# Air Quality Assessment

Land at Penlanlas Farm

March 2019

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## Land at Penlanlas Farm, Abergavenny

## March 2019

## Boyer Planning

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# Contents

# 1. Introduction

1.1 Phlorum Ltd has been commissioned by Boyer Planning to undertake an air quality assessment (AQA) for the proposed class C3 residential development on land at Penlanlas Farm, Abergavenny, NP7 7HN. The National Grid Reference for the centre of the site is 3302863, 215938. A site location plan is included in Figure 1.

1.2 The application site is located in Abergavenny, Monmouthshire County, Wales. At this location, the surrounding area has a range of land uses. The site is located on the eastern boundary of the Brecon Beacons National Park, which is predominantly rural. The proposal is to develop ca. 146 residential dwellings on land at Penlanlas Farm, north of Abergavenny.

1.3 Within Abergavenny, there are a number of businesses, residential properties and educational institutions. The primary land uses in the vicinity of the application site are residential and agricultural. However, it should be noted that within 350m of the site there are 3 Schools (Llantilo Pertholey, Ysgol Gymraeg Y Fenni and Deri View Primary School) - see Figure 2.

1.4 The main pollution sources in the vicinity of the application site originate from road traffic travelling along the local network, primarily Old Hereford Road and Llwynu Lane.

1.5 Monmouthshire County Council (MCC) has declared two Air Quality Management Areas (AQMAs) due to exceedances of the UK Air Quality Standard (AQS) for annual mean nitrogen dioxide ($NO_2$). The AQMAs are Bridge Street in Usk, and Hardwick Hill (A48), Chepstow. These AQMAs are approximately 17km and 32km from the application site, respectively. Based on separation distance, impacts from the proposed development on these AQMAs are considered highly unlikely.

1.6 However, there are local air quality concerns within Abergavenny, and the purpose of this assessment is to assess both the suitability of the site for its proposed residential use, and the impact of emissions from anticipated scheme generated and committed development traffic, in air quality terms.

# 2. Policy

## The UK Air Quality Strategy (UKAQS)

2.1 The UKAQS[1] sets a number of "standard" (AQS) concentrations for a number of key pollutants that are to be achieved at sensitive receptor locations across the UK by various "objective" dates. The sensitive locations at which the standards and objectives apply are places where the population is expected to be exposed to the various pollutants over the particular averaging period. Thus for those objectives to which an annual mean standard applies, the most common sensitive receptor locations used to measure concentrations against the set standards are areas of residential housing, since it is reasonable to expect that people living in their homes could be exposed to pollutants over such a period of time. Schools and children's playgrounds are also often used as sensitive locations for comparison with annual mean objectives due to the increased sensitivity of young people to the effects of pollution (regardless of whether or not their exposure to the pollution could be over an annual period). For shorter averaging periods of between 15 minutes, 1 hour or 1 day, the sensitive receptor location can be anywhere where the public could be exposed to the pollutant over these shorter periods of time. A summary of the AQS relevant to this assessment are included in Table 2.1, below.

**Table 2.1 UK Air Quality Standards**

| Pollutant | Averaging Period | Air quality standard (AQS) (μg.m$^{-3}$) | Air quality objective | Objective: to achieve the standard by |
|---|---|---|---|---|
| Nitrogen dioxide ($NO_2$) | 1 hour | 200 | 200 μg.m$^{-3}$ not to be exceeded more than 18 times a year | 31 December 2005 |
| | Annual | 40 | 40 μg.m$^{-3}$ | 31 December 2005 |
| Particulate Matter ($PM_{10}$) | 24 hour | 50 | 50 μg.m$^{-3}$ not to be exceeded more than 35 times a year | 31 December 2004 |
| | Annual | 40 | 40 μg.m$^{-3}$ | 31 December 2004 |
| Particulate Matter ($PM_{2.5}$)* | Annual | 25 | 25 μg.m$^{-3}$ | 2020 |

Note: $PM_{2.5}$ has a target value in the UK (except Scotland) as opposed to a limit value

1 Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2) July 2007.

2.2 The objectives adopted in Wales are based on the Air Quality Regulations 2000 as amended by the Air Quality (Wales) (Amendment) Regulations 2002[2] for the purpose of Local Air Quality Management. These Air Quality Regulations have been adopted into Welsh law from the limit values required by European Union Daughter Directives on air quality.

2.3 Obligations under the Environment Act 1995 require local authorities to declare an AQMA at sensitive receptor locations where an objective concentration has been predicted to be exceeded. In setting an AQMA, the local authority must then formulate an Air Quality Action Plan (AQAP) to seek to reduce pollution concentrations to values below the objective levels.

## Welsh Government Air Quality Plan

2.4 The Welsh Government "Interim Supplemental Air Quality Plan (July 2018)"[3] (WGSP) builds on Section 7.6 (Additional Actions in Wales) of the 2017 UK plan for tackling roadside nitrogen dioxide concentrations.

2.5 It sets out how the Welsh Government will comply within the shortest possible time with the limit values for nitrogen dioxide ($NO_2$). These values are set by the EU Ambient Air Quality Directive (2008/50/EC) and the Air Quality Standards (Wales) Regulations 2010.

2.6 The WGSP sets out the approach for the Welsh Government and local authorities to review, assess and implement actions to reduce harmful levels of air pollution.

## Wales Planning Policy

2.7 Land-use planning policy in Wales is established within Planning Policy Wales (PPW)[4]. The document provides the policy framework for the effective preparation of local planning authorities' development plans in Wales. PPW recognises that to prevent unacceptable risks from air pollution, planning decisions should ensure that new developments are appropriate for their locations.

2.8 Planning Policy Wales (PPW) is organised into policy themes around well-being goals, with policies to reflect the strategies of the Welsh Government. It states that the effects of pollution on health, the sensitivity of the area and the development should be taken into account when determining planning applications.

2 The Air Quality (Wales) (Amendment) Regulations 2002 – Welsh Statutory Instrument 2002 No.3182.
3 https://gov.wales/docs/desh/policy/180731-interim-supplemental-air-quality-plan.pdf accessed 27/11/18
4 Planning Policy Wales (2018). https://beta.gov.wales/sites/default/files/publications/2018-12/planning-policy-wales-edition-10.pdf

2.9 The topic of Air Quality is covered by 'The Distinctive and Natural Places' theme of the PPW document, and states that development should prevent air quality problems from 'occurring' or 'worsening'. Furthermore, PPW states that the effects of pollution on health, the sensitivity of the area and the development should be taken into account when considering planning applications.

2.10 Specifically, section 6.7: *Air Quality and Soundscape*, states:

> *"The planning system should maximize its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should consider the long-term effects of current and predicted levels of air pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimize population exposure to air pollution where it is practical and feasible to do so.*
>
> *In taking forward these broad objectives the key planning policy principle is to consider the effects which proposed developments may have on air quality and the effects which existing air quality may have on proposed developments.*
>
> *In proposing new development, planning authorities and developers must, therefore: address any implication arising as a result of its association with, or location within, air quality management areas or areas where there are sensitive receptors."*

2.11 Furthermore, PPW also states:

> *"When proposing to introduce a development activity into an area the impacts which existing pollution sources (including roads, railways and industrial or commercial operations) have in terms of air pollution should be carefully considered, particularly taking into account any increases in pollution levels which may be reasonably expected in the foreseeable future as a result of increased transport activity.*
>
> *Proposed development should be designed wherever possible to prevent adverse effects to amenity, health and the environment but as a minimum to limit or constrain any effects that do occur.*
>
> *In circumstances where impacts are unacceptable, for example where adequate mitigation is unlikely to be sufficient to safeguard local amenity in terms of air quality, it will be appropriate to refuse permission.*

*It will not be appropriate to locate sensitive uses, such as housing, adjacent to busy roads or other transport routes, where there are no connectivity benefits to be gained and where health and amenity impacts associated with increased exposure of people to pollution will be unacceptable.*

*Whilst some uses may be appropriate with the aid of good design, air quality considerations can be overriding factors, especially for sensitive uses, if they cannot be adequately mitigated and impacts minimized."*

2.12 Finally, with reference to the construction phase of development, PPW states:

*"Planning authorities must consider the potential for temporary environmental risks, including airborne pollution… arising during the construction phases of development. Where appropriate, planning authorities should require a construction management plan, covering pollution prevention, noisy plant, hours of operation, dust mitigation and details for keeping residents informed about temporary risks."*

2.13 PPW offers a broad framework, but does not include a detailed methodology for air quality assessments. Natural Resources Wales (NRW) is the principal environmental advisor to the Welsh Government and supports its duty to enact air quality regulations. NRW provides the Welsh Government with advice, guidance and evidence[5] in order to achieve this.

2.14 Specific guidance for air quality continues to be provided by organisations such as the Department for Environment, Food and Rural Affairs (Defra), Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM).

## Local Planning Policy

2.15 The Monmouthshire County Council Local Development Plan (LDP) 2011-2021[6] was adopted on 27 February 2014, replacing the Monmouthshire Unitary Development Plan (UDP), to become the adopted development plan for the county.

2.16 The LDP has a fundamental role in delivering sustainable development. In seeking to achieve this it sets out a framework for the development and use of land and for the protection of the environment. Specifically, it seeks to ensure that the location of new development does not worsen conditions in existing Air Quality Management Areas, or result in the designation of new ones.

5 Natural Resources Wales. http://naturalresourceswales.gov.uk/guidance-and-advice/environmental-topics/air-quality/?lang=en
6 The Monmouthshire County Council Local Development Plan (LDP) 2011-2021. https://www.monmouthshire.gov.uk/app/uploads/2017/05/Adopted-Local-Development-Plan-with-PDF-tags.pdf

2.17 Within the LDP, Air Quality is covered by Policy EP1: Amenity and Environmental Protection, which seeks to prevent development proposals which could result in 'unacceptable risk or harm due to air pollution'. Specifically, policy EP1 states:

*"Development proposals that would cause or result in an unacceptable risk /harm to local amenity, health, the character /quality of the countryside or interests of nature conservation, landscape or built heritage importance due to the following will not be permitted, unless it can be demonstrated that measures can be taken to overcome any significant risk:*

- *Air pollution;*
- *Light pollution;*
- *Noise pollution;*
- *Water pollution;*
- *Contamination;*
- *Land instability;*
- *Or any identified risk to public health or safety."*

2.18 Where it is considered that a development proposal may impact upon an AQMA, or exacerbate an existing problem, developers will be required to provide an assessment of air quality impact, together with proposals for mitigation.

# 3. Assessment Methodology

## Guidance

3.1 Defra LAQM Technical Guidance TG(16)[7] was followed in carrying out this assessment. Guidance published by the IAQM[8] on the *'Assessment of Dust from Demolition and Construction'* was also used when assessing the construction phase of the proposed development. The Greater London Authority (GLA) Supplementary Planning Guidance[9] on the control of dust from construction has also been referred to, which, although primarily intended for use in London, is considered best practice guidance for the UK as a whole. It details a number of mitigation measures that should be adopted to minimise impacts of dusts and fine particles.

3.2 In addition, the latest Environmental Protection UK (EPUK) & IAQM guidance on *'Planning for Air Quality'*[10] has been referred to for the operational phase assessment. The criteria used to determine the significance of impact were derived from this guidance, and have been included in Appendix A.

## Consultation

3.3 Details of the development and proposed scope of assessment were sent to Paul White, the Environmental Health Officer (EHO) for Monmouthshire County Council on 4th March 2019 with a request for comment / guidance.

3.4 Mr White replied with comments which had previously been discussed with the planning authority, as follows:

> *"I would recommend that the cumulative impacts (for both air quality and traffic) from this development, the 250 Deri Farm development (DC/2014/01360), and any other large developments (air quality) within Abergavenny and Llanfoist are considered, including their impacts on local roads, the A40 and A4143 (Merthyr Road), which is close to the air quality objective level for nitrogen dioxide. The properties at the junction of Pen-y-Pound and Park Road (A40) should also be considered in particular.*
>
> *In addition there are a further two current planning or pre-applications in the immediate area - 50 houses adjacent to this site (DM/2018/01498 - Land North of*

7 Defra. 2016. Part IV of the Environment Act 1995, Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management, Technical Guidance LAQM. TG(16). London: Defra.
8 IAQM. (2014). Guidance on the assessment of dust from demolition and construction.
9 Greater London Authority. (2014). The Control of Dust and Emissions During Construction and Demolition.
10 EPUK & IAQM. (2017). Land-Use Planning & Development Control: Planning For Air Quality.

*Hillgrove) and 39 houses nearby (DM/2018/01858 - Land North Of St Teilo's Church) that should be taken into consideration for air quality impacts.*

*Both construction phase and operational phase should be considered in the Air Quality Impact Assessment.*

*The development should be encouraged or required to adopt good design principals that reduce emissions and contribute to better air quality management. For example:-*

*• Do not create a new "street canyon", or a building configuration that inhibits effective pollution dispersion;*

*• Deliver a sustainable development;*

*• Be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads, or directing combustion generated pollutants through well sited vents or chimney stacks;*

*• Provide at least 1 Electric Vehicle (EV) "rapid charge" point per 10 residential dwellings. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made.*

*• Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety.*

*• All gas-fired boilers to meet a minimum standard of <40mgNOx/kWh.*

*• All gas-fired CHP plant to meet a minimum emissions standard of:*

- *Spark ignition engine: 250 mgNOx/Nm3;*
- *Compression ignition engine**23** : 400 mgNOx/Nm3;*
- *Gas turbine: 50 mgNOx/Nm3.*

*• A presumption should be to use natural gas-fired installations. Where biomass is proposed within an urban area it is to meet minimum emissions standards of:*

- *Solid biomass boiler: 275 mgNOx/Nm3 and 25 mgPM/Nm3.*

*In addition to these good practice principles, the planning Authority may wish to incorporate additional proportional measures to offset emissions at an early stage. Such offsetting can be based on a quantification of the emissions associated with the development. These emissions can be assigned a value, based on the "damage cost approach" used by Defra, and then applied as an indicator of the level of offsetting required, or as a financial obligation on the developer."*

## Baseline

3.5 The baseline air quality conditions in the vicinity of the application site are established through the compilation and review of appropriately sourced background concentration estimates and local monitoring data.

3.6 Defra provides estimated background concentrations of the UKAQS pollutants at the UK Air Information Resource (UK-AIR) website[11]. These estimates are produced using detailed modelling tools and are presented as concentrations at central 1km$^2$ National Grid square locations across the UK. At the time of writing, the most recent background maps were from November 2017 and based on monitoring data from 2015.

3.7 Being background concentrations, the UK-AIR data are intended to represent a homogenous mixture of all emissions sources within the general area of a particular grid square location. Concentrations of pollutants at various sensitive receptor locations can, therefore, be calculated by modelling the emissions from a nearby pollution source, such as a busy road, and then adding this to the appropriate UK-AIR background datum.

3.8 MCC automatic and non-automatic monitoring data are also considered an appropriate source for establishing baseline air quality, and the most recent available data from MCC's 2018 Air Quality Progress Report (APR)[12] have been included and assessed.

## Construction Phase

3.9 The construction phase of the proposed development will involve a number of activities that could potentially produce polluting emissions to air. Predominantly, these will be emissions of dust. However, they could also include releases of odours and/or more harmful gases and particles.

11 Defra: UK-AIR. www.uk-air.defra.gov.uk
12 Monmouthshire County Council, 2018 Air Quality Progress Report: https://www.monmouthshire.gov.uk/app/uploads/2018/12/MCC-Annual-Progress-Report-2018.pdf

3.10 The IAQM's guidance to assess the impacts of construction on human and ecological receptors has been followed in carrying out this air quality assessment. The guidance suggests that where a receptor is located within 350m of a site boundary and/or 50m of a route used by construction vehicles, up to 500m from the site entrance, a dust assessment should be undertaken. High sensitivity receptors are considered particularly sensitive when located within 20m of a works area. Figure 2 shows receptors that could be sensitive to dust that are located within 350m of the boundaries of the site.

3.11 Attempt was made to review Natural Resources Wales Review of the Multi Agency Geographic Information for the Countryside (MAGIC) website[13], which incorporates Natural Resources Wales interactive maps, identified no statutory ecological sensitive receptor within 50m of the application site.

3.12 The IAQM guidance suggests that Demolition, Earthworks, Construction and Trackout should all be assessed individually to determine the overall significance of the construction phase.

**Construction Significance**

3.13 In the IAQM dust guidance, the first step in assessing the risk of impacts is to define the potential dust emission magnitude. This can be considered 'Negligible', 'Small', 'Medium' or 'Large' for each of the construction stages.

3.14 While the IAQM provides examples of criteria that may be used to assess these magnitudes, the vast number of potential variables mean that every site is different and therefore professional judgement must be applied by what the IAQM refer to as a "technically competent assessor". The construction phase assessment therefore relies on the experience of the appraiser.

3.15 As such, attempts to define precisely what constitutes a negligible, small, medium or large dust emission magnitude should be treated with caution. Factors such as the scale of the work, both in terms of size and time, the construction materials and the plant to be used must be considered.

3.16 The second step is to define the sensitivity of the area around the construction site. IAQM guidance states:

*"the sensitivity of the area takes into account a number of factors:*

- *the specific sensitivities of receptors in the area;*
- *the proximity and number of those receptors;*
- *in the case of $PM_{10}$, the local background concentrations; and*

13 Natural Resources Wales and MAGIC partnership organisations. Multi Agency Geographic Information for the Countryside. http://www.magic.gov.uk (accessed February 2019).

- *site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust."*

3.17 Based on these factors, the area can be categorised as being of 'Low', 'Medium' or 'High' sensitivity.

3.18 When dust emission magnitudes for each stage and the sensitivity of the area have been defined, the risk of dust impacts can be determined. The IAQM provides a risk of impacts matrix for each construction stage. The overall significance for the construction phase can then be judged from the stages assessed. Again, this is subject to professional judgement.

3.19 Combustion exhaust gases from diesel-powered plant and construction vehicles accessing the application site will also be released. However, the volumes and periods over which these releases will occur are unlikely to result in any significant peaks in local air pollution concentrations and therefore this has been scoped out of the assessment.

## Operational Phase

### Vehicle Emissions

3.20 Vehicle emissions will arise from the combustion of fossil fuels in vehicle engines and their subsequent release to atmosphere via tailpipe exhausts. The most significant pollutants released by cars and other vehicles are oxides of nitrogen ($NO_2$/$NO_x$) and particulate matter ($PM_{10}$ and $PM_{2.5}$). Releases of carbon monoxide (CO) and some volatile hydrocarbons (e.g. benzene and 1,3-butadiene) are of less significance and are not assessed further in this report.

### ADMS-Roads Assessment

3.21 In order to determine the potential exposure of existing receptors in 2021; the anticipated opening year, and 2031; after the development is fully occupied, emissions from local roads have been assessed using a detailed air dispersion model.

3.22 The model used was ADMS-Roads (version 4.1), which is produced by CERC[14] and has been validated and approved by Defra for use as an assessment tool for calculating the dispersion of pollutants from traffic on UK roads. Model inputs are included in Appendix B.

3.23 Detailed, hourly sequential, meteorological data are used by the model to determine pollutant transportation and levels of dilution by the wind and vertical air movements.

14 Cambridge Environmental Research Consultants.

3.24 Meteorological data used in the model were obtained from Hereford / Credenhill as it was considered to provide the most representative data of similar conditions to the application site. The meteorological data used for this assessment were from 2017, for which monitoring data were also available. It should be noted that the meteorological data had 10% missing cloud from Pershore.

3.25 The surface roughness applied to the model for the meteorological station was 0.5, and 1.0m for the application site.

3.26 Modelled receptor locations are indicated on Figures 3, 4 and 5. Discrete model receptors were positioned at the façades of proposed and existing sensitive receptors closest to the main pollution sources in the vicinity of the application site, and at an "at risk" junction between Pen Y Pound and Park Road A40 as requested during consultation with the local authority. These are considered worst-case locations, as pollutant concentrations would be expected to reduce further inside the properties with increased distance from the roads.

3.27 Details of the existing and proposed receptors are included in Table 3.1, below. All existing receptors were modelled at "breathing height", which is by convention 1.5m above ground level plus the relevant floor height.

3.28 To assist interpretation, receptors R1 – R11 are those in the vicinity of the application site (Figure 3), and receptors R12 – R15 are those at the "at risk" junction of Pen Y Pound and Park Road A40 (Figure 4). Proposed new receptors P1 – P3 were positioned according to the latest available masterplan for the proposed development (Figure 5).

**Table 3.1: Modelled Receptor locations.**

| Receptor | Modelled Height (m) | UK Grid Reference | |
|---|---|---|---|
| | | X | Y |
| R1 | 1.5 | 330119 | 215701 |
| R2 | 1.5 | 330105 | 215623 |
| R3 | 1.5 | 330208 | 215716 |
| R4 | 1.5 | 330265 | 215617 |
| R5 | 1.5 | 330199 | 215593 |
| R6 | 1.5 | 330427 | 215583 |

| | | | |
|---|---|---|---|
| R7 | 1.5 | 330510 | 215314 |
| R8 | 1.5 | 330574 | 215217 |
| R9 | 1.5 | 330499 | 215267 |
| R10 | 1.5 | 330618 | 215144 |
| R11 | 1.5 | 329999 | 215263 |
| R12 | 1.5 | 329731 | 214553 |
| R13 | 1.5 | 329709 | 214619 |
| R14 | 1.5 | 329761 | 214521 |
| R15 | 1.5 | 329574 | 214521 |
| P1 | 1.5 | 330196 | 215841 |
| P2 | 1.5 | 330226 | 215928 |
| P3 | 1.5 | 330295 | 215995 |

Note: Grid references are indicative as the model layout is based on Ordnance Survey based mapping which does not accurately portray the width or position of roads.

3.29 Traffic data used for model verification was sourced from 2017 Department for Transport (DfT) flows[15]. The surveyed baseline traffic data (2018), and future predicted traffic flows projected forward to 2021 and 2031, inclusive of predicted traffic generated by the proposed development and other committed developments in the area (detailed below), were provided by Lime Transport, the transport consultants for the project. All modelled road links are shown in Figure 3, with model inputs included in Appendix B.

3.30 The following traffic scenarios were modelled:

- 2017 Model Verification;
- Scenario 1: 2018 Baseline;
- Scenario 2: 2021 With Committed Development (Future Baseline);

15 https://www.dft.gov.uk/traffic-counts/cp.php?la=Monmouthshire

- Scenario 3: 2021 With Development and Committed (Cumulative);
- Scenario 4: 2031 With Committted Development (Future Baseline);
- Scenario 4: 2031 With Development and Committed (Cumulative);

3.31 It should be noted that, as requested during consultation with the local authority, Scenarios 2-5 include predicted traffic flows from the 250 Deri Farm development (DC/2014/01360), Land North of Hillgrove (DM/2018/01498) and Land North of St Teilo's Church (DM/2018/01858), as provided by Lime Transport.

3.32 It is understood that, due to difficulty obtaining data, the distribution and trip rate for the proposed development at Penlanlas Farm (146 dwellings) was applied to both the Land North of St Teilo's Church and Land North of Hillgrove developments (39 and 50 dwellings, respectively). This was done to ensure a worst-case assessment.

**Model Verification**

3.33 It is recommended, following guidance set out in LAQM.TG(16), that the model results be compared with measured data to determine whether they need adjusting to more accurately reflect local air quality. This process is known as verification and reduces the uncertainty associated with local effects on pollution dispersion and allows the model results to be more site-specific.

3.34 A verification study has been undertaken using local authority monitoring data from 2017. Full details of this study are included in Appendix C. The model was found to be under-predicting concentrations, which is not unusual, and therefore an adjustment factor of **2.13** was applied to the model results.

**Model Uncertainty**

3.35 There are a number of inherent uncertainties associated with the modelling process, including:

- Model uncertainty – due to model formulations;
- Data uncertainty – due to errors in input data, including emissions estimates, background estimates and meteorology; and
- Variability – randomness of measurements used.

3.36 Using a validated air quality model such as ADMS Roads, as well as undertaking the model verification takes into account modelling uncertainty. In addition, the most detailed available input data is used and is reviewed to ensure the accuracy of these data.

3.37 Defra's Emissions Factors Toolkit (EFT (v8.0))[16] for road transport provides forecasts of $NO_x$ and $PM_{10}$ emissions up to 2030. This is widely used as input to dispersion models such as ADMS-Roads to estimate future pollutant concentrations close to new developments.

3.38 Although the latest version of Defra's EFT (v8.0) provides a far more reasonable match for real world emissions in the current UK fleet than previous versions, there remains uncertainty regarding future emissions from the vehicle fleet, especially for NOx[17].

3.39 To adequately account for this uncertainty when predicting future $NO_2$ concentrations, the IAQM recommend applying a sensitivity testing approach which assumes $NO_x$ emissions will not reduce as rapidly as shown by the EFT.

3.40 To account for this uncertainty, 2025 emissions factors have been applied to the 2031 modelled scenarios in this assessment.

**Damage Cost Calculation**

3.41 The standard approach for undertaking air quality assessments has been to predict the change in pollutant concentrations through the use of a screening or detailed dispersion models. Where the potential for a significant impact is identified, mitigation measures would be recommended to ensure that the significance of effect can be kept to an acceptable level.

3.42 However, this type of assessment does little to consider the overall emissions from a development and its contribution to broader background concentrations, which can gradually increase due to incremental changes from successive developments.

3.43 Therefore, as suggested during consultation with MCC, the 'damage cost' approach has been included in this assessment. It is stated here that the results of this calculation are intended to be indicative of the level of offsetting which could be requested from the planning authority.

3.44 Defra's guidance on the application of damage costs[18], which are defined per tonne of emission by pollutant, was updated in January 2019. The updated costs follow advice from the Committee on the Medical Effects of Air Pollutants (COMEAP).

16 Defra Emissions Factor Toolkit: (v8.0) https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html
17 IAQM: Dealing with Uncertainty in Vehicle NOx emissions within Air Quality Assessments (2018 V1.1). https://iaqm.co.uk/text/position_statements/uncertainty_vehicle_NOx_emissions.pdf
18 Air Quality Damage Cost Guidance, 2019. Report for Defra. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770576/air-quality-damage-cost-guidance.pdf

3.45 The calculation requires the latest Defra Emissions Factor Toolkit (EFT) and 'damage cost values' for specific pollutants over a period of 5 years, which are a simple way to value changes in air pollution. The calculation used in this assessment followed the below formula:

*EFT output x Damage costs x 5 years = 5 year exposure cost value (in £)*

# 4. Baseline

4.1 This chapter is intended to establish prevailing air quality conditions in the vicinity of the application site.

## UK-AIR Background Pollution

4.2 The UK-AIR predicted background pollution concentrations for $NO_2$ and $PM_{10}$ for 2016 to 2021 are presented in Table 4.1. These data were taken from the central grid square location closest to the application site (i.e. grid reference: 330500, 215500).

**Table 4.1: 2016 to 2021 background concentrations of pollutants at the application site.**

| Pollutant | Predicted background concentration (µg.m$^{-3}$) | | | | | | Averaging Period | Air quality standard concentration (µg.m$^{-3}$) |
|---|---|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | | |
| $NO_2$ | 7.3 | 7.1 | 6.9 | 6.7 | 6.4 | 6.1 | annual mean | 40 |
| $PM_{10}$ | 11.9 | 11.8 | 11.7 | 11.7 | 11.6 | 11.5 | annual mean | 40 |

4.3 The data in Table 4.1 show that annual mean background concentrations of $NO_2$ and $PM_{10}$ in the vicinity of the application site between 2016 and 2021 were predicted to be well below their respective AQS. The data show that in 2018, $NO_2$, and $PM_{10}$ concentrations were predicted to be below their AQS by 83% and 71% respectively.

4.4 Concentrations of all pollutants were predicted to decline each year, which is principally due to the forecast effect of cleaner vehicles being rolled out, but also due to UK national and international plans to reduce emissions across all sectors. It is noted that such improvements have not yet been universally realised.

4.5 The annual mean concentration of $PM_{10}$ is well below the AQS, according to the UK-AIR background maps. This provides a good indication that $PM_{10}$ concentrations for both annual mean and daily mean concentrations are likely to be below the respective AQSs at the application site and adjacent uses.

## Local Sources of Monitoring Data

4.6 Local monitoring is considered an appropriate source of data for the purposes of describing baseline air quality.

### Automatic Monitoring

4.7 MCC undertakes automatic (continuous) monitoring at one site across Monmouthshire County. The most recent data available from this air quality monitoring station (AQMS), which is approximately 31.5km from the proposed development, are included in Table 4.2, below.

**Table 4.2: $NO_2$ data from MCC Automatic Monitor.**

| Monitor | Type | Distance from the application site (km) | $NO_2$ annual mean concentration ($\mu g.m^{-3}$) | | |
|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 |
| AQMS | R | 31.5 | 37 | 35 | 35 |

Note: "R" = roadside.

4.8 The data in Table 4.2 show that annual mean concentrations of $NO_2$, in recent years, have been consistently well below the $40\mu g.m^{-3}$ AQS at the automatic roadside monitor in Monmouthshire.

4.9 The most recent results (2017) from the automatic monitor (AQMS) were below the long-term $40\mu g.m^{-3}$ AQS by 12.5%. However, results from this monitor are 79.7% above UK-AIR predictions for $NO_2$ background concentrations at the application site.

4.10 Being a roadside monitor which is approximately 31.5km away from the application site, $NO_2$ concentrations are not considered to be representative of background conditions at the application site.

### Non-Automatic Monitoring

4.11 MCC operates an extensive non-automatic, $NO_2$ diffusion tube monitoring network across the county. The most recent available monitoring data for diffusion tubes located within Abergavenny are included in Table 4.3, below.

4.12 It should be noted that, outside of Abergavenny, the closest diffusion tubes are located within the town of Usk, approximately 16km from the application site. As such, based on distance, concentrations would not be representative of those in the vicinity of the application site, and have been excluded from this assessment accordingly.

**Table 4.3: Monitoring data from MCC NO2 diffusion tubes**

| Monitor | Type | Distance from the application site (km) | $NO_2$ annual mean concentration (µg.m$^{-3}$) | | |
|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 |
| AB6 | R | 1.5 | 22.4 | 22.4 | 22.3 |
| AB3 | R | 1.9 | 26.1 | 26.8 | 25.4 |
| AB5 | R | 2.0 | 17.2 | 19.4 | 18.6 |
| AB1 | K | 2.2 | 36.1 | 38.4 | **40.1** |
| AB2 | R | 2.2 | 34.4 | 35.0 | 32.7 |
| AB4 | R | 2.3 | 26.5 | 26.4 | 25.5 |

Note: "R" = roadside, "K" = Kerbside. **Bold** denotes exceedance of the AQS.

4.13 The data in Table 4.3 show that annual mean concentrations of $NO_2$, between 2015 and 2017, are consistently below the 40µg.m$^{-3}$ AQS at the majority of sites in Abergavenny. In 2017, of the 6 monitoring stations included in Abergavenny, 1 exceeded the 40µg.m$^{-3}$AQS.

4.14 The highest annual mean concentration of $NO_2$ was recorded at AB1 in 2017, which exceeded the AQS by 0.3%. AB1 is located 0.85 metres from the kerb of Merthyr Road, Abergavenny. Despite recording an exceedance, the latest MCC's APR notes that, when corrected for distance with Defra's '$NO_2$ Fall-Off with Distance' calculator, the concentration at the nearest sensitive receptor was 38.0µg.m$^{-3}$, which is 5% below the AQS.

4.15 With regard to the hourly AQS for $NO_2$ presented in table 2.1 (i.e. 200µg.m$^{-3}$ not to be exceeded more than 18 times a year), LAQM.TG(16) states that if the annual mean is below 60µg.m$^{-3}$ then this AQS should be met. As such, the concentrations at all monitoring locations in Abergavenny indicate that exceedances of the hourly AQS are highly unlikely.

4.16 However, roadside diffusion tubes are not considered representative of background air quality conditions. As such, while providing context of air quality conditions across Abergavenny, the concentrations presented in Table 4.3 are not taken forward as background conditions in this assessment.

## Summary of Data used in Assessment

4.17 It was decided that 2017 UK-AIR predicted $NO_2$ concentrations from the closest grid-square to the application site would be used in this assessment.

4.18 To ensure conservative predictions of pollutant concentrations, no reduction has been applied to the annual mean background $NO_2$ and $PM_{10}$ concentrations used in this assessment for future modelled years.

4.19 The background concentrations used in the assessment are included in Table 4.4, below.

**Table 4.4: Background annual mean concentrations used in this assessment**

| Pollutant | Concentration ($\mu g.m^{-3}$) | Data Source |
|---|---|---|
| $NO_2$ | 7.1 | UK-AIR (2017) |
| $PM_{10}$ | 11.8 | UK-AIR (2017) |

# 5. Construction Phase Impacts

5.1 The construction phase of the proposed development will involve a number of activities that could produce polluting emissions to air. Predominantly, these will be emissions of dust.

5.2 The estimates for the dust emission magnitude for demolition, earthworks, construction and trackout below are, where appropriate, based on the construction information provided by the client and professional experience of Phlorum staff.

## Dust Emission Magnitude

**Demolition**

5.3 The application site is currently undeveloped, therefore no demolition is anticipated with relation to the proposed development, and the overall dust emission magnitude for this phase is not assessed.

**Earthworks**

5.4 The total site has an area of approximately 58,900m$^2$. This is considered 'Large' with reference to the IAQM guidance, as it is >10,000m$^2$.

5.5 It is anticipated that the amount of earth to be moved during the earthworks would be below 20,000 tonnes, with between 5-10 heavy earth moving vehicles operating on site at any one time. In addition, one 5m bund will be formed on site.

5.6 Given the total area of the site, the overall dust emission magnitude for the earthworks stage is considered to be *'Large'*.

**Construction**

5.7 During construction, it is understood that no concrete batching, sandblasting or piling will be undertaken. However, localised use of cement powder and general handling of construction materials will have the potential to generate dust. Furthermore, wind-blow from stockpiles of friable materials also has the potential to cause dust emissions.

5.8 The primary construction materials will be masonry and stonework, which have a moderate potential for dust emissions. The total volume of building works on site for the proposed development is to be in the range of 25,000 - 100,000m$^3$; which falls into the IAQM's 'Medium' dust emission category.

5.9 Based on the above, the overall dust emission magnitude for the construction stage is considered to be *'Medium'.*

**Trackout**

5.10 Construction traffic, when travelling over soiled road surfaces, has the potential to generate dust emissions and to add soil to the local road network. During dry weather, soiled roads can lead to dust being emitted due to physical and turbulent effects of vehicles.

5.11 To commence the site, unpaved road surfaces will reach a maximum length of 50m. The main entrance to the site will be on Old Hereford Road.

5.12 As well as the type of road surface, the number of daily heavy duty vehicles (HDVs) accessing the site is used to determine dust emission magnitude during construction: <10 Small; 10-50 Medium; and >50 Large. The number of HDVs accessing the site is expected to be between 10-50, falling into the '*Medium*' IAQM category.

5.13 Overall the dust emission magnitude for the trackout phase is considered to be '*Medium*'.

**Emission Magnitude Summary**

5.14 A summary of the dust emission magnitude as a result of the activities of Demolition, Earthworks, Construction and Trackout as specified in the IAQM guidance, and discussed above, are listed in Table 5.1 below. Overall, the dust emission magnitude is considered to be *'Large'.*

**Table 5.1: Dust Emission Magnitude for the construction activities, based on the IAQM's guidance.**

| Activity | Dust Emission Magnitude |
|---|---|
| Earthworks | Large |
| Construction | Medium |
| Trackout | Medium |

## Sensitivity of the Area

5.15 Having established the emission magnitude for dust above, the sensitivity of the area must be considered to establish the significance of effects. The effect of dust emissions depends on the sensitivity of each receptor. High sensitivity human receptors include residential dwellings, schools and hospitals.

5.16 The impacts of dust emissions from the sources discussed above have the potential to cause an annoyance to human receptors living in the local area. Within distances of 20m of the site boundary there is a high risk of dust impacts, regardless of the prevailing wind direction. Up to 100m from the construction site, there may still be a high risk, particularly if the receptor is downwind of the dust source.

5.17 With the exponential decline in dust with distance from dust generating activities, it is considered that for receptors more than 350m from the site boundary, the risk is negligible. Furthermore, the risks at over 100m only have the potential to be significant in certain weather conditions, e.g. downwind of the source during dry periods.

5.18 The approximate number of high sensitivity human receptors in the vicinity of the application site is detailed in Table 5.2 and shown in Figure 2.

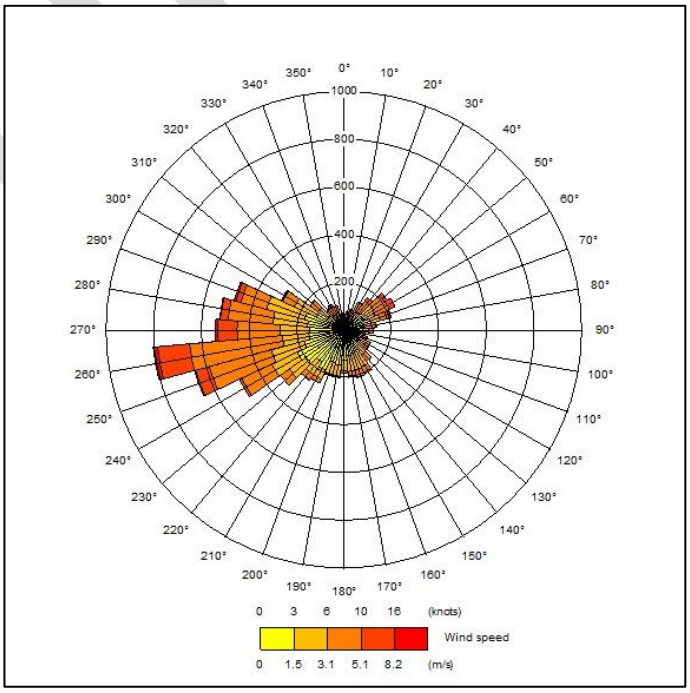
**Table 5.2: Approximate number of High Sensitivity Human Receptors close to the application site.**

| Distance to site (m) | Approximate number of receptors | Receptor Details |
|---|---|---|
| <20 | 0 | N/A |
| 20-100 | <200 | Residential Dwellings |
| 100-350 | >1000 | Llantilo Pertholey<br>Ysgol Gymraeg Y Fenni<br>Deri View Primary School |

Note: *includes pupils of Llantilo Pertholey, Ysgol Gymraeg Y Fenni and Deri View Primary School.

5.19 Plate 5.1, below, shows that the prevailing wind is from the West / South-West. As shown in Figure 2, there are a number of highly sensitive receptors, including residential dwellings and 2 schools, to the East / North-East (downwind) of the application site. As such, the sensitivity of the area to dust soiling impacts is defined as *Medium.*

**Plate 5.1: Wind Rose for Hereford / Credenhill, 2017.**



## Risk of Impacts

5.20 Having established the likely dust emission magnitudes and sensitivity of the area, the risk of impacts can be determined in accordance with IAQM guidance. These are summarised in Table 5.3.

**Table 5.3: Summary of Impact Risk by Construction Stage based on the IAQM's dust guidance.**

| Stage | Impact Risk | | |
|---|---|---|---|
| | Nuisance Dust | Ecology | $PM_{10}$ |
| Earthworks | Medium | N/A | Low Risk |
| Construction | Medium | N/A | Low Risk |
| Trackout | Low | N/A | Low Risk |

5.21 Overall, the development is considered to be *Medium Risk* for nuisance dust soiling effects, *Low Risk* for $PM_{10}$ health effects and to be *Negligible* for ecology, in the absence of mitigation.

## Site Specific Mitigation

5.22 The GLA guidance suggests a number of mitigation measures that should be adopted in order to minimise impacts from dusts and fine particles. Appropriate measures that could be included in the construction of the proposed development include:

- ideally cutting, grinding and sawing should not be conducted on-site and pre-fabricated material and modules should be brought in where possible;
- where such work must take place, water suppression should be used to reduce the amount of dust generated;
- skips, chutes and conveyors should be completely covered and, if necessary, enclosed to ensure that dust does not escape;
- no burning of any materials should be permitted on site;
- any excess material should be reused or recycled on-site in accordance with appropriate legislation;
- developers should produce a waste or recycling plan;
- following earthworks, exposed areas and soil stockpiles should be re-vegetated to stabilise surfaces, or otherwise covered with hessian or mulches;

- stockpiles should be stored in enclosed or bunded containers or silos and kept damp where necessary;
- hard surfaces should be used for haul routes where possible;
- haul routes should be swept/washed regularly;
- vehicle wheels should be washed on leaving the site;
- all vehicles carrying dusty materials should be securely covered; and
- delivery areas, stockpiles and particularly dusty items of construction plant should be kept as far away from neighbouring properties as possible.

5.23 In addition, the IAQM lists recommended mitigation measures for low, medium and high Dust Impact Risks. The highly recommended mitigation measures for *Medium Risk* sites are included in Appendix D of this report.

5.24 Where dust generation cannot be avoided in areas close to neighbouring properties, additional mitigation measures should be put in place, such as: windbreaks, sprinklers, and/or time/weather condition limits on the operation of some items of plant or the carrying out of activities that are likely to generate a particularly significant amount of dust.

## Residual Effects

5.25 After the implementation of the mitigation measures listed above and in Appendix D, the significance of each phase of the construction programme will be reduced and the residual significance of impact for the construction phase is expected to be *Negligible*.

# 6. Operational Phase Impacts

6.1 A comparison of modelled and monitored data, as laid out in LAQM TG(16), has been undertaken. Full details of this are provided in Appendix C. This ensures that the assessment provides a more conservative estimate of pollution concentrations than using unadjusted modelling results. As the model was found to be under-predicting concentrations, road contributions of both $NO_x$ and $PM_{10}$ were adjusted by a factor of **2.13**

6.2 Results from the ADMS-Roads assessment of the proposed development are presented below. Modelled road links and receptor points are displayed in Figures 3, 4 and 5.

## Existing Receptors

### 2021 Scenarios

6.3 Table 6.1 shows model predicted annual mean $NO_2$ concentrations in 2021, the anticipated opening year, at existing receptors both in the vicinity of the application site (R1 – R11), and at the "at risk" junction of Pen Y Pound and Park Road A40 (R12 – R15).

**Table 6.1: Predicted Annual Mean Concentrations of $NO_2$.**

| Receptor No | Predicted Concentration (µg.m$^{-3}$) | | | Change in Annual Mean Concentration (µg.m$^{-3}$) | Change as a % of the AQS | EPUK & IAQM Significance Criteria |
|---|---|---|---|---|---|---|
| | 2018 Baseline | 2021 Future Baseline | 2021 With (Cumulative) | | | |
| | 1 | 2 | 3 | 3-2 | | |
| R1 | 9.0 | 8.7 | 9.1 | 0.4 | 0.9 | Negligible |
| R2 | 10.2 | 9.2 | 9.7 | 0.4 | 1.1 | Negligible |
| R3 | 9.7 | 9.2 | 9.3 | 0.1 | 0.2 | Negligible |
| R4 | 9.6 | 9.1 | 9.3 | 0.1 | 0.3 | Negligible |
| R5 | 8.4 | 8.1 | 8.2 | 0.1 | 0.3 | Negligible |
| R6 | 8.1 | 7.9 | 8.0 | 0.0 | 0.1 | Negligible |
| R7 | 9.6 | 9.2 | 9.4 | 0.2 | 0.4 | Negligible |

| Receptor No | Predicted Concentration (µg.m$^{-3}$) | | | Change in Annual Mean Concentration (µg.m$^{-3}$) | Change as a % of the AQS | EPUK & IAQM Significance Criteria |
|---|---|---|---|---|---|---|
| | 2018 Baseline | 2021 Future Baseline | 2021 With (Cumulative) | | | |
| | 1 | 2 | 3 | 3-2 | | |
| R8 | 10.2 | 9.7 | 9.9 | 0.2 | 0.5 | Negligible |
| R9 | 10.0 | 9.5 | 9.7 | 0.2 | 0.5 | Negligible |
| R10 | 11.6 | 11.3 | 11.5 | 0.1 | 0.4 | Negligible |
| R11 | 7.9 | 7.8 | 7.8 | 0.1 | 0.1 | Negligible |
| R12 | 21.6 | 19.1 | 19.4 | 0.3 | 0.8 | Negligible |
| R13 | 12.8 | 11.7 | 11.9 | 0.1 | 0.3 | Negligible |
| R14 | 18.4 | 16.7 | 16.7 | 0.1 | 0.2 | Negligible |
| R15 | 21.4 | 19.2 | 19.4 | 0.2 | 0.6 | Negligible |

6.4 The data in Table 6.1 show that annual mean concentrations of $NO_2$ are predicted to be well below the 40µg.m$^{-3}$ AQS at all existing receptors in 2021, in both Scenario 2 and Scenario 3.

6.5 When comparing Scenario 2 and Scenario 1, the model is predicting a decline in annual mean concentrations of $NO_2$ at all receptors. This is due to EFT in the model accounting for anticipated future reductions in emissions from the vehicle fleet.

6.6 In 2021, a maximum annual mean $NO_2$ concentration of 19.4µg.m$^{-3}$ is predicted at R12 and R15 in Scenario 3, which includes the cumulative impact of both the proposed development and committed developments. This is well below the AQS by 51.5%, and accounts for a maximum 0.8% change as a percentage of the AQS, which is *Negligible* with reference to the EPUK & IAQM impact descriptors. R12 was positioned on the façade of a residential dwelling at the "at risk" junction with Pen Y Pound and Park Road A40, and R15 was positioned on the façade of a residential dwelling, west of the "at risk" junction at the mouth of Merthyr Road.

6.7 The largest increase in annual mean $NO_2$ concentrations, as a result of the proposed development, is 0.4µg.m$^{-3}$; which was predicted at R1 and R2. With respect to the AQS, this equates to a maximum increase of 1.1%, which is *Negligible*. R1 and R2 were position on the Old Hereford Road façade of Deri View Primary School.

6.8 With regard to the hourly AQS for $NO_2$ (i.e. 200µg.m$^{-3}$ not to be exceeded more than 18 times a year), LAQM.TG(16) states that if the annual mean is below 60µg.m$^{-3}$ then this AQS should be met. The data in Table 6.1 show that all predicted concentrations of $NO_2$ are well below this threshold in all scenarios and at all receptor points. Therefore, it is considered highly unlikely that the hourly AQS would be exceeded.

**Table 6.2: Predicted Annual Mean Concentrations of $PM_{10}$.**

| Receptor No | Predicted Concentration (µg.m$^{-3}$) | | | Change in Annual Mean Concentration (µg.m$^{-3}$) | Change as a % of the AQS | EPUK & IAQM Significance Criteria |
|---|---|---|---|---|---|---|
| | 2018 Baseline | 2021 Future Baseline | 2021 With (Cumulative) | | | |
| | 1 | 2 | 3 | 3-2 | | |
| R1 | 12.1 | 12.1 | 12.2 | 0.1 | 0.2 | Negligible |
| R2 | 12.3 | 12.2 | 12.3 | 0.1 | 0.2 | Negligible |
| R3 | 12.2 | 12.2 | 12.2 | 0.0 | 0.0 | Negligible |
| R4 | 12.2 | 12.2 | 12.2 | 0.0 | 0.1 | Negligible |
| R5 | 12.0 | 12.0 | 12.0 | 0.0 | 0.1 | Negligible |
| R6 | 12.0 | 12.0 | 12.0 | 0.0 | 0.0 | Negligible |
| R7 | 12.2 | 12.2 | 12.3 | 0.1 | 0.1 | Negligible |
| R8 | 12.3 | 12.3 | 12.4 | 0.1 | 0.1 | Negligible |
| R9 | 12.3 | 12.3 | 12.3 | 0.0 | 0.1 | Negligible |
| R10 | 12.6 | 12.7 | 12.8 | 0.1 | 0.1 | Negligible |
| R11 | 11.9 | 11.9 | 11.9 | 0.0 | 0.0 | Negligible |
| R12 | 14.0 | 14.0 | 14.0 | 0.1 | 0.1 | Negligible |
| R13 | 12.7 | 12.7 | 12.7 | 0.0 | 0.1 | Negligible |
| R14 | 13.7 | 13.7 | 13.7 | 0.0 | 0.0 | Negligible |

| | | | | | | |
|---|---|---|---|---|---|---|
| R15 | 14.4 | 14.4 | 14.5 | 0.1 | 0.1 | Negligible |

6.9 The data in Table 6.2 show that annual mean $PM_{10}$ concentrations at all receptors, in all scenarios, are predicted to be 63.8% or more below the 40µg.m$^{-3}$ AQS.

6.10 The proposed development is predicted to result in small increases of $PM_{10}$ concentrations. The maximum percentage change as a percentage of the AQS is an increase of 0.2% at R1 and R2, which is *Negligible* with regard to EPUK & IAQM impact descriptors.

6.11 For $PM_{10}$, the following equation can be used to derive the number of days that the daily mean AQS limit of 50µg.m$^{-3}$ is likely to be exceeded:

$$\text{No. 24 hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}}\right)$$

6.12 The data in Table 6.2 show that the highest annual mean $PM_{10}$ concentration predicted in the model was 14.5µg.m$^{-3}$ in Scenario 3 at receptor R15, which is located west of the "at risk" junction with Pen Y Pound and Park Road A40. Based on the above formula, this would lead to 0.5 exceedance days, which is 98.5% below the 35-day limit.

**2031 Scenarios**

6.13 Table 6.3 shows model predicted annual mean $NO_2$ concentrations in 2031, after the development is fully occupied, at existing receptors both in the vicinity of the application site (R1 – R11), and the "at risk" location at the junction of Pen Y Pound and Park Road A40 (R12 – R15).

**Table 6.3: Predicted Annual Mean Concentrations of $NO_2$.**

| Receptor No | Predicted Concentration (µg.m$^{-3}$) | | | Change in Annual Mean Concentration (µg.m$^{-3}$) | Change as a % of the AQS | EPUK & IAQM Significance Criteria |
|---|---|---|---|---|---|---|
| | 2018 Baseline | 2031 Future Baseline | 2031 With (Cumulative) | | | |
| | 1 | 4 | 5 | 5-4 | | |
| R1 | 9.0 | 8.3 | 8.5 | 0.3 | 0.6 | Negligible |
| R2 | 10.2 | 8.6 | 9.0 | 0.4 | 0.9 | Negligible |
| R3 | 9.7 | 8.7 | 8.7 | 0.0 | 0.1 | Negligible |
| R4 | 9.6 | 8.6 | 8.7 | 0.1 | 0.2 | Negligible |
| R5 | 8.4 | 7.8 | 7.9 | 0.1 | 0.2 | Negligible |

| Receptor No | Predicted Concentration (µg.m$^{-3}$) | | | Change in Annual Mean Concentration (µg.m$^{-3}$) | Change as a % of the AQS | EPUK & IAQM Significance Criteria |
|---|---|---|---|---|---|---|
| | 2018 Baseline | 2031 Future Baseline | 2031 With (Cumulative) | | | |
| | 1 | 4 | 5 | 5-4 | | |
| R6 | 8.1 | 7.7 | 7.8 | 0.0 | 0.1 | Negligible |
| R7 | 9.6 | 8.6 | 8.8 | 0.1 | 0.3 | Negligible |
| R8 | 10.2 | 9.0 | 9.1 | 0.1 | 0.3 | Negligible |
| R9 | 10.0 | 8.8 | 9.0 | 0.1 | 0.4 | Negligible |
| R10 | 11.6 | 10.2 | 10.3 | 0.1 | 0.2 | Negligible |
| R11 | 7.9 | 7.6 | 7.6 | 0.0 | 0.1 | Negligible |
| R12 | 21.6 | 15.9 | 16.1 | 0.2 | 0.6 | Negligible |
| R13 | 12.8 | 10.5 | 10.6 | 0.1 | 0.2 | Negligible |
| R14 | 18.4 | 14.1 | 14.2 | 0.1 | 0.2 | Negligible |
| R15 | 21.4 | 16.0 | 16.2 | 0.2 | 0.4 | Negligible |

6.14 The data in Table 6.3 show that annual mean concentrations of $NO_2$ are predicted to be well below the 40µg.m$^{-3}$ AQS at all existing receptors in 2031, in both Scenario 4 and Scenario 5.

6.15 When comparing Scenario 4 and Scenario 1, the model is predicting a decline in annual mean concentrations of $NO_2$ at all receptors. This is due to EFT in the model accounting for anticipated future reductions in emissions from the vehicle fleet.

6.16 In 2031, a maximum annual mean $NO_2$ concentration of 16.2µg.m$^{-3}$ is predicted at R15 in Scenario 5, which includes the cumulative impact of both the proposed development and committed developments. This is well below the AQS by 59.5%, and accounts for a maximum 0.4% change as a percentage of the AQS, which is *Negligible* with reference to the EPUK & IAQM impact descriptors.

6.17 The largest increase in annual mean $NO_2$ concentrations, as a result of the proposed development, is 0.4µg.m$^{-3}$; which was predicted at R2. With respect to the AQS, this equates to a maximum increase of 0.9%, which is considered to be *Negligible*, with reference to the EPUK & IAQM impact descriptors.

6.18 With regard to the hourly AQS for $NO_2$ (i.e. 200µg.m$^{-3}$ not to be exceeded more than 18 times a year), LAQM.TG(16) states that if the annual mean is below 60µg.m$^{-3}$ then this AQS should be met. The data in Table 6.3 show that all predicted concentrations of $NO_2$ are below this threshold in all scenarios and at all receptor points. Therefore, it is considered highly unlikely that the hourly AQS would be exceeded.

**Table 6.4: Predicted Annual Mean Concentrations of $PM_{10}$.**

| Receptor No | Predicted Concentration (µg.m$^{-3}$) | | | Change in Annual Mean Concentration (µg.m$^{-3}$) | Change as a % of the AQS | EPUK & IAQM Significance Criteria |
|---|---|---|---|---|---|---|
| | 2018 Baseline | 2031 Future Baseline | 2031 With (Cumulative) | | | |
| | 1 | 4 | 5 | 5-4 | | |
| R1 | 12.1 | 12.1 | 12.2 | 0.1 | 0.2 | Negligible |
| R2 | 12.3 | 12.2 | 12.3 | 0.1 | 0.2 | Negligible |
| R3 | 12.2 | 12.2 | 12.2 | 0.0 | 0.0 | Negligible |
| R4 | 12.2 | 12.2 | 12.3 | 0.1 | 0.1 | Negligible |
| R5 | 12.0 | 12.0 | 12.0 | 0.0 | 0.1 | Negligible |
| R6 | 12.0 | 12.0 | 12.0 | 0.0 | 0.0 | Negligible |
| R7 | 12.2 | 12.2 | 12.3 | 0.1 | 0.1 | Negligible |
| R8 | 12.3 | 12.3 | 12.4 | 0.1 | 0.1 | Negligible |
| R9 | 12.3 | 12.3 | 12.3 | 0.0 | 0.1 | Negligible |
| R10 | 12.6 | 12.8 | 12.8 | 0.0 | 0.1 | Negligible |
| R11 | 11.9 | 11.9 | 12.0 | 0.1 | 0.0 | Negligible |
| R12 | 14.0 | 14.1 | 14.1 | 0.1 | 0.1 | Negligible |
| R13 | 12.7 | 12.7 | 12.7 | 0.0 | 0.1 | Negligible |
| R14 | 13.7 | 13.8 | 13.8 | 0.0 | 0.0 | Negligible |

| | | | | | | |
|---|---|---|---|---|---|---|
| R15 | 14.4 | 14.5 | 14.5 | 0.0 | 0.1 | Negligible |

6.19 The data in Table 6.4 show that annual mean $PM_{10}$ concentrations at all receptors, in all scenarios, are predicted to be 63.8% or more below the 40µg.m$^{-3}$ AQS.

6.20 The proposed development is predicted to result in small increases of $PM_{10}$ concentrations. The maximum percentage change is an increase of 0.2% at R1 and R2, which is *Negligible* with regard to EPUK & IAQM impact descriptors.

6.21 For $PM_{10}$, the following equation can be used to derive the number of days that the daily mean AQS limit of 50µg.m$^{-3}$ is likely to be exceeded:

$$\text{No. 24 hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}}\right)$$

6.22 The data in Table 6.4 show that the highest annual mean $PM_{10}$ concentration predicted in the model was 14.5µg.m$^{-3}$ in scenarios 4 and 5 at receptor R15. Based on the above formula, this would lead to a maximum 0.13 exceedance days.

## Proposed New Receptors

6.23 As a residential scheme, the proposed development will introduce new sensitive receptors (i.e. dwellings) when the development is expected to be occupied. Therefore, predicted pollution concentrations at representative proposed receptor locations are included in Tables 6.5 and 6.6, below.

6.24 Proposed receptors were positioned according to the latest available scheme designs (Figure 5), and located on the facades of proposed dwellings closest to Old Hereford Road and Llwynu Lane. It should be noted that the layout of the proposed development is designed as such that the closest kerb to the proposed receptors is approximately 50 meters as measured in Google Earth.

6.25 The results presented in Tables 6.5 and 6.6 are based on the worst case scenarios; scenario 3 (2021) and scenario 5 (2031), i.e. inclusive of both the proposed development and predicted committed development contributions.

**Table 6.5: Predicted pollution concentrations at the closest two façades of the Proposed Development in 2021 (Scenario 3).**

| Receptor No | Floor | Annual Mean Concentration (µg.m$^{-3}$) | | 50µg.m$^{-3}$ mean exceedance days |
|---|---|---|---|---|
| | | $NO_2$ | $PM_{10}$ | $PM_{10}$ |
| P1 | Ground | 7.6 | 11.9 | 1.3 |
| P2 | Ground | 7.4 | 11.9 | 1.3 |
| P3 | Ground | 7.3 | 11.8 | 1.3 |

**Table 6.6: Predicted pollution concentrations at the closest two façades of the Proposed Development in 2031 (Scenario 5).**

| Receptor No | Floor | Annual Mean Concentration (µg.m$^{-3}$) | | 50µg.m$^{-3}$ mean exceedance days |
|---|---|---|---|---|
| | | $NO_2$ | $PM_{10}$ | $PM_{10}$ |
| P1 | Ground | 7.5 | 11.9 | 1.3 |
| P2 | Ground | 7.3 | 11.9 | 1.3 |
| P3 | Ground | 7.2 | 11.8 | 1.3 |

6.26 The data in Tables 6.5 and 6.6 show that annual mean $NO_2$ concentrations are predicted to be well below the 40µg.m$^{-3}$ AQS at all representative proposed receptor locations in 2021 and 2031.

6.27 The highest predicted concentration of $NO_2$ is 7.6µg.m$^{-3}$ at P1 in scenario 3; which is situated on the façade of the closest dwelling to Old Hereford Road, according to plans. 7.6µg.m$^{-3}$ is 81% below the long-term AQS.

6.28 The annual mean concentration of $PM_{10}$ and the daily mean $PM_{10}$ exceedance days are expected to be at least 70.3% and 96.3% below their AQS, respectively across both scenarios.

6.29 Since $NO_2$ and $PM_{10}$ concentrations will be greater closer to the source (roads), the concentrations predicted by the model at P1, P2 and P3 provides a good indication that concentrations will be well below the relevant AQSs across the entirety of the application site.

6.30 Similarly, concentrations at higher floors (above ground) would be lower than those at modelled height (i.e. 1.5m). As such, it can be concluded that $NO_2$ and $PM_{10}$ concentrations would be well below the AQSs across the entirety of the application site at potential higher floors.

6.31 For the hourly AQS for $NO_2$ (200µg.m$^{-3}$ not to be exceeded more than 18 times a year), LAQM.TG(16) states that if the annual mean is below 60µg.m$^{-3}$, this AQS should be met. Predicted concentrations at the proposed receptor locations in both scenarios are well below 60µg.m$^{-3}$.

## Damage Cost Calculation

6.32 Following the January 2019 update to Defra's guidance, the calculation below has been carried out to estimate the value of the impact of $NO_x$ and $PM_{2.5}$ emitted as a result of the proposed development. Although $PM_{10}$ has been assessed throughout this report, Defra's 2019 update of the calculation puts more emphasis on $PM_{2.5}$ as it has far greater health implications. As such, the below calculation has costed for the impacts of $NO_x$ and $PM_{2.5}$.

6.33 In order to evaluate the scale of a proposed development's total emissions, Defra recommends an emissions cost calculation using the following formula:

$$Road\ Transport\ Emission\ Increase\ (cost, £) = Estimated\ trip\ rate\ for\ 5\ years * Emission\ rate\ per\ 10km\ per\ vehicle\ type * damage\ costs$$

6.34 The latest Defra Emissions Factor Toolkit was used to determine the total transport related emissions that would be generated by the proposed development. Inputs used in the calculation are included in Table 6.7, below.

**Table 6.7: Damage cost calculation inputs.**

| Input | Value | Unit | Source/explanation |
|---|---|---|---|
| Trip Length | 10 | km | EPUK / IAQM Guidance |
| Traffic Flow (LDV) | 598 | AADT | 24-hour trip generation for proposed development. (provided by Lime Transport) |
| EFT Road Type | Urban (Not London) | - | N/A |
| Year | 2021 | - | Anticipated opening year. |
| Average Speed | 50 | $Km.hr^{-1}$ | EPUK / IAQM Guidance |
| Cost / tonne $NO_X$ | 11,941 | £ | Central estimate damage cost for 'Road Transport' (Defra 2019 prices). |
| Cost / tonne $PM_{2.5}$ | 226,929 | £ | Central estimate damage cost for 'Road Transport' (Defra 2019 prices). |
| Generated $NO_X$ transport emissions | 0.61 | Tonnes | Output from Defra EFT spreadsheet. |
| Generated $PM_{2.5}$ transport emissions | 0.04 | Tonnes | Output from Defra EFT spreadsheet. |

6.35 Emissions "damage" cost calculation:

- $NO_X$ emission 'damage' (cost, £) = 11,941 × 0.61 × 5 years* = £35,380.
- $PM_{2.5}$ emission 'damage' (cost, £) = 226,929 × 0.04 × 5 years* = £44,089.
- **TOTAL (cost, £) = £79,469.**

*The calculation accounts for an uplift factor of 2% cumulatively per annum, in line with the latest 2019 guidance[19].

6.36 The total 'damage cost' for the proposed development, based on 2019 updated Defra guidance and costs, has been calculated as £79,469.

19 Air Quality Damage Cost update, 2019. Report for Defra. https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1902271109_Damage_cost_update_2018_FINAL_Issue_2_publication.pdf

6.37 During consultation with MCC's EHO, it was advised that the development should adopt sustainable design principles which should include the provision of at least 1 Electric Vehicle (EV) "rapid charge" point per 10 residential dwellings. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made available. In addition, ultra-low NOx gas-fired boilers should be installed which meet a minimum standard of <40mgNOx/kWh.

6.38 It is recommended that the proposed development should adhere to these sustainable design principles to offset the calculated damage cost. Based on the understanding that the proposed development is intended to deliver approximately 146 new dwellings, this would include the provision of at least 15 rapid EV charging points.

6.39 Additional mitigation options to offset the 'damage cost' could include those listed below. The list is not exhaustive.

- Car club provision or support to local car club/eV car club;
- Designation of parking spaces for low emission vehicles;
- Differential parking charges depending on vehicle emissions;
- Use of ultra-low emission service vehicles;
- Support for local walking and cycling initiatives;
- Bike/e-bike hire schemes;
- Contribution to renewable fuel and energy generation projects;
- Incentives for the take-up of low emission technologies and fuels.

# 7. Discussion

7.1 Monmouthshire County Council (MCC) has declared two AQMAs due to exceedances of the UK Air Quality Standard (AQS) for annual mean nitrogen dioxide ($NO_2$). The AQMAs are Bridge Street in Usk, and Hardwick Hill (A48), Chepstow. These AQMAs are approximately 17km and 32km from the application site, respectively. Based on separation distance, impacts from the proposed development on these AQMAs are considered highly unlikely.

7.2 Pollution concentrations adjacent to the Borough's busiest roads can be high; however, data from the UK-AIR suggest that background concentrations in the vicinity of the application site are well below the key AQSs for $NO_2$ and $PM_{10}$.

7.3 An air quality assessment was required to assess the suitability of the site, in air quality terms, for its proposed class C3 residential use. It was also necessary to conduct a detailed modelling assessment which considered the impact of traffic generated by the proposed development, and other committed developments in the area, to determine whether existing receptors would be exposed to unacceptable levels of air pollution.

7.4 A detailed dispersion model has been used to predict pollutant concentrations at the façades of existing receptors, mainly residential dwellings along the local roads in the vicinity of the application site. In addition, at the request of MCC's EHO, receptors at the "at risk" junction of Pen Y Pound and Park Road A40 were assessed. Annual mean concentrations of $NO_2$ and $PM_{10}$ are predicted to be below the 40µg.m$^{-3}$ AQS at all existing receptors, in all scenarios.

7.5 It has been shown that cumulative $NO_2$ emissions from traffic generated by the proposed development and other committed developments are expected to have a *Negligible* impact on air quality in Abergavenny, and not cause exceedances of the AQS, with reference to EPUK and IAQM guidance.

7.6 Results from the dispersion model indicate that concentrations of $NO_2$ and $PM_{10}$ will be below the relevant AQSs at the facades of the proposed development and across the application site. As such, the site is deemed acceptable, in air quality terms, for its proposed use.

7.7 The demolition and construction phases of the proposed development could give rise to emissions that may cause some dust soiling effects on adjacent uses. However, by adopting appropriate mitigation measures to reduce emissions and their potential impact, there should be no significant residual effects.

7.8 The proposed development is considered to comply with the requirements of the Wales PPW and local planning policies, as it is not expected to expose any existing or proposed receptors to unacceptable air quality.

# 8. Conclusions

8.1 Phlorum Ltd has been commissioned by Boyer Planning to undertake an air quality assessment (AQA) for the proposed class C3 residential development on land at Penlanlas Farm, Abergavenny. The proposal is to develop ca. 146 residential dwellings.

8.2 UK-AIR background concentrations and local air quality monitoring results from the wider area suggest that whilst air quality adjacent to busy roads is generally below objective concentrations, but can be poor adjacent to certain "at risk" locations in Abergavenny. Background pollution concentrations across the application site are likely to be below the relevant UK Air Quality Strategy Standard concentrations.

8.3 The development is expected to have a minimal impact on pollution concentrations at nearby existing and future proposed receptors, including those located at the junction of Pen Y Pound and Park Road A40. Overall this impact is predicted to be *Negligible*, which is not significant.

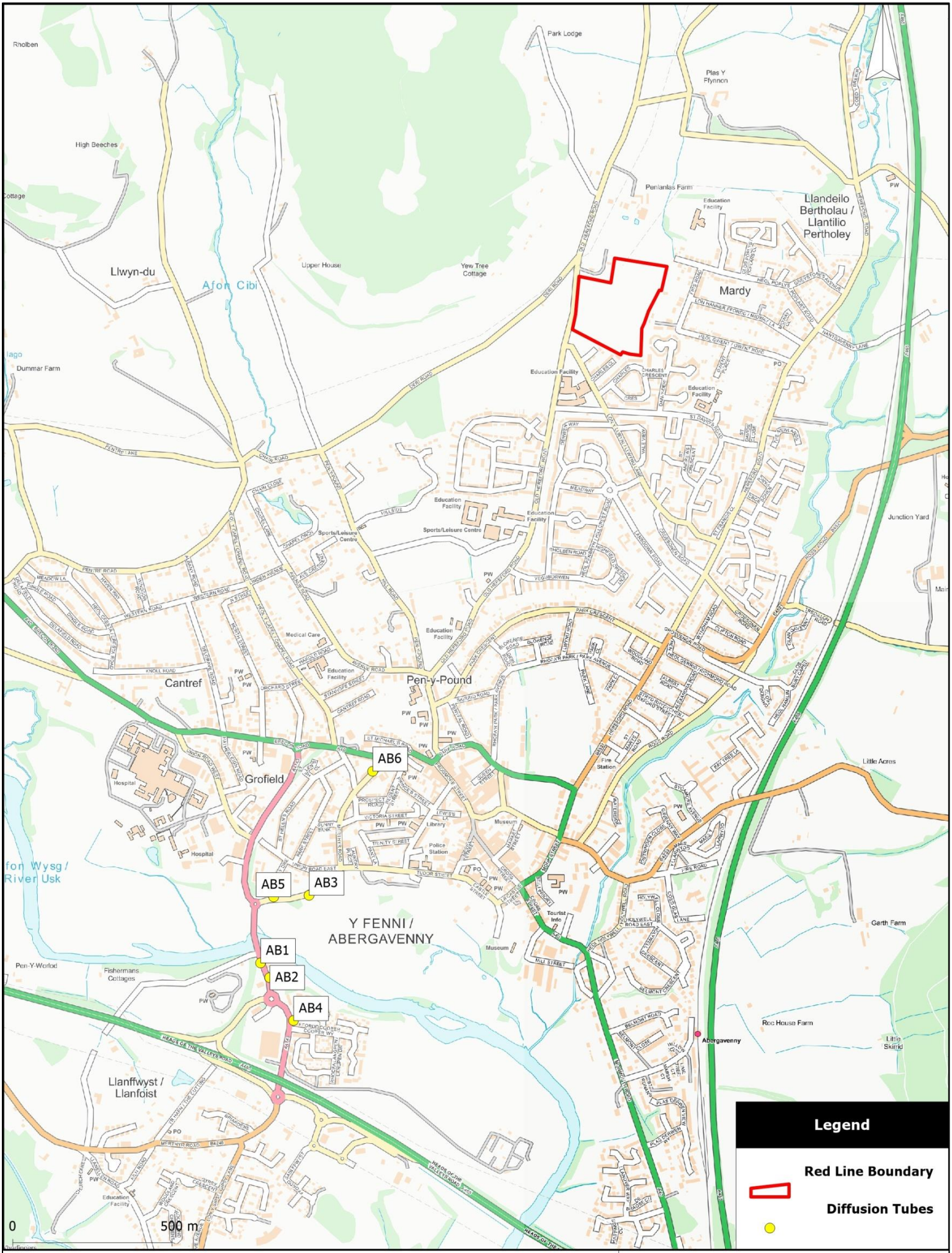
8.4 Pollution concentrations across the site, in 2021 and 2031, are predicted to be well below the relevant Air Quality Standards; as such, the site is considered acceptable for its proposed residential use.

8.5 During construction, adopting appropriate mitigation measures should prevent any significant air quality effects on the surrounding area.

8.6 The proposed development is expected to comply with all relevant air quality policy. Air quality should not, therefore, pose any significant obstacles to the planning process.

# Figures and Appendices

# Figure 1: Site Location Plan




# Figure 1: Site Location



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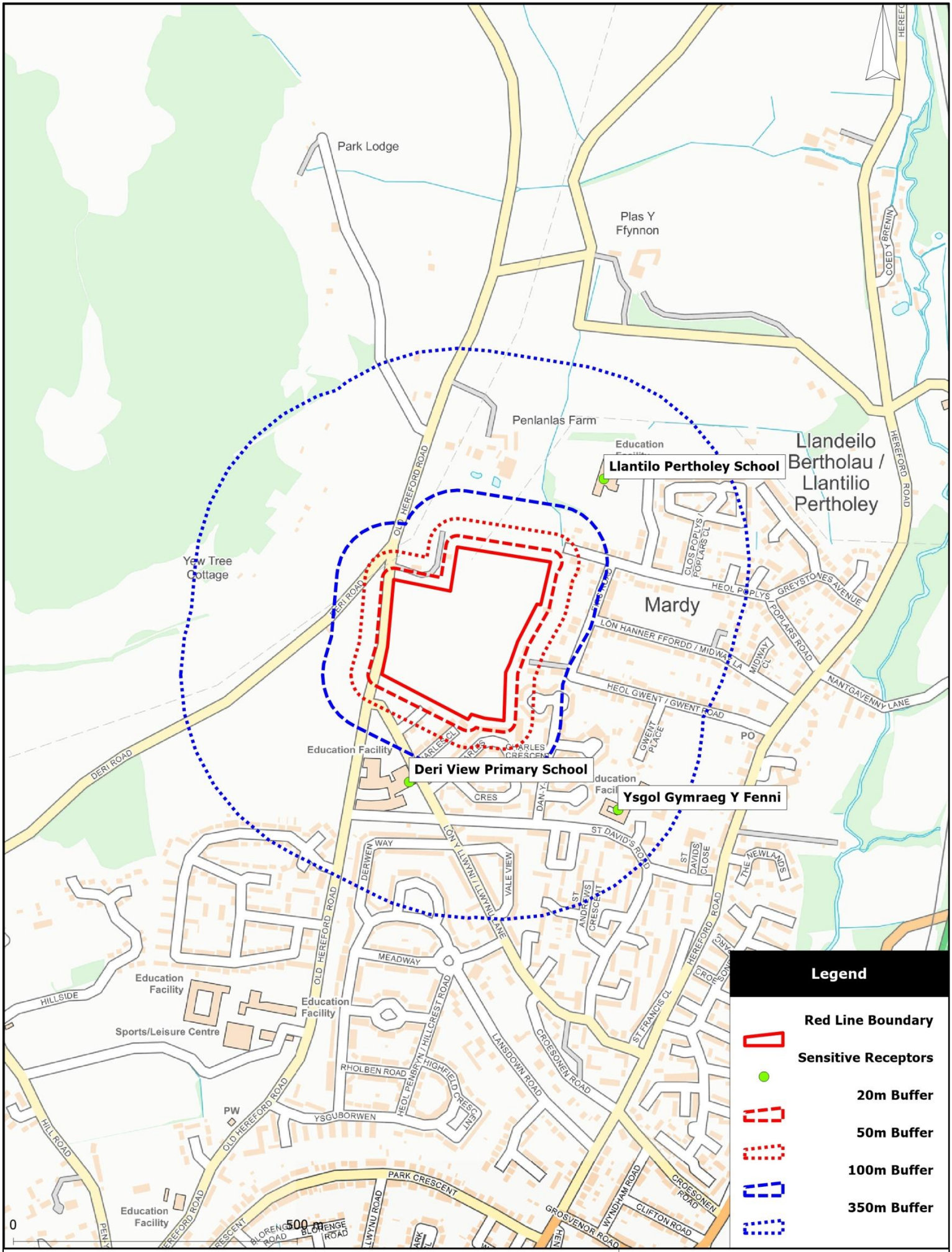
# Figure 2: Construction Phase Receptors




# Figure 2: Construction Phase Receptors



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# Figure 3: Operational Phase Receptors: Site Vicinity

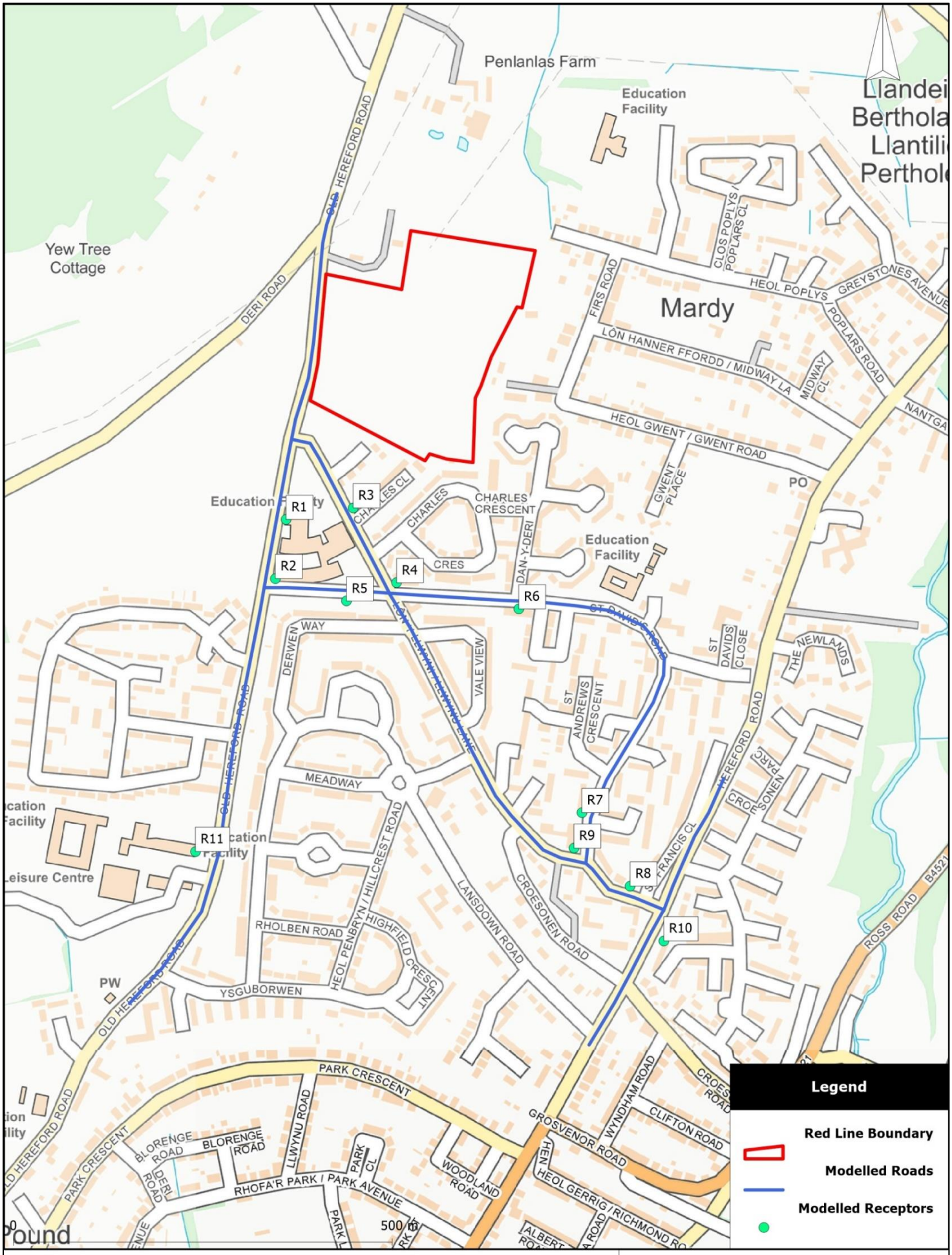


Figure 3: Operations Phase Receptors: Site Vicinity



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# Figure 4: Operational Phase Receptors: Pen Y Pound

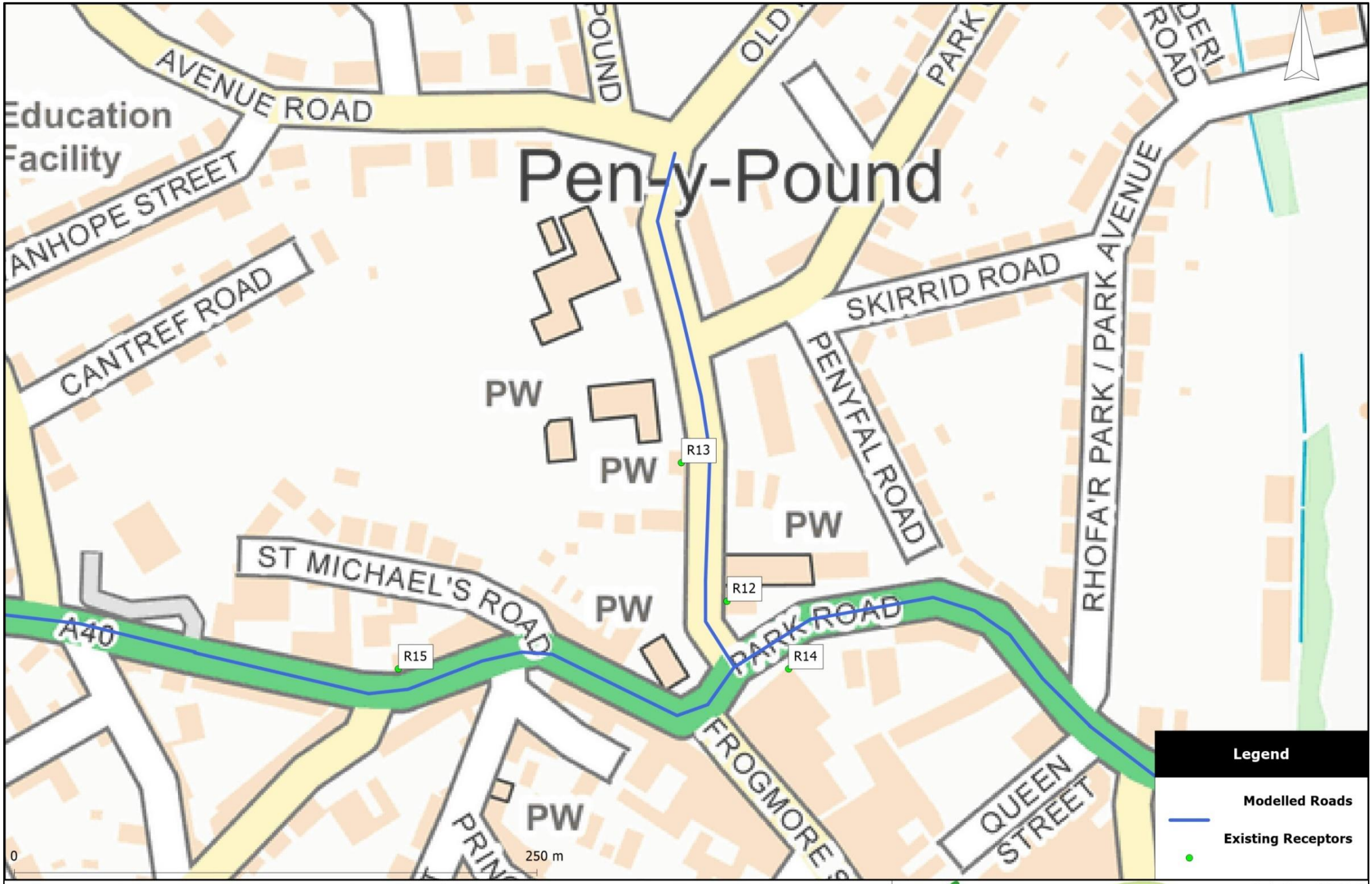


Figure 4: Operational Phase Receptors: Pen Y Pound



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# Figure 5: Proposed Receptors


# Figure 5: Proposed Receptors



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# Appendix A: EPUK & IAQM Significance Criteria

**Table A.1: EPUK & IAQM Significance Criteria**

| Long term average Concentration at receptor in assessment year | % Change in concentration relative to Air Quality Assessment Level (AQAL) | | | |
|---|---|---|---|---|
| | 1 | 2-5 | 6-10 | >10 |
| 75% or less of AQAL | Negligible | Negligible | Slight | Moderate |
| 76-94% of AQAL | Negligible | Slight | Moderate | Moderate |
| 95-102% of AQAL | Slight | Moderate | Moderate | Substantial |
| 103-109% of AQAL | Moderate | Moderate | Substantial | Substantial |
| 110% or more of AQAL | Moderate | Substantial | Substantial | Substantial |

**Explanation**

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
2. The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. .less than 0.5% will be described as Negligible..
3. The Table is only designed to be used with annual mean concentrations.
4. Descriptors for individual receptors only; the overall significance is determined using professional judgement (see Chapter 7). For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.
7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

# Appendix B: Model Input Data

# Traffic input data

The data used in the ADMS-Roads assessment are included in the table below and were provided by Lime Consultants, the transport consultants for the project.

**Table B.1: Scenario 1 Traffic Data**

| Road | Scenario 1 | |
|---|---|---|
| | AADT | %HGV |
| Old Hereford Road (Site Access) | 617 | 2 |
| Llwynu Lane (Site Access) | 1266 | 1 |
| Old Hereford Road (between Llwynu Lane and St David's Road) | 1815 | 2 |
| St David's Road (West of Llwynu Lane) | 1507 | 1 |
| Old Hereford Road (South of St David's Road) | 2729 | 2 |
| Llwynu Lane (South of St David's Road) | 1970 | 2 |
| St David's Road (East of Llwynu Lane) | 1531 | 1 |
| St Teilos Road | 4748 | 1 |
| Pen Y Pound | 8261 | 2 |
| Park Road A40 (East of Junction) | 13571 | 2 |
| Park Road A40 (West of Junction) | 17498 | 1 |

**Table B.2: Scenario 2 and Scenario 3 Traffic Data**

| Road | Scenario 2 | | Scenario 3 | |
|---|---|---|---|---|
| | AADT | %HGV | AADT | %HDV |
| Old Hereford Road (Site Access) | 717 | 2 | 1315 | 2 |
| Llwynu Lane (Site Access) | 1292 | 1 | 1312 | 1 |
| Old Hereford Road (between Llwynu Lane and St David's Road) | 1952 | 2 | 2531 | 2 |
| St David's Road (West of Llwynu Lane) | 1538 | 1 | 1759 | 1 |
| Old Hereford Road (South of St David's Road) | 2873 | 2 | 3231 | 2 |
| Llwynu Lane (South of St David's Road) | 2011 | 2 | 2252 | 2 |
| St David's Road (East of Llwynu Lane) | 1028 | 1 | 1047 | 1 |
| St Teilos Road | 4848 | 1 | 5285 | 1 |
| Pen Y Pound | 8522 | 2 | 8879 | 2 |
| Park Road A40 (East of Junction) | 14584 | 2 | 14584 | 2 |
| Park Road A40 (West of Junction) | 18507 | 1 | 18865 | 1 |

**Table B.3: Scenario 4 and Scenario 5 Traffic Data**

| Road | Scenario 4 | | Scenario 5 | |
|---|---|---|---|---|
| | AADT | %HGV | AADT | %HDV |
| Old Hereford Road (Site Access) | 759 | 2 | 1354 | 2 |
| Llwynu Lane (Site Access) | 1372 | 1 | 1392 | 1 |
| Old Hereford Road (between Llwynu Lane and St David's Road) | 2065 | 2 | 2644 | 2 |
| St David's Road (West of Llwynu Lane) | 1633 | 1 | 1854 | 1 |
| Old Hereford Road (South of St David's Road) | 3045 | 2 | 3403 | 2 |
| Llwynu Lane (South of St David's Road) | 2135 | 2 | 2376 | 2 |
| St David's Road (East of Llwynu Lane) | 1091 | 1 | 1111 | 1 |
| St Teilos Road | 5147 | 1 | 5585 | 1 |
| Pen Y Pound | 9042 | 2 | 9400 | 2 |
| Park Road A40 (East of Junction) | 15441 | 2 | 15441 | 2 |
| Park Road A40 (West of Junction) | 19611 | 1 | 19969 | 1 |

# Model Inputs

| Inputs | |
|---|---|
| Dataset | Data provided by Lime Consultants |
| Emission Year(s) | 2018, 2021, 2025 |
| Road Type | Wales (Urban) |
| Surface roughness | 1.0 (Cities, Woodland) |
| Meteorological Data | Hereford / Credenhill 2017 |

# Model Verification

| Inputs | |
|---|---|
| Emission Year | 2017 |
| Road Type | Wales (Urban) |
| Surface roughness | 1.0 (Cities, Woodland) |
| Meteorological Data | Hereford / Credenhill 2017 |
| Traffic Data | DfT 99917 (AADT) |

# Traffic Data Used in Model Verification

| DfT Control Point | Road | 2017 24h AADT | |
|---|---|---|---|
| | | LDVs | HGVs |
| 99917 | A4143 (A465 to A40) | 17651 | 479 |

# Appendix C: Model Verification Study

# Model Verification

Model verification studies are undertaken in order to check the performance of dispersion models and, where modelled concentrations are significantly different to monitored concentrations, a factor can be established by which the modelled results can be adjusted in order to improve their reliability. The model verification process is detailed in LAQM.TG(16).

According to TG(16), no adjustment factor is necessary where the results of the model all lie within 25% of the monitored concentrations.

Model verification can only be undertaken where there is sufficient roadside monitoring data in the vicinity of the subject scheme being assessed. LAQM.TG(16) recommends that a combination of automatic and diffusion tube monitoring data is used; although this may be limited by data availability. Two monitoring locations in Abergavenny with appropriate DfT traffic data were selected for this study.

**Table C.1: Comparison of monitored and modelled $NO_2$ concentrations at the two monitoring locations.**

| DfT ID | Monitor ID | Type | Concentrations (µg.m$^{-3}$) | | |
|---|---|---|---|---|---|
| | | | Modelled | Monitored | % Difference |
| 99917 | AB4 | DT | 16.6 | 25.5 | -34.8 |
| 99917 | AB2 | DT | 19.5 | 32.7 | -40.4 |

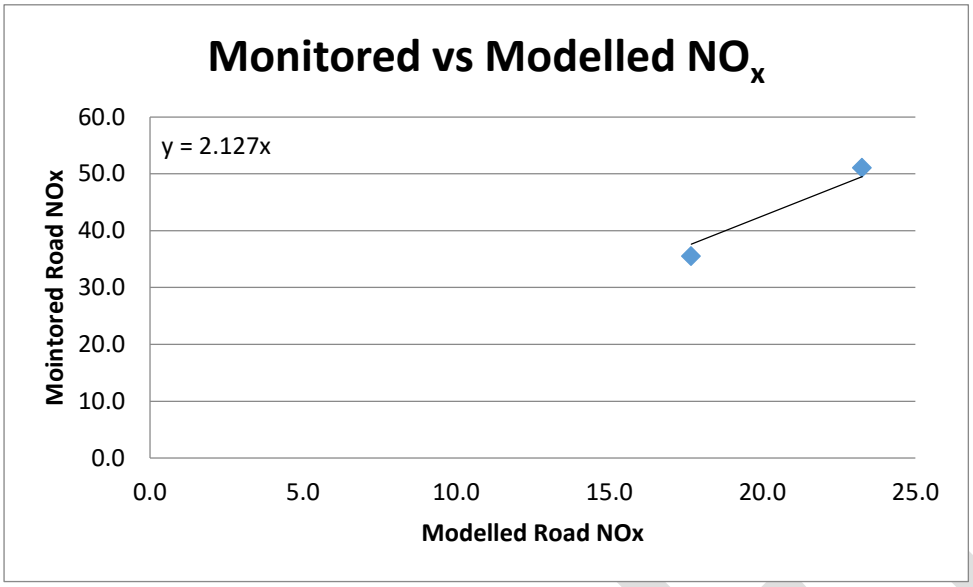
*Note: DT = Diffusion Tube*

The data in Table C.1 shows that the model is under-predicting concentrations at both locations to a varying degree. This is a pattern frequently seen in model verification studies, and is likely to be the result of local dispersion characteristics. It was decided to proceed with adjustment as the model was systematically under predicting $NO_2$ concentrations. This was done in order to ensure conservative results.

As it is primary $NO_x$, rather than secondary $NO_2$, emissions that are modelled, an adjustment factor must be derived for the road contribution of $NO_x$.

A plot of modelled versus monitored $NO_x$ concentrations on a graph shows a positive correlation. This graph is included in Figure C.1, overleaf.

**Figure C.1 Monitored vs Modelled Road $NO_x$**




By plotting a trend line through the points on the graph, a factor of 2.13 was derived. Table C.2 shows total monitored versus modelled $NO_2$ following the adjustment of the road contribution of $NO_x$ by this factor. It shows that, following this adjustment, all modelled concentrations of $NO_2$ are within 25% of monitored concentrations at these locations As a result, the factor of 2.13 was considered appropriate for the adjustment of all modelled road contributions of $NO_x$ for the proposed development.

**Table C.2: Monitored and Adjusted Modelled Total $NO_2$ at Roadside Monitoring Sites**

| Dft ID | Monitor ID | Type | Concentrations (µg.m-3) | | |
|---|---|---|---|---|---|
| | | | Modelled | Monitored | % Difference |
| 99917 | AB4 | DT | 26.5 | 25.5 | 4.0 |
| 99917 | AB2 | DT | 32.0 | 32.7 | -2.1 |

*Note: DT = Diffusion Tube*

# Appendix D: IAQM Highly Recommended Mitigation Measures for Medium Risk Sites

**IAQM Highly Recommended Mitigation Measures for sites with a Medium Risk of Dust Impacts**

Please refer to the IAQM's Construction Dust Guidance (*Guidance on the assessment of dust from demolition and construction (2014)* [20] and *Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites (2018)*[21]) for further, "desirable", mitigation measures.

**Communications**

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- 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 Appendix. The DMP may include monitoring of dust deposition, dust flux, real-time $PM_{10}$ continuous monitoring and/or visual inspections.

**Site Management**

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

**Monitoring**

- Carry out regular site inspections to monitor compliance with the Dust Management Plan, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of 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.
- 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 is a large site, before work on a phase commences. Further guidance is provided by the IAQM[22] on *monitoring during demolition, earthworks and construction*.

[20] IAQM (2014) Guidance on the assessment of dust from demolition and construction
[21] IAQM. (2018). Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites. https://iaqm.co.uk/text/guidance/guidance_monitoring_dust_2018.pdf

**Preparing and Maintaining the Site**

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

**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.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

**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 equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

**Waste Management**

- Avoid bonfires and burning of waste materials.

**Demolition**

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

**Construction**

- 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.

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