4	3.1	-52
7	34.7	11.8	8.90	52.4	23.5	2.2	-39
ECC	39.9	11.8	8.90	64.6	22.0	2.9	-49

The model is systematically underpredicting the monitored concentrations by 35% to 52% and as such the modelled results need to be corrected.

An adjustment factor has been calculated based on a comparison of the modelled and monitored road contribution of total NO_x concentrations. A graph of modelled vs monitored road contribution NO_x was then created, including a trendline with the equation in the format of $y = mx$ and the intercept set at 0. "m" is the adjustment factor to be applied to the modelled road NO_x contribution. The verification locations have been split into two zone. Zone 1 has been applied to the locations at the western end of the AQMA (13 and 18) and Zone 2 has been applied to the locations to the eastern end of the AQMA (17, 21, 7 and ECC).

Figure D.1 Graph of Modelled vs Monitored Road NO_x Contribution from MCC Monitoring



The relevant adjustment factor of 2.3 (Zone 1) and 2.6 (Zone 2) taken from Figure D.1 was then applied to the modelled road NO_x at each verification site and the resulting value combined with the annual mean NO₂ background in Defra’s “NO_x to NO₂” calculator. This provided the total adjusted modelled annual mean NO₂ concentration for each verification site, for comparison against the monitored total annual mean NO₂ concentration. This data is presented in Table D.2.

Table D.2 Post Adjustment Data

Site ID	Ratio of monitored road Contribution NOx/modelled road contribution NOx	Adjustment Factor Applied	Adjusted Modelled Road NO _x Contribution (µg/m ³)	Adjusted Modelled Total NO ₂ (output from NO _x to NO ₂ calcs) (µg/m ³)	Monitored Total NO ₂ (µg/m ³)	% Difference (between Modelled and Monitored totals)
13	2.1	2.3	47.7	32.64	30.6	7
18	3.1		25.4	22.15	26.3	-16
17	2.1	2.6	61.2	38.5	33.0	17
21	3.1		68.5	41.54	47.0	-12
7	2.2		61.0	38.4	34.7	11
ECC	2.9		57.2	36.79	39.9	-8

The modelled results are now within 25% of the monitored concentrations and as such a correction factor of 2.3 or 2.6 has been applied to modelled road contribution of NO_x and PM₁₀ in this assessment, dependent on location.

In Air Quality modelling, it is not always possible to remove all error from a model. The model input data comes from a range of sources, such as the traffic data and meteorological data, and compares the model outputs against additional data sources, such as the Local Authority monitoring used in model verification. All of these sources have their own errors associated with them (for example, the traffic data has been taken from a model with its own assumptions and errors). The model has been set up and corrected during the process to make it as representative as possible at this site, but it is impossible to get an exact representation of the reality, as a result of the number of variables involved. The use of an adjustment factor then accounts for the rest of the error that could not be removed. The use of an adjustment factor is a standard practice for dispersion modelling. The adjustment factor obtained in this assessment is in line with the similar assessments undertaken in the urban environment.

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