Chapter 07

Air Quality

Contents

7. Air Quality

7.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) has considered the potential air quality impacts associated with the Construction and Operational Phases of the Kimmage to City Centre Core Bus Corridor Scheme (hereafter referred to as the Proposed Scheme).

During the Construction Phase, the potential air quality impacts associated with the development of the Proposed Scheme have been assessed. This included construction activities such as utility diversions, road carriageway / cycleway / footway resurfacing and kerb road realignments. Construction traffic on construction access routes are also assessed as part of the study area for this phase of the works.

During the Operational Phase, the potential air quality impacts associated with altered traffic flows along the Proposed Scheme, reallocated traffic lanes and displaced traffic flows have been assessed.

The assessment has been carried out according to best practice and guidelines relating to air quality.

The aim of the Proposed Scheme when in operation is to provide enhanced walking, cycling and bus infrastructure on this key access corridor in the Dublin region, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction). The Proposed Scheme which is described in Chapter 4 (Proposed Scheme Description) has been designed to meet these objectives.

The design of the Proposed Scheme has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development process have been incorporated, where appropriate.

7.2 Methodology

The assessment has been undertaken with reference to the most applicable guidance documents relating to air quality, which are set out in the following sections of this Chapter.

An overview of the methodology undertaken for the air quality impact assessment is outlined below:

- A detailed baseline air monitoring study has been undertaken in order to characterise the existing ambient environment in areas along the Proposed Scheme. This has been undertaken through a review of available published ambient air monitoring data and site-specific ambient air monitoring at sensitive locations along the Proposed Scheme;
- A review of the most applicable standards and guidelines has been reviewed in order to define the air quality significance criteria for the Construction and Operational Phases of the Proposed Scheme;
- Predictive calculations and impact assessments relating to the likely Construction Phase air quality impacts have been undertaken at the nearest sensitive locations to the construction work areas associated with the Proposed Scheme;
- Predictive calculations have been performed to assess the potential air quality impacts associated with traffic alterations associated with the operation of the Proposed Scheme at the most sensitive locations; and
- A schedule of mitigation measures has been incorporated where required, to reduce, where necessary, the identified potential air quality impacts associated with the Proposed Scheme.

7.2.1 Study Area

The study area for this assessment covers the length of the Proposed Scheme, approximately 3.7 kilometre (km) from R817 Lower Kimmage Road to R137 New Street South / Patrick Street and R110 Kevin Street Upper Junction, and the area either side of the Proposed Scheme up to a maximum distance of 50 metres (m) during construction, and 200m during the Operational Phase. For the Construction Phase assessment, the focus is on air quality sensitive receptors adjacent to the proposed works (e.g. utility diversions, road widening works, road excavation works (where required), road reconfiguration and resurfacing works) that are susceptible to dust impacts but also those receptors along construction access routes within the study area (please see Chapter 5 (Construction) in Volume 2 of this EIAR for more information on construction traffic access routes). The extent of the overall study area is typically up to a maximum of 350m from a specific area of construction work, as per the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (hereafter referred to as the IAQM Guidance) (IAQM 2014), with the key impacted study areas focused up to a maximum of 100m depending on the air emission sources in question and the local area under consideration. For the Operational Phase, assessment of the dust impacts from maintenance of the Proposed Scheme route has been scoped out on the basis that these activities have low potential for dust release and are likely to have a negligible impact on air quality sensitive receptors.

For the Construction Phase and Operational Phase traffic assessment, the focus is on air quality sensitive receptors which bound the Proposed Scheme and those along diverted traffic routes within the study area. Highly sensitive air quality receptors during the construction phase include residential properties, hospitals, schools and residential care homes, whilst commercial and workplace properties are generally viewed as being of medium sensitivity (IAQM 2014). Sensitive receptor locations include residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present (Transport Infrastructure Ireland (TII 2011)). Designated areas of conservation (either Irish or European designation) are also considered sensitive air quality receptors (TII 2011). Potential impacts to air quality relate to alterations to traffic patterns (e.g. introduction of a new bus lane or due to redistributed traffic), with particular attention focused on those areas where the Proposed Scheme is encroaching closer to air quality receptors, specifically where bus or traffic lanes are moving closer to air quality receptors.

For the Construction Phase and Operational Phase traffic assessment, the focus is on air quality receptors within an overall study area of 200m from the Proposed Scheme, as per the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (hereafter referred to as the TII Air Quality Guidelines) (TII 2011) or diverted routes within the key impacted study areas focused within 50m to 100m. The range of air quality sensitive receptors for the Proposed Scheme are discussed in Table 7.1. The locations of sensitive receptors are provided initially in Table 7.19 and also in Figure 7.3 to Figure 7.8 in Volume 3 of this EIAR.

Table 7.1: Description of Air Quality Receptors within the Study Area

Proposed Scheme Section	Description of Study Area
Lower Kimmage Road from Kimmage Cross Road to the junction with Harold's Cross Road	The key air quality sensitive receptors are residential receptors lining the R817 Kimmage Road, within 50m of the road edge. The study area also includes offices, B&B's, guesthouses and St. Gladys Private Nursing Home within 10 to 25 m of the R817 and amenity areas including Whelan Park and Mount Argus Park, within 100m of the R817. Religious receptors, Mount Jerome Cemetery, Holy Apostles Peter and Paul Russian Orthodox Church and Mount Argus Church and Retreat between 10m and 150 to 200m of the R817 respectively.
Harold's Cross Road from Harold's Cross Park to the Grand Canal	Within this study area, the key air quality sensitive areas are predominantly residential properties, which bound the east and west of R817 and R137 Harold's Cross Road, within 5 to 10m of the road edge. Educational receptors are within 10 to 100m of R137 Harold's Cross Road, including Leinster Park Montessori and St. Clare's Convent National School. Other air quality sensitive receptors include Our Lady's Hospice and Care Services within 150m west of the R817.
Clanbrassil Street Upper and Lower and New Street from the Grand Canal to the Patrick Street Junction	Within this study area, the key air quality sensitive areas are predominately residential dwellings, which are located between 10 to 20m to the east and west of the Proposed Scheme. The Proposed Scheme passes within 10 m of the Maldron Hotel along New Street South eastern road edge.

7.2.2 Relevant Guidelines, Policy and Legislation

The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022) were considered and consulted in the preparation of this Chapter.

The statutory ambient air quality limit values in Ireland are outlined in S.I. No. 739/2022 Air Quality Standards Regulations 2022 (hereafter referred to as the Air Quality Regulations), which incorporates the ambient air quality limits set out in Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (hereafter referred to as the CAFE Directive), for a range of air pollutants. The statutory ambient air quality guidelines are discussed in greater detail in Section 7.2.2.1.

In addition to the specific statutory air quality standards, the assessment has made reference to national guidelines, where available, in addition to international standards and guidelines relating to the assessment of ambient air quality impacts from road schemes. These are summarised below:

- IAQM Guidance (IAQM 2014);
- A Guide to The Assessment Of Air Quality Impacts On Designated Nature Conservation Sites (Version 1.1) (IAQM 2020);
- The TII Air Quality Guidelines (TII 2011);
- Guidelines for Assessment of Ecological Impacts of National Roads Schemes (hereafter referred to as the TII Ecological Guidelines) (TII 2009);
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission 2013);
- Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report (European Commission 2017);
- United Kingdom (UK) Department of Environment Food and Rural Affairs (DEFRA) Part IV of the Environment Act 1995: Local Air Quality Management Policy Guidance (PG22) (hereafter referred to as LAQM (PG22)) (DEFRA 2022a);
- Part IV of the Environment Act 1995: Local Air Quality Management Technical Guidance (TG22) (hereafter referred to as LAQM (TG22)) (DEFRA 2022b);
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) – LA 105 Air Quality (hereafter referred to as LA 105 Air Quality) (UKHA 2019);
- World Health Organization (WHO) Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide Global Update 2005 (hereafter referred to as the WHO Air Quality Guidelines) (WHO 2006); and

- WHO Global Air Quality Guidelines: Particulate Matter ($PM_{2.5}$ and PM_{10}), Ozone, Nitrogen Dioxide, Sulfur Dioxide and Carbon Monoxide (WHO 2021).

The guidance 'PE-ENV-01107: Air Quality Assessment of Proposed National Roads – Standard' was issued by TII in December 2022. Section 1.9 of PE-ENV-01107 states that:

> *'where projects requiring approval under Section 51, Section 177AE or Part 8 have, at the date of publication of this SD, commenced planning and design, and in particular, where technical advisor contracts have been executed, this SD should be:*
>
> - *treated as advice and guidance;*
> - *employed to the greatest extent reasonably practicable; and*
> - *applied in a proportionate manner, having regard to the characteristics and location of the project/maintenance works and the type and characteristics of potential impacts.'*

At the date of publication of PE-ENV-01107, this EIAR was being finalised. It is therefore considered appropriate to retain the methodology outlined in the 2011 TII Air Quality Guidelines (TII 2011) and LA 105 Air Quality (UKHA 2019), particularly to preserve comparability of air quality impacts from the cumulative assessment of this scheme with 11 other Core Bus Corridor Schemes and the standalone assessments of other schemes already submitted for planning permission.

7.2.2.1 Ambient Air Quality Standards / Limit Values

In order to reduce the risk to health from poor air quality, National and European statutory bodies have set limit values in ambient air for a range of air pollutants. The applicable legal standards in Ireland are outlined in the Air Quality Regulations, which incorporate the CAFE Directive. The Air Quality Regulations set limit values for the pollutants nitrogen dioxide (NO_2) and nitrogen oxides (NO_X), particulate matter (PM) with an aerodynamic diameter of less than 10 microns (PM_{10}), PM with an aerodynamic diameter of less than 2.5 microns ($PM_{2.5}$), lead (Pb), sulphur dioxide (SO_2), benzene and carbon monoxide (CO) (see Table 7.2).

Table 7.2: Air Quality Regulations (based on the CAFE Directive)

Pollutant	Regulation*	Limit Type	Value**
NO_2	S.I. 739 of 2022	Hourly limit for protection of human health - not to be exceeded more than 18 times / year	200μg/m^3 (micrograms per metre cubed) NO_2
		Annual limit for protection of human health	40μg/m^3 NO_2
Nitrogen Oxides (NO + NO_2)		Critical limit for the protection of vegetation and natural ecosystems	30μg/m^3 NO + NO_2
Lead	S.I. 739 of 2022	Annual limit for protection of human health	0.5μg/m^3
SO_2	S.I. 739 of 2022	Hourly limit for protection of human health - not to be exceeded more than 24 times / year	350μg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times / year	125μg/m^3
		Critical limit for the protection of vegetation and natural ecosystems (calendar year and winter)	20μg/m^3
PM (as PM_{10})	S.I. 739 of 2022	24-hour limit for protection of human health - not to be exceeded more than 35 times / year	50μg/m^3
		Annual limit for protection of human health	40μg/m^3
PM (as $PM_{2.5}$)	S.I. 739 of 2022	Annual limit for protection of human health	25μg/m^3
Benzene	S.I. 739 of 2022	Annual limit for protection of human health	5μg/m^3
CO	S.I. 739 of 2022	8-hour limit (on a rolling basis) for protection of human health	10mg/m^3

* CAFE Directive replaces the previous Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management and daughter directives, Council Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air and Directive 2000/69/EC of the European Parliament and of the Council of 16 November 2000 relating to limit values for benzene and carbon monoxide in ambient air

** µg/m^3 (micrograms per cubic metre); mg/m^3 (milligrams per cubic metre)

The WHO Air Quality Guidelines (WHO 2021) values relating to NO_2, PM_{10} and $PM_{2.5}$ are shown in Table 7.3. The WHO Air Quality Guidelines values are more stringent than the European Union (EU) statutory limit values for NO_2, PM_{10} and $PM_{2.5}$. However, the WHO NO_2 one-hour guideline value is an absolute value while the EU standards allow this limit to be exceeded for 18 hours / annum without breaching the statutory limit value.

In May 2020, as part of the joint WHO / United Nations Environment Program (UNEP) / World Bank *BreatheLife* campaign, the four Dublin local authorities signed a commitment to achieve the 2006 WHO Air Quality Guidelines (WHO 2006) by a target date of 2030.

The appropriate compliance limit values for the assessment of air quality impacts of the Proposed Scheme are those outlined in the Air Quality Regulations, which incorporate the CAFE Directive.

Table 7.3: WHO Air Quality Guidelines (WHO 2021)

Pollutant	Regulation	Limit Type	Value
NO_2	WHO Air Quality Guidelines	Hourly limit for protection of human health	25µg/m^3 NO_2
		Annual limit for protection of human health	10µg/m^3 NO_2
PM (as PM_{10})		24-hour limit for protection of human health	45µg/m^3 PM_{10}
		Annual limit for protection of human health	15µg/m^3 PM_{10}
PM (as $PM_{2.5}$)		24-hour limit for protection of human health	15µg/m^3 $PM_{2.5}$
		Annual limit for protection of human health	5µg/m^3 $PM_{2.5}$

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the Construction Phase of a development in Ireland. Dublin City Council (DCC) has published a guidance document titled Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition (DCC 2018). However, this guidance does not specify a guideline value.

The Verein Deutscher Ingenieure (VDI) German Technical Instructions on Air Quality Control – TA Luft standard for dust deposition (VDI 2002) (non-hazardous dust) sets a maximum permissible emission level for dust deposition of 350mg/(m^2*day) (milligrams per metre squared per day) averaged over a one-year period at any receptors outside the site boundary. Recommendations from the Department of the Environment, Health and Local Government (DEHLG) Quarries and Ancillary Activities, Guidelines for Planning Authorities (DEHLG 2004) apply the Bergerhoff limit of 350mg/(m^2*day) measured over monitoring periods of between 28 - 32 days which are then averaged over a one-year period to the site boundary of quarries. This guidance value can be implemented with regard to dust impacts from the construction of the Proposed Scheme.

7.2.2.2 National Air Emission Targets

Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (hereafter referred to as the National Emissions Reduction Directive) was published in December 2016. The National Emissions Reduction Directive applied the limits set out in Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (hereafter referred to as the National Emission Ceiling Directive) until 2020 and established new national emission reduction commitments which are applicable from 2020 and 2030 for SO_2, NO_X, non-methane volatile organic compounds (NMVOC), ammonia (NH_3), $PM_{2.5}$ and methane (CH_4). In relation to Ireland, the 2020 to 2029 emission targets are 25kt (kilotonnes) for SO_2 (65% on 2005 levels), 65kt for NO_X (49% reduction on 2005 levels), 43kt for NMVOCs (25% reduction on 2005 levels), 108kt for NH_3 (1% reduction on 2005 levels) and 10kt for $PM_{2.5}$ (18% reduction on 2005 levels), as shown in Table 7.4. In relation to 2030, Ireland's emission targets are 85% below 2005 levels for SO_2, 69% reduction for NO_x, 32% reduction for VOCs, 5% reduction for NH_3 and 41% reduction for $PM_{2.5}$, also shown in Table 7.4.

Table 7.4: National Air Emission Targets (Ireland's Air Pollutant Emissions 2020 to 2030)

Pollutant	2020 to 2029 Reduction Commitments (kt) (and % Reduction Compared to 2005 Levels)	2030 Reduction Commitments (kt) (and % Reduction Compared to 2005 Levels)
SO_2	25.6	11.0
	-65%	-85%
NO_X	66.8	40.6
	-49%	-69%
NMVOC	56.3	51.1
	-25%	-32%
NH_3	112.1	107.5
	-1%	-5%
$PM_{2.5}$	15.6	11.2
	-18%	-41%

7.2.2.3 Regional Policy

In 2009, the Dublin Regional Air Quality Management Plan 2009-2012 (DCC 2009) was published, and a range of strategies defined to improve air quality in the Dublin Region. The strategies included an improvement in co-ordination to build on the good work to date, to mainstream air quality management into all major policy areas, strengthen the decision-making by improving sharing of information on air quality, introduce measures related to local authority activities that will reduce air emissions and identify and prioritise the main potential threats to air quality.

In relation to specific policies, Policy 6 states that the local authorities shall:

> *'support and encourage the rapid implementation of Quality Bus Corridors and other bus priority measures along the routes identified in the Dublin Transportation Initiative strategy within their functional areas'*.

The Dublin Regional Air Quality Management Plan for Improvements in Levels of Nitrogen Dioxide in Ambient Air Quality (DCC 2011) was a companion document to the Dublin Regional Air Quality Management Plan 2009 - 2012. The document reviewed the measured levels of NO_2 in Dublin City. The document defined the current strategic planning approach as the promotion of *'consolidated urban development based on enhanced public transport'* and outlines a range of measures and policies which will help to improve ambient levels of NO_2.

As a result of an exceedance of the annual mean NO_2 ambient air quality limit value at the St John's Road West monitoring station in 2019 (EPA 2020a), a Dublin Region Air Quality Plan by Dublin Local Authorities in conjunction with the EPA was legally required by the end of 2021 (DCC, Fingal County Council, South Dublin County Council, Dún Laoghaire-Rathdown County Council 2021). The Air Quality Action Plan was subject to public consultation, which gave interested members of the public the opportunity to share their views and input to the plan, which is now complete and was issued to the Minister for the Environment and the EU Commission at the end of 2021. The plan sets out 14 broad measures and a number of associated actions to address the exceedance of the nitrogen dioxide annual limit value. This location of exceedance is outside the study area of the Proposed Scheme.

7.2.3 Data Collection and Collation

The baseline ambient air quality environment has been characterised through a desk study of publicly available published data sources and in-situ baseline ambient monitoring surveys.

7.2.3.1 Desk Study

A desk-based air quality assessment was carried out following guidelines described in the publication by TII (TII 2011). TII states that, wherever possible, use should be made of existing certified air quality data such as that undertaken by the EPA. Air quality monitoring programmes have been undertaken in recent years by the EPA and local authorities in the Dublin Region. The most recent annual report at the time of assessment, Air Quality in Ireland 2019 (EPA 2020a), details the range and scope of monitoring undertaken throughout Ireland. The Urban Environmental Indicators: Nitrogen dioxide levels in Dublin report (EPA 2020b) assessed spatial variations in ambient air quality in Dublin using diffusion tube sampling and detailed air dispersion modelling. The study found that there were potential exceedances of the ambient air quality limit values for NO_2 close to busy City Centre road junctions, near the Dublin Port Tunnel entrance and exit, and along the M50 Motorway. The baseline air quality data collected through the desk study is detailed in Section 7.3.2.1.

A review of potentially sensitive ecological areas has also been conducted using the National Parks and Wildlife Services (NPWS) online mapping services. This review is discussed in Section 7.2.4.3.

7.2.3.2 Site-Specific Baseline Surveys

A site-specific baseline monitoring study was undertaken at monthly intervals from November 2019 to June 2020 as part of the air quality assessment for NO_2 using diffusion tube monitoring at eight locations, as detailed in Section 7.3.2.2, and shown in Figure 7.1 in Volume 3 of this EIAR. Passive sampling of NO2 involves the molecular diffusion of NO2 molecules through a polycarbonate tube and their subsequent adsorption onto a stainless-steel disc coated with triethanolamine. Following a month of sampling, the tubes were analysed using ultraviolet (UV) spectrophotometry, at a United Kingdom Accreditation Service (UKAS) accredited laboratory (SOCOTEC Laboratories in Burton-on-Trent, UK).

The TII Air Quality Guidelines (TII 2011) note that NO_2 diffusion tube monitoring provides a simple, cost-effective means of monitoring at a number of locations across an area and can provide useful information on spatial distributions. The baseline study overlapped in time with traffic surveys being conducted as part of the Traffic Impact Assessment (TIA). Details of the baseline data collected is discussed in Section 7.3.2.

7.2.4 Appraisal Method for the Assessment of Impacts

7.2.4.1 Air Quality Impact Assessment from Traffic Emissions

The air quality assessment has been carried out following the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022) and using the methodology outlined in LA 105 Air Quality (UKHA 2019), LAQM (PG22) (DEFRA 2022a) and LAQM (TG22) (DEFRA 2022b). The general approach outlined in the LA 105 Air Quality, LAQM (PG22) and LAQM (TG22) guidance documents and the methodology outlined within has been recommended for use in assessing Irish road schemes by the TII Air Quality Guidelines (TII 2011) as discussed in Section 7.2.4.1.1.

The potential changes in regional air emissions due to the Construction Phase and Operational Phase traffic impacts of the Proposed Scheme have been assessed using the National Transport Authority (NTA) Environmental Appraisal Tool (NTA 2015), which is based on the Environmental Evaluation Model (hereafter referred to as ENEVAL). The data also takes into account the modal shift from private car to bus (walking or cycling).

A validation study of ENEVAL was undertaken by Jacobs Systra in 2016 (Jacobs Systra 2016) which involved running the module on all the Regional Modelling System (RMS) base models to produce a national emission figure for CO_2 (carbon dioxide) production against the national figure provided by the Department of Transport, Tourism and Sport (DTTAS) of 12 megatonnes. The resultant figure was 8.1 megatonnes for ENEVAL. The DTTAS figure included non-transport related fuel (agricultural and industrial use) and in addition the ENEVAL modelled year was 2012 whilst the DTTAS figures were based on 2015 which would be expected to have higher flows. Therefore, ENEVAL is deemed to be valid for the purposes of calculating regional emissions.

7.2.4.1.1 Local Air Quality Screening Assessment

In 2019, the UKHA DMRB air quality guidance was revised with the publication of LA 105 Air Quality (UKHA 2019) replacing a number of historical guidance documents (HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15). The revised document outlines a number of changes of approach when assessing the air quality impact of road schemes.

LA 105 Air Quality states that modelling should be conducted for NO_2 for the base, construction and opening years for both the Do Minimum (DM) and Do Something (DS) scenarios (please see Chapter 6 (Traffic & Transport) for the definition of these terms). Modelling of PM_{10} is only required for the base year to demonstrate that the air quality limit values in relation to PM_{10} are not breached. Where the air quality modelling indicates exceedances of the PM_{10} air quality limits in the base year then PM_{10} should be included in the air quality model in the Do-Minimum and Do-Something scenarios. LA 105 Air Quality guidance states that modelling of $PM_{2.5}$ is not required, as modelling of PM_{10} can be used to show that the project does not impact on the $PM_{2.5}$ limit value. However, as outlined in Section 7.2.2.1, the four Dublin local authorities have signed up for the *BreatheLife* campaign(https://breathelife2030.org/) to work towards achieving the goal of compliance with the WHO Air Quality Guidelines (WHO 2021) by 2030. Modelling of PM_{10} and $PM_{2.5}$ was undertaken to consider the impact of the Proposed Scheme on these concentrations.

Historically, modelling of CO, lead and benzene was required by UK HA Design Manual for Roads and Bridges document & calculation spreadsheet (UKHA 2007) and TII Air Quality Guidelines (TII 2011). However, guidance has now been updated by LA 105 Air Quality. As concentrations of these pollutants have been monitored to be significantly below their air quality limit values in recent years, even in urban centres (see Section 7.3.2.1) CO, lead and benzene have been scoped out of detailed assessment (EPA 2020a).

LA 105 Air Quality states that the following scoping criteria shall be used to determine whether the air quality impacts of a project can be scoped out or require an assessment based on the changes between the Do DS traffic (with the Proposed Scheme) compared to the DM traffic (without the Proposed Scheme):

- Annual Average Daily Traffic (AADT) changes by 1,000 or more;
- Heavy Duty Vehicle (HDV – includes goods vehicles, buses and other heavy vehicles) AADT changes by 200 or more;
- A change in speed band; and
- A change in carriageway alignment by 5m or greater.

The above scoping criteria have been used in the current assessment to determine the road links required for inclusion in the modelling assessment. Sensitive receptors within 200m of impacted road links were included within the modelling assessment as detailed in LA 105 Air Quality.

7.2.4.1.2 Atmospheric Dispersion Modelling System (ADMS)-Roads Dispersion Model

The TII Air Quality Guidelines (TII 2011) state that the assessment must progress to detailed modelling if:

- Concentrations exceed 90% of the air quality limit values when assessed by the screening method; or
- Sensitive receptors exist within 50m of a complex road layout (e.g. grade separated junctions, hills etc.).

Guidance from LA 105 Air Quality states that a detailed assessment must be conducted where the sensitivity of the environment is medium or above when combined with a high-risk project, due to a risk of exceeding air quality thresholds.

Considering the scale of the Proposed Scheme, its risk should be considered high as it has the potential to have an impact on ambient air quality over a large geographical area.

Guidance from LA 105 Air Quality states that a medium sensitivity environment includes areas that have annual mean NO_2 concentrations of 36µg/m^3 or above, combined with sensitive receptors within 50m of the impacted roads. NO_2 concentrations (Section 7.3.2.1 and Section 7.2.3.2) were found to be generally below 36µg/m^3 along the suburban areas along the Proposed Scheme. However, towards the City Centre, ambient NO_2 concentrations were measured in excess of 36µg/m^3. The LA 105 Air Quality guidance states that a detailed assessment should consider a representative number of receptors, and all receptors with the likelihood of exceeding the air quality limit values.

Vehicle-derived air emissions for areas impacted by significant changes in AADT were modelled using the detailed ADMS-Roads dispersion model (Version 5.1) which has been developed by Cambridge Environmental Research Consultants (CERC) (CERC 2020). The model is a steady-state Gaussian plume model used to assess ambient pollutant concentrations associated with road sources.

The ADMS-Roads dispersion model (Version 5.1) has been used to predict the ground level concentrations (GLC) of NO_2 and PM_{10} / $PM_{2.5}$ in the vicinity of the impacted areas for the baseline year of 2019, the peak construction year of 2024 and the opening and design years of 2028 and 2043 respectively.

The modelling incorporated the following features:

- Hourly-sequenced meteorological information for Casement Aerodrome in 2019 has been used in the model (see Diagram 7.2) (Met Éireann 2020). The selection of the appropriate meteorological data has followed the guidance issued by the LAQM (TG22) (DEFRA 2022b). A primary requirement is that the data used should have a data capture of greater than 90% for all parameters; and
- Specific Air Sensitive Receptors (ASRs) were also mapped into the model. Receptor heights were input at 1.5m to represent breathing height. Concentrations were reported for each ASR modelled for all modelling scenarios.

It is intended that the Proposed Scheme will have a peak Construction Year (2024) and an Opening Year (2028). Road traffic emission rates are derived using data for the peak Construction Year (2024), and the Opening Year (2028) and the Design Year (2043) provided in Chapter 6 (Traffic & Transport) and using emission factors from the COPERT V database (EMISIA 2020) which has been incorporated into the UK DEFRA Emission Factor Toolkit (EFT) Version 10.1 (DEFRA 2019).

The EFT Version 10.1 has been incorporated into the ADMS-Roads model. The toolkit provides emission rates from 2017 to 2030 and traffic emissions for the Proposed Scheme were based on the following assumptions:

- EFT Version 10.1 is based on eight vehicle categories including petrol cars, diesel cars, diesel Light Goods Vehicles (LGV), rigid (Heavy Goods Vehicles (HGV)) and buses;
- Systra (ENEVAL) fleet composition data for Ireland (2016 base year) were selected to input car, LGV and HGV proportions (Table 7.5). 2019 projections were used for detailed modelling of the 2019 base year, 2022 projections and 2024 projections were used as conservatively representative of the 2024 peak construction year and 2028 opening year respectively;
- National Transport Model (NTM) fleet projections provided in UK TAG (UK Department for Transport 2020) have been used to estimate the proportions of cars, LGV and HGV in 2043. No fleet projection tools currently exist, Irish or UK based, that accurately predict the proportion of electric vehicles in 2043, or which take the Climate Action Plan 2021 (Government of Ireland 2019) measures into account. A conservative approach is therefore inevitable, and on consultation from Systra, is based on the use of the UK NTM as the most up to date and robust alternative to the older 2016 base year Systra fleet;
- Predicted bus fleet composition data was developed for 2019, 2028 and 2043 (Table 7.5). The 2019 bus fleet was also applied to the 2024 construction year);
- Emissions have been calculated using predicted emissions factors for 2019 (to represent the Base Year (2019)), 2022 (to represent the peak Construction Year (2024)), 2024 (to represent the

Opening Year (2028)) and 2030 (to represent the Design Year (2043)). A conservative approach to emission years has been taken, similarly to the fleet projections, to counteract some of the uncertainty associated with improved vehicle standards;

- EFT Version 10.1 incorporates updated NO_X (defined as NO and NO_2) and PM speed emission coefficient equations for Euro 5 and 6 vehicles, taken from the European Environment Agency (EEA) COPERT V emission calculation tool which reflects the most recent evidence on the real-world emission performance of these vehicles;
- Fleet composition based on European emission standards from pre-Euro 1 to Euro 6/VI. Systra fleet data was used to estimate Euro class proportions for cars, LGV, and HGV. The NTA provided Euro class proportions for the bus fleet; and
- Improvements in the quality of fuel and some degree of retrofitting; technology conversion in the national fleet.

Table 7.5: Summary of Fleet Proportions

Vehicle Type		Base Year	Construction Year	Operational Year	Design Year
Car	Petrol Car	41%	38%	36%	38%
	Diesel Car	57%	60%	63%	25%
	Electric Car	2%	2%	2%	37%
LGV	LGV	99.9%	99.9%	99.9%	81.5%
	Electric LGV	0.1%	0.1%	0.1%	18.5%
HGV	Rigid HGV	86%	86%	86%	86%
	Artic HGV	14%	14%	14%	14%
Bus	Plug-in Hybrid Bus	0%	0%	24%	0%
	Fuel Cell Electric Bus	0%	0%	70%	100%
	Diesel Bus	100%	100%	6%	0%

Advancements in engine technology and the addition of a higher percentage of electric vehicles to the fleet will assist in significantly reducing emissions between 2028 and 2043, even in circumstances where the number of vehicles using a road link increases. Emissions per road link using the EFT Version 10.1 were calculated for the 2043 DS scenario and compared to the 2028 DS scenario. Conservative assumptions were made for future fleet and uptake of electric vehicles. Across the Proposed Scheme, emissions decreased in 2043, and therefore, 2028 modelled impacts can be considered worst case. As a result, detailed modelling of the Design Year (2043) was scoped out for all pollutants on the basis that emissions will be lower compared to 2028 emissions.

7.2.4.1.3 Verification Study – Year 2019 Traffic Data

Model verification investigates the level of agreement between modelled and measured concentrations. Differences between modelled and measured pollutant concentrations can arise due to uncertainties in, or limitations to, the model input data (such as traffic data and meteorological data), uncertainties in monitoring data and inherent modelling limitations. As outlined in LAQM (TG22) (DEFRA 2022b), an adjustment to the modelled results is usually required in order to ensure that the final concentrations presented are representative of monitoring information in the area.

A verification study was undertaken using the traffic data for the study area which was received from the NTA Eastern Regional Model (ERM) traffic model (See Section 7.2.4.1.2 and Chapter 6 (Traffic & Transport)) for the year 2020. The study compared the ambient NO_2 monitored concentration at a range of diffusion tube locations with the ADMS-Roads model output at these locations. DCC has undertaken a diffusion tube monitoring program at a range of locations in the study area for both 2018 and 2019. This data has been used to compare model predictions of $NO_2$to monitored NO_2concentrations.

Background data was based on and NO_2levels from Ballyfermot for 2019. Ballyfermot was selected as a suitable suburban background station as it is an ambient air monitoring station suitably removed from Dublin City Centre and at a distance of over 200m from a main roadway. The backgrounds were also utilised in the 2024 and 2028 modelling.

The emission data for the ADMS-Roads model was based on EFT Version 10.1 and the ADMS-Roads model input parameters selected is summarised in Table 7.6.

Table 7.6: Summary of the ADMS-Roads Model Input Parameters

Parameter	Description	Input Value
Coordinate System	Spatial data in ADMS-Roads is linked to a Cartesian coordinate system, measured in meters.	Irish Transverse Mercator (ITM) Coordinate system was used.
Pollutants	A range of present pollutants can be selected in ADMS-Roads for modelling.	NO_X, NO_2 and PM_{10} were specifically modelled.
Road Source Emissions	Road sources emissions can be entered manually or calculated from traffic flow data.	Road emissions have been calculated from traffic flow data.
Street Canyons	ADMS-Roads has to the ability to model street canyon effects either by using the Basic Street Canyon module or the Advance Street Canyon Module to simulate turbulent flow patterns along streets with relatively tall buildings.	Basic Street Canyon module has been used where canyons have been identified.
Road Emission Factors	ADMS-Roads has a range of emission factors including the recent UK Emission Factor Tool (EFT) v.9.0 dataset.	UK Emission Factor Tool (EFT) v.10.1 (8 VC) dataset has been used based on Northern Ireland (Urban)
Traffic Speed	ADMS-Roads can adjust pollutant emission factors to take account of traffic speed.	Average traffic speed specific to each link, as advised by traffic consultant, has been used in the model.
Meteorological Data	ADMS-Roads requires hourly meteorological data from a suitable meteorological station for a full year.	2019 data from Casement Aerodrome has been used in the model.
Surface Roughness	The model requires a representative surface roughness value for both the modelling domain and the meteorological station.	A value of 1.0m has been selected for the modelling domain with a value of 0.1m selected for Casement Aerodrome
Time-varied Emissions	The model can accept a range of profiles including 3-day and 7-day diurnal profiles	3-day diurnal profile (Weekdays, Saturday, Sunday) has been used in the model.
Primary NO_2	Model will assume that a certain percentage of NO_X emissions are NO_2 when modelling chemistry	Primary NO_2 fractions (%) were calculated using the EFT for each modelled scenario: 2020 Base – 28.2% 2024 Do Minimum – 28.9% 2024 Do Something – 28.9% 2028 Do Minimum – 29.6% 2028 Do Something – 29.6%
Complex Terrain	Where terrain exceeds 1;10, terrain effects may be modelled	Flat terrain has been used in the modelling domain

The first step of model verification, in line with LAQM (TG22), is to consider the performance of the model, prior to any adjustment, by comparing modelled and measured road NO_X contribution at each of the site-specific survey and DCC diffusion tube locations. Some of the monitoring locations were not considered suitable for model verification, due to missing traffic or monitoring data, or other spatial considerations. A total of eight monitoring sites were included in the verification exercise. The comparison is shown in Diagram 7.1, as the red points and trendline, and also in Table 7.7. This shows that on average, the unadjusted model under predicts total NO_2 concentrations by around 6%.

Table 7.7: Diffusion Tube Monitoring Data Used for Model Verification

Diffusion Tube Location	Modelled NO_X concentration (µg/m^3)	Modelled NO_2 concentration (µg/m^3)	Monitored NO_X concentration (µg/m^3)	Monitored NO_2 concentration (µg/m^3)	Difference [(modelled – monitored)/(monitored) *100]	Adjustment Factor
11.2	15.3	27.6	25.5	32.5	-15.3%	1.49
11.3	8.7	24.3	11.3	25.6	-5.1%	
11.4	3.0	21.3	8.0	23.9	-11%	
11.5	6.9	23.3	6.5	23.1	0.8%	
11.6	12.6	26.2	19.2	29.5	-11.2%	
South Circular / Clanbrassil St Lower	23.2	31.4	43.3	40.7	-22.7%	
11.7	12.6	26.3	18.5	29.2	-10%	
11.8	7.3	23.5	5.8	22.8	3.2%	
Grand Canal 1	12.4	26.1	4.1	21.9	19.4%	

In line with LAQM.TG22, the model adjustment was based on NO_X rather than $NO_2$with the NO_2 diffusion tube data first converted to NO_X using the NO_X to NO_2Calculator (DEFRA 2020). Additionally, the adjustment was applied to the road source contribution only rather than total NO_X, again in line with LAQM (TG22). This process identified that the model performed better at some locations than others, and the adjustment of model bias took this into account.

The comparison of road NO_X contributions provided a bias adjustment factor of 1.49 across the study area, which was then applied to the modelled road contributions at all air quality sensitive receptors, before being converted into total NO_2 concentrations.

Following the application of the model bias adjustment factor, the modelled and measured values at these locations included in the verification exercise were compared again. This comparison is shown in Diagram 7.1 as the blue points and trendline. This shows that on average, the adjusted model is within the target 10% of the EU air quality limit value, with a root mean square error (RMSE) of 3.06µg/m^3. In the absence of measured PM_{10} and $PM_{2.5}$ at roadside locations in the study area, the same factors calculated for the modelled road NO_X contribution were applied to the road PM_{10} and road $PM_{2.5}$ contributions.

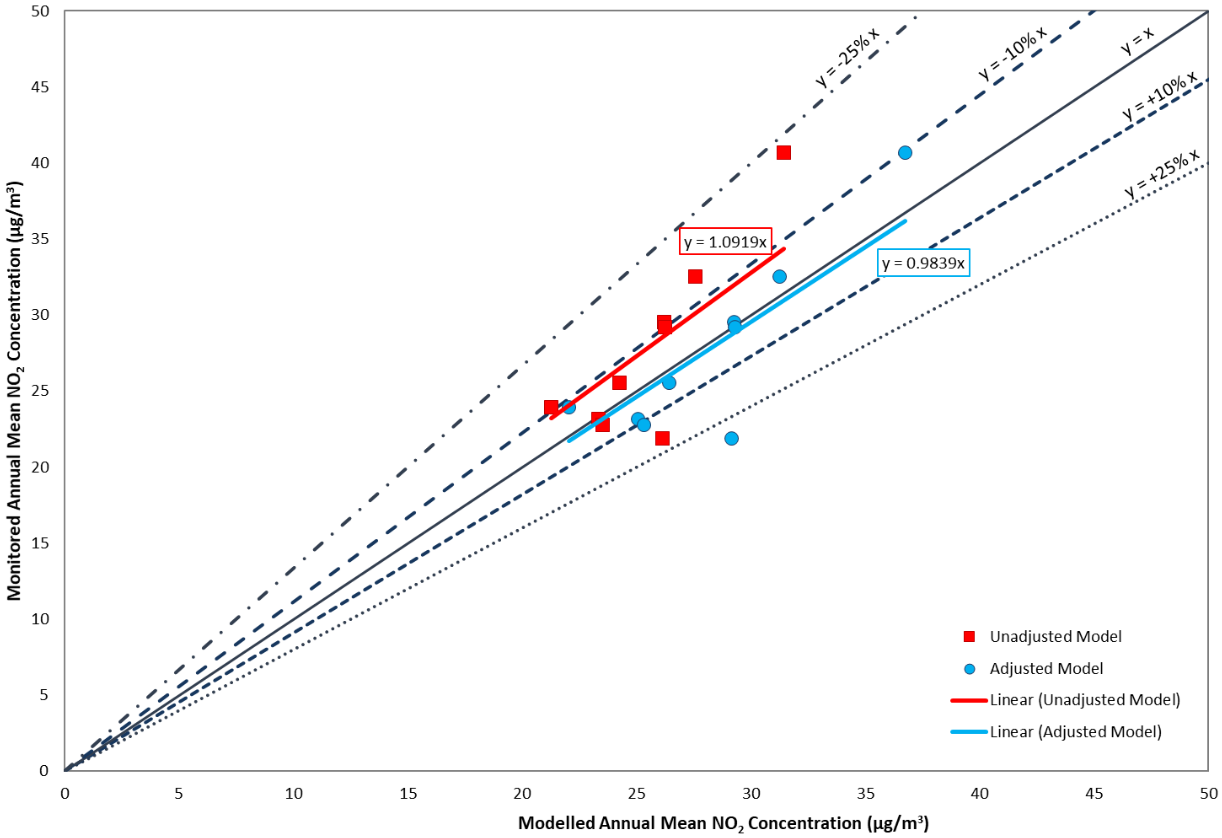

Diagram 7.1: Dispersion Model Verification - Comparison of Monitored and Modelled NO_2 Concentrations (µg/m³)

7.2.4.1.4 Air Quality Impact Significance Criteria

The TII Air Quality Guidelines (TII 2011) detail the methodology for determining air quality impact significance criteria for road schemes in Ireland. The degree of impact is determined based on both the absolute and relative impact of the Proposed Scheme. The significance criteria have been adopted for the Proposed Scheme and are detailed in Table 7.8, Table 7.9 and Table 7.10. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the annual mean limit values (40µg/m³). However, the criteria have also been applied to the predicted annual $PM_{2.5}$ concentrations for the purpose of this assessment.

Table 7.8: Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations (TII 2011)

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No. Days with PM_{10} Concentration > 50 µg/m³	Annual Mean $PM_{2.5}$
Large	Increase / decrease ≥4µg/m³	Increase / decrease >4 days	Increase / decrease ≥ 2.5µg/m³
Medium	Increase / decrease 2µg/m³ - < 4µg/m³	Increase / decrease 3 or 4 days	Increase / decrease 1.25µg/m³ - <2.5µg/m³
Small	Increase / decrease 0.4µg/m³ - < 2µg/m³	Increase / decrease 1 or 2 days	Increase / decrease 0.25µg/m³ - <1.25µg/m³
Imperceptible	Increase / decrease < 0.4µg/m³	Increase / decrease <1 day	Increase / decrease < 0.25µg/m³

Table 7.9: Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations (TII 2011)

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	Moderate	Large
Increase with Proposed Scheme			
Above Objective / Limit Value with Proposed Scheme (≥40µg/m^3 of NO_2 or PM_{10}) (≥25µg/m^3 of $PM_{2.5}$)	Slight adverse	Moderate adverse	Substantial adverse
Just Below Objective/Limit Value with Proposed Scheme (36µg/m^3 - <40µg/m^3 of NO_2 or PM_{10}) (22.5µg/m^3 - <25µg/m^3 of $PM_{2.5}$)	Slight adverse	Moderate adverse	Moderate adverse
Below Objective / Limit Value with Proposed Scheme (30µg/m^3 - <36µg/m^3 of NO_2 or PM_{10}) (18.75µg/m^3 - <22.5µg/m^3 of $PM_{2.5}$)	Negligible	Slight adverse	Slight adverse
Well Below Objective / Limit Value with Proposed Scheme (<30µg/m^3 of NO_2 or PM_{10}) (<18.75µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight adverse
Decrease with Proposed Scheme			
Above Objective / Limit Value with Proposed Scheme (≥40µg/m^3 of NO_2 or PM_{10}) (≥25µg/m^3 of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Substantial beneficial
Just Below Objective/Limit Value with Proposed Scheme (36µg/m^3 - <40µg/m^3 of NO_2 or PM_{10}) (22.5µg/m^3 - <25µg/m^3 of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Moderate beneficial
Below Objective / Limit Value with Proposed Scheme (30µg/m^3 - <36µg/m^3 of NO_2 or PM_{10}) (18.75µg/m^3 - <22.5µg/m^3 of $PM_{2.5}$)	Negligible	Slight beneficial	Slight beneficial
Well Below Objective / Limit Value with Proposed Scheme (<30µg/m^3 of NO_2 or PM_{10}) (<18.75µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight beneficial

* Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible

Table 7.10: Air Quality Impact Significance Criteria (TII 2011)

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Proposed Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Proposed Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

* Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible

7.2.4.2 Regional Air Quality Assessment

The change in regional air quality emissions due to Operational Phase traffic impacts of the Proposed Scheme have been assessed using the NTA Environmental Appraisal Module. Emissions from the zonal level ENEVAL tool can provide information on the emissions of pollutants including NO_2, PM_{10}, CO_2 and VOCs for the different traffic scenarios on a regional basis. The ENEVAL software is recommended by Codema in the publication Developing CO_2 Baselines – A Step-by-Step Guide for Your Local Authority (Codema 2017). The ENEVAL tool is discussed in more detail in Section 7.2.4.1.

7.2.4.3 Ecology

For routes which pass within 2km of a designated area of conservation (either Irish or European designation) the TII Air Quality Guidelines (TII 2011) require the Air Quality Specialist to consult with the project ecologist. However, in practice, the potential for impact on an ecological site is highest within 200m of the Proposed Scheme and within 200m of roads where significant changes in AADT (Section 7.2.4.1) occur. Sites identified within these parameters are considered Key Ecological Receptors.

The TII Ecological Guidelines (TII 2009) and the Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities (DEHLG 2010) provide details regarding the legal protection of designated conservation areas. Further guidance can also be found in A Guide To The Assessment Of Air Quality Impacts On Designated Nature Conservation Sites (IAQM 2020) and in LA105 Air Quality (UKHA 2019), both of which describe nitrogen deposition as the most likely source of significant impacts from road traffic. Pollutants such as CO_2, CO, SO_2, ammonia, particulate matter and volatile organic compounds have been scoped out of detailed assessment.

The following assessment criteria, in accordance with TII Air Quality Guidelines (TII 2011), is used to determine whether an assessment for nitrogen deposition should be conducted:

- There is a designated area of conservation within 200m of the Proposed Scheme; and
- There is a significant change in AADT flows (see Section 7.2.4.1).

In circumstances where the above criteria are met, there is the potential for impacts on ecology as a result of nitrogen deposition and thus an assessment should be undertaken. For road transport sources within 200m of a designated habitat, individual ecological receptors along a transect at 10m intervals are modelled. Ecological receptors are modelled up to a maximum distance of 200m regardless of whether the habitat extends beyond 200m. It is considered that the greatest impacts will have occurred in proximity to the road. LA 105 Air Quality notes that only sites that are sensitive to nitrogen deposition need to be included in the assessment, it is not necessary to include sites for example that have been designated as a geological feature or water course. The ecological receptors along the 200m transect are modelled using the methodology for sensitive human receptors in Section 7.2.4.1.2.

There is one designated site within 2km of the boundary of the Proposed Scheme which is the Grand Canal proposed Natural Heritage Area (pNHA) (Site Code 002104). This is shown in Figure 12.3 in Volume 3 of this EIAR Consultation with the project's ecologist has been undertaken and habitats of particular ecological importance at this site are:

- Canal (FW3);
- Dry Meadow / Grassy Verges (GS2);
- Reed and Large Sedge Swamps (FS1); and
- Tall-herb Swamps (FS2).

Species of particular ecological importance include *Tolypella intricata* and Opposite-leaved Pondweed.

The Air Quality Regulations outline an annual critical level for NO_X for the protection of vegetation and natural ecosystems in general. The CAFE Directive defines 'Critical Levels' as:

> '*a level fixed on the basis of scientific knowledge, above which direct adverse effects may occur on some receptors, such as trees, other plants or natural ecosystems but not on humans*'.

The TII Ecological Guidelines reference the United Nations Economic Commission for Europe (UNECE) Critical Loads for Nitrogen where a '*Critical Load*' is defined by the UNECE as:

> '*a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge*' (UNECE 2003).

The TII Ecological Guidelines states that where the predicted environmental concentration (PEC) is less than 70% of the long-term critical level/load, the process contribution (PC) is likely to be insignificant.

The TII Ecological Guidelines outline a methodology to derive the road contribution to dry deposition and thereafter to compare with the published critical loads for the appropriate habitat.

The UNECE critical loads were subsequently updated in the 2010 Review and Revision of Empirical Critical Loads and Dose-Response Relationships (UNECE 2010). The pNHAs are not currently designated for the protection of a specific habitat type. In the absence of a specific designation, the most stringent published critical load in the 2010 Review and Revision of Empirical Critical Loads and Dose-Response Relationships for inland and surface water habitats (5kg(N)/ha/yr to 10kg(N)/ha/yr) (kilogrammes of nitrogen per hectare per year) has been used in the assessment.

In order to calculate the nitrogen deposition, the NO_2 / NO_X concentration determined through modelling, including the background concentration, must be converted firstly into a dry deposition flux using the equation below which is taken from UK Environment Agency (UKEA) publication AGTAG06 – Technical Guidance On Detailed Modelling Approach For An Appropriate Assessment For Emissions To Air (hereafter referred to as AGTAG06) (UKEA 2014):

Dry deposition flux (µg m^{-2} s^{-1}) = ground-level concentration (µg/m^3) x deposition velocity (m/s)

Deposition velocities are provided in both the TII Air Quality Guidelines (TII 2011) and A Guide to The Assessment of Air Quality Impacts on Designated Nature Conservation Sites (IAQM 2020) for NO_2 in grassland and forestry. Once the dry deposition flux (µg m^{-2} s^{-1}) (micrograms, per metre squared, per second) is calculated it must then be converted to nitrogen equivalent acidification flux (k_{eq} ha^{-1} $year^{-1}$) for comparison with critical loads.

In order to convert the dry deposition flux from units of µg m^{-2} s^{-1} to units of kg ha^{-1} $year^{-1}$ the dry deposition flux is multiplied by the conversion factors. For NO_2 this factor is 96. In order to convert kg ha^{-1} $year^{-1}$ to k_{eq} ha^{-1} $year^{-1}$, where k_{eq} is a unit of equivalents (a measure of how acidifying the chemical species can be), the deposition flux in units of kg ha^{-1} $year^{-1}$ is multiplied by the conversion factor (taken from AQTAG06 (UKEA 2014)). The conversion factor for nitrogen is 0.071428. LA 105 Air Quality (UKHA 2019) states that if the change in nitrogen (N) deposition is greater than 0.4kg N/ha/yr (kilograms of nitrogen, per hectare, per year) or 1% of the critical level / load consultation with the consultation should occur.

7.2.4.4 Air Quality Impact Assessment from Construction-related Dust Emissions

The greatest potential impact on air quality during the Construction Phase will be from construction dust emissions, PM_{10} / $PM_{2.5}$ emissions and the potential for nuisance dust. Dust is characterised as encompassing PM with a particle size of between 1 micron and 75 microns (1µm to 75µm). Deposition of dust typically occurs in close proximity to the source, and with IAQM Guidance (IAQM 2014) defining a maximum impact area of 350m from the dust generating activity. Sensitivity to dust depends on the duration of the dust deposition, the dust generating activity, and the nature of the deposit. Therefore, a higher tolerance of dust deposition is likely to be shown if only short periods of dust deposition are expected and the dust generating activity is either expected to stop or move on.

An appraisal has been carried out to assess the risk to sensitive receptors as a result of dust soiling, health impacts and ecology impacts due to the Construction Phase in accordance with the IAQM Guidance. This appraisal reviews the sensitivity of the site's location with respect to dust nuisance, human health and ecological impacts and then calculates a risk of impact using the magnitude of site activities.

Receptor sensitivity can be described, as follows, with respect to nuisance dust as per the IAQM Guidance:

- High sensitivity receptor with respect to dust nuisance – surrounding land where:
  - Users can reasonably expect enjoyment of a high level of amenity;
  - The appearance, aesthetics or value of their property would be diminished by soiling;
  - 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; or
  - Examples include dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms.
- Medium sensitivity receptor with respect to dust nuisance – surrounding land where:
  - 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, aesthetics or value of their property could be diminished by soiling;
  - The people or property would not reasonably be expected to be present continuously or regularly for extended periods as part of the normal pattern of use of the land; or
  - Indicative examples include parks and places of work.
- Low sensitivity receptor with respect to dust nuisance – surrounding land where:
  - 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; or
  - Indicative examples include playing fields, farmland (unless commercially sensitive horticultural), footpaths, short-term car parks and roads.

Receptor sensitivity can be described, as follows, with respect to human health as per the IAQM Guidance:

- High sensitivity receptor with respect to human health – surrounding land where:
  - Locations where members of the public are exposed over a time period relevant to the air quality limit value for PM_{10} (in the case of the 24-hour limit value, a relevant location would be one where individuals may be exposed for eight hours or more in a day); or
  - Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.
- Medium sensitivity receptor with respect to human health – surrounding land where:
  - Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality limit value for PM_{10} (in the case of the 24-hour limit value, relevant location would be one where individuals may be exposed for eight hours or more in a day); or
  - Indicative examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.
- Low sensitivity receptor with respect to human health – surrounding land where:
  - Locations where human exposure is transient; or
  - Indicative examples include public footpaths, playing fields, parks and shopping streets.

Receptor sensitivity can be described, as follows, with respect to ecology as per the IAQM Guidance:

- High sensitivity receptor with respect to ecology – surrounding land where:
    - Locations with an international or national designation and the designated features may be affected by dust soiling; or
    - Indicative examples include a 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 sensitivity receptor with respect to ecology – surrounding land where:
    - Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or
    - Indicative example is a National Heritage Area (NHA) with dust sensitive features.
- Low sensitivity receptor with respect to ecology – surrounding land where:
    - Locations with a local designation where the features may be affected by dust deposition; or
    - Indicative example is a local Nature Reserve with dust sensitive features.

Prior to assessing the impact from dust emissions, the sensitivity of the area must be established. The sensitivity of the area is determined using the headings:

- Dust Soiling Effects on People and Property;
- Human Health Impacts; and
- Ecological Impacts.

The sensitivity of the area is considered as per the criteria outlined in the IAQM Guidance and as reproduced in Table 7.11, Table 7.12 and Table 7.13.

In terms of the sensitivity of the area to dust soiling effects on people and property, the receptor sensitivity, number of receptors and their distance from the source are considered. Using these criteria as outlined in Table 7.11 the sensitivity of the area to dust soiling can be established.

The IAQM Guidance also outline the criteria for assessing the human health impact from PM_{10} emissions from construction activities based on the current annual mean PM_{10} concentration, receptor sensitivity and the number of receptors effected as per Table 7.12.

An assessment of the Proposed Scheme was completed with respect to the sensitivity criteria in Table 7.11 and Table 7.12.

Where the number of receptors was not clear (i.e. for an apartment building), conservative sensitivities were assumed. In addition, when calculating the sensitivity with respect to human health, the background concentrations of particulates was reviewed. The background air quality in the area of the Proposed Scheme is discussed in Section 7.3.2.

Table 7.11: Sensitivity of the Area to Dust Soiling Effects on People and Property (IAQM 2014)

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 7.12: Sensitivity of the Area to Human Health Impacts (IAQM 2014)

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from Source (m)				
			<20	<50	<100	<200	<350
High	> 32µg/m³	>100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28µg/m³ - 32µg/m³	>100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24µg/m³ - 28µg/m³	>100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	< 24µg/m³	>100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	> 32µg/m³	>10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28µg/m³ - 32µg/m³	>10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24µg/m³ - 28µg/m³	>10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	< 24µg/m³	>10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	1+	Low	Low	Low	Low	Low

Dust deposition impacts on ecology can occur due to chemical or physical effects. This includes reduction in photosynthesis due to smothering from dust on the plants and chemical changes such as acidity to soils. Often impacts will be reversible once the works are completed, and dust deposition ceases. Designated sites within 50m of the boundary of the site, or within 50m of the Proposed Scheme used by construction vehicles on public highways up to a distance of 500m from a construction site entrance can be affected according to the IAQM Guidance. The sensitivity of the area to ecological impacts are considered using the sensitivity criteria outlined in Table 7.13. The Grand Canal pNHA (Site Code 002104) is within 50m of the Proposed Scheme.

Table 7.13: Sensitivity of the Area to Ecological Impacts (IAQM 2014)

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

In order to determine the level of dust mitigation required during the Construction Phase, the potential magnitude of dust emission magnitude for each dust generating activity needs to be taken into account, along with the already established sensitivity of the area. These major dust generating activities are divided into four types (where relevant) to reflect their different potential impacts, as outlined below:

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

Trackout is defined by the IAQM as the *'transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network'.*

7.3 Baseline Environment

The following sections describe the baseline conditions in the vicinity of the Proposed Scheme based on a review of published data and on-site monitoring.

7.3.1 Meteorological Conditions

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (WHO 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ to PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

Casement Aerodrome meteorological station, which is located approximately 11km south-west of the Proposed Scheme at the closest point, collects meteorological data in the correct format for the purposes of this assessment and has a data collection of greater than 90%. Long-term hourly observations at Casement Aerodrome meteorological station provide an indication of the prevailing wind conditions for the region (see Diagram 7.2). Results indicate that the prevailing wind direction is from south to westerly in direction over the period 2015 to 2019.

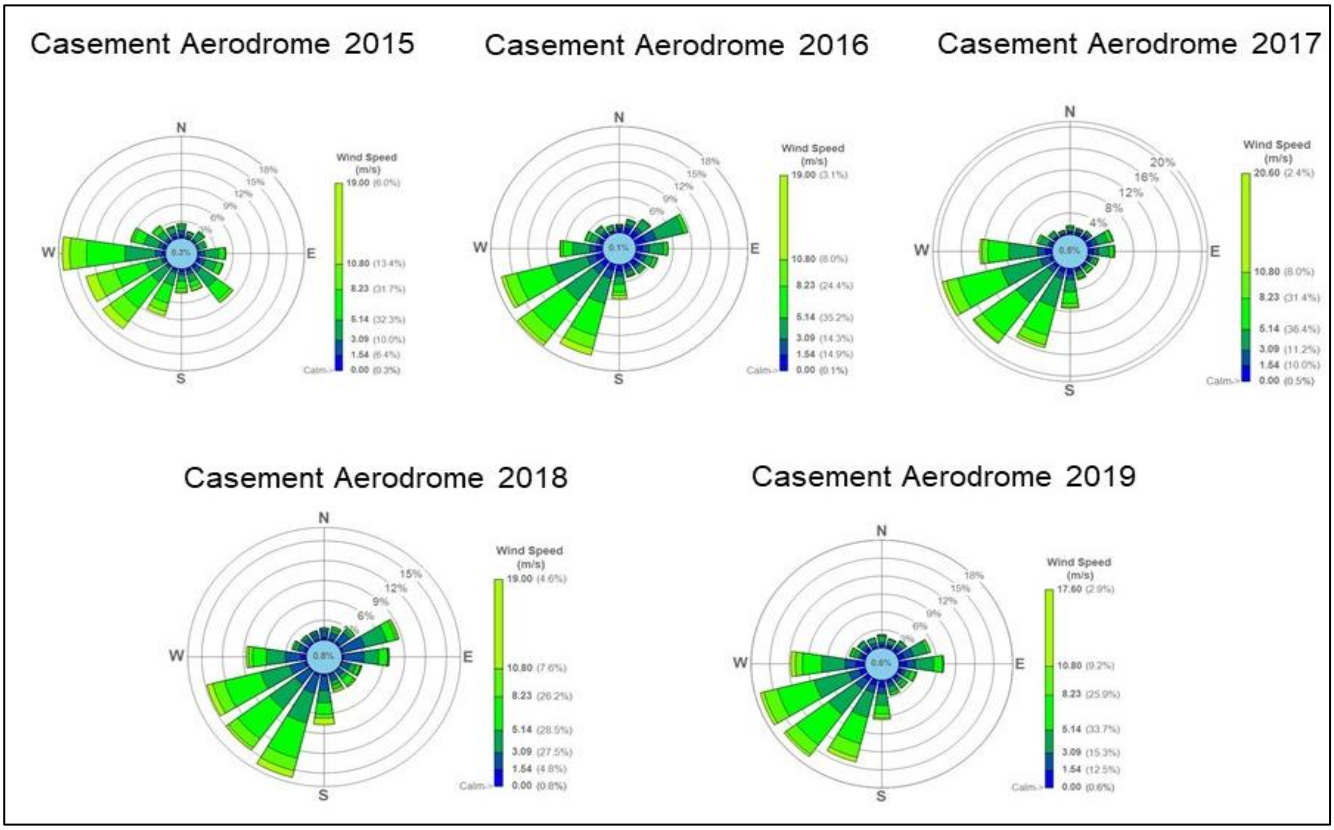

Diagram 7.2: Casement Aerodrome Meteorological Station Windrose 2015 to 2019 (Met Éireann 2020)

7.3.2 Baseline Ambient Air Quality

Background air quality is the air quality at a specific location when the local emissions of air quality have been subtracted from the measured air quality. Thus, a 'background' air concentration is usually representative of a wider area (such as an urban area or suburban area). Baseline air quality is the current air quality at a specific location including all local and non-local sources.

A desk study of the EPA air quality monitoring programs has been undertaken. The most recent annual report at the time of the assessment, Air Quality in Ireland 2019 (EPA 2020a), details the range and scope of monitoring undertaken throughout Ireland. In addition, scheme-specific baseline air quality monitoring has been conducted. The data collected has been included to provide site-specific baseline concentrations of NO_2 in areas which have the potential to be impacted by the Proposed Scheme.

7.3.2.1 EPA Data

As part of the implementation of S.I. No. 271/2002 - Air Quality Standards Regulations 2002, four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA 2020a). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D. In terms of air monitoring zoning, the area of the Proposed Scheme is located within Zone A, as shown in Figure 7.2 in Volume 3 of this EIAR (EPA 2020a).

With regard to NO_2, continuous monitoring data from the EPA Zone A stations was reviewed (EPA 2020a). The stations representative of the Proposed Scheme are Ballyfermot, Dún Laoghaire and Rathmines. Sufficient data was available for the station in Rathmines, which is located roughly 800m from the Proposed Scheme, to review long-term trends over a five-year period (2015 to 2019) as shown in Table 7.14. Long-term annual average levels at Rathmines range from 17µg/m^3 to 22µg/m^3 over the period 2015 to 2019, with an average concentration of 22µg/m^3 in 2019.

In addition to the stations in close proximity to the Proposed Scheme, sufficient data was available for stations in Dún Laoghaire and Ballyfermot to observe long-term trends over the period 2015 to 2019. Results average between 15µg/m³ to 22µg/m³ for the annual mean concentrations at each location compared to the annual limit value of 40µg/m³ with no exceedances of the one-hour limit value of 200µg/m³. Rathmines, Dún Laoghaire and Ballyfermot had average NO_2 concentrations of 19µg/m³ in 2019.

Long-term trends at the City Centre location of Winetavern Street are available, which is located near the City Centre end of the Proposed Scheme. Concentrations of NO_2 were below the annual and one-hour limit values, with annual average levels ranging from 27µg/m³ to 37µg/m³ over the period 2015 to 2019 compared to the annual limit value of 40µg/m³. The average concentration in 2019 was 28µg/m³.

The ambient NO_2 monitoring results for Rathmines, Winetavern Street, Dún Laoghaire and Ballyfermot over the period 2015 to 2019, based on a three-year rolling average, are shown in Diagram 7.3. The data and trend line indicate that levels are reasonably constant at each location over the five-year period.

Table 7.14: Trends in Suburban and Urban NO_2 Concentration (µg/m³) In Dublin 2015 to 2019

Station	Station Classification Council Directive 96/62/EC*	Averaging Period	Year					Limit Value
			2015	2016	2017	2018	2019	
Winetavern Street	Urban Traffic	Annual Mean NO_2 (µg/m³)	31	37	27	29	28	40
		99.8th%ile 1-hr NO_2 (µg/m³)	128	120	110	115	115	200
Rathmines	Urban Background	Annual Mean NO_2 (µg/m³)	18	20	17	20	22	40
		99.8th%ile 1-hr NO_2 (µg/m³)	105	88	86	87	102	200
Ballyfermot	Suburban Background	Annual Mean NO_2 (µg/m³)	16	17	17	17	20	40
		99.8th%ile 1-hr NO_2 (µg/m³)	127	90	112	101	101	200
Dún Laoghaire	Suburban Background	Annual Mean NO_2 (µg/m³)	16	19	17	19	15	40
		99.8th%ile 1-hr NO_2 (µg/m³)	91	105	101	91	91	200

* Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management

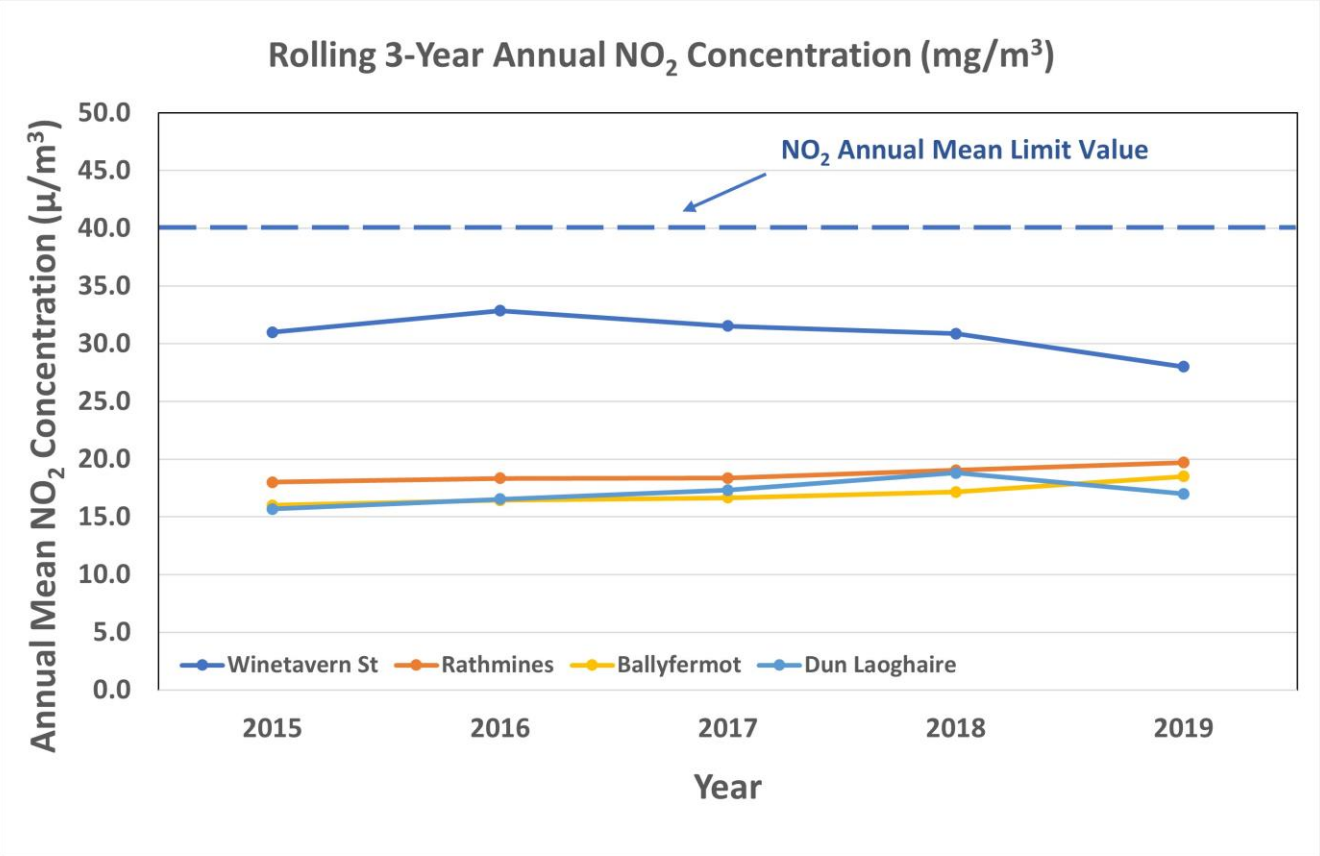

Diagram 7.3 Rolling Three-Year Annual NO_2 Concentration (µg/m3)

In addition to the continuous monitoring stations, the EPA has gathered NO_2 data using the passive diffusion tube methodology in proximity to the proposed scheme (EPA 2020b). The diffusion tube sampling was carried out in conjunction with DCC. Monitoring is for single year periods, and therefore, long-term averages are not available at diffusion tube locations. Further details on the diffusion tube methodology is discussed in Section 7.3.2.2 as part of the site-specific monitoring study. The two roadside monitoring locations at R111 South Circular / R137 Clanbrassil Street Lower and R811 Camden Street / R114 Wexford Street were found to exceed the annual mean NO_2 concentration in 2019.

Table 7.15: EPA NO_2 Diffusion Tube Monitoring Data

Monitoring Site	Monitoring Year	Annual Mean NO_2 Concentration (µg/m^3)
South Circular / Clanbrassil Street Lower	2019	40.7
Grand Canal 1	2018	21.9
Grand Canal 2	2018	23.8
Grand Canal 3	2018	19.1
Grand Canal 4	2018	25.0
Camden Street / Wexford Street	2019	49.1

Continuous PM_{10} monitoring carried out at the suburban locations of Ballyfermot, Tallaght, Davitt Road, Dún Laoghaire, Rathmines and Phoenix Park showed annual average levels ranging from 11µg/m^3 to 19µg/m^3 in 2019, with a maximum of 15 exceedances of the 24-hour limit value of 50µg/m^3 (35 exceedances are permitted per year). Longer term averages for Ballyfermot, Dún Laoghaire, Rathmines and Phoenix Park from 2015 to 2019 show annual average concentrations of between 9µg/m^3 to 16µg/m3 as shown in Table 7.16.

Average PM_{10} levels at the urban traffic monitoring location of Winetavern Street, which is in close proximity to the City Centre end of Proposed Scheme, were reviewed. The annual average level in 2019 was 15µg/m^3, with nine exceedance of the 24-hour limit value of 50µg/m^3. The City Centre monitoring location of Winetavern Street has a long-term average (2015 to 2019) of 14µg/m^3.

Continuous $PM_{2.5}$ monitoring carried out at the Zone A locations of Ballyfermot, Phoenix Park, Davitt Road, Ringsend, Finglas, Rathmines and Marino showed average levels of 9.3µg/m^3 in 2019. The annual average level measured in Finglas in 2019, was 9µg/m^3 compared to an annual mean limit value of 25µg/m^3. Longer term averages for Finglas, Rathmines and Marino from 2015 to 2019 show annual average concentrations of between from 6µg/m^3 to 9µg/m^3. Rathmines monitors both PM_{10} and $PM_{2.5}$ allowing a ratio of PM_{10} to $PM_{2.5}$ to be calculated. The average $PM_{2.5}$/PM_{10} ratio in Rathmines was 0.53 in 2019.

Table 7.16: Trends in Suburban and Urban PM_{10} Concentration (µg/m^3) In Dublin 2015 to 2019

Station	Averaging Period	Year					Limit Value
		2015	2016	2017	2018	2019	
Winetavern Street	Annual Mean PM_{10} (µg/m^3)	14	14	13	14	15	40
	90th%ile 24-hr PM_{10} (µg/m^3)	25	23	21	24	25	50
Rathmines	Annual Mean PM_{10} (µg/m^3)	15	15	13	15	15	40
	90th%ile 24-hr PM_{10} (µg/m^3)	28	28	24	25	24	50
Dún Laoghaire	Annual Mean PM_{10} (µg/m^3)	13	13	12	13	12	40
	90th%ile 24-hr PM_{10} (µg/m^3)	22	22	21	21	21	50
Phoenix Park	Annual Mean PM_{10} (µg/m^3)	12	11	9	11	11	40
	90th%ile 24-hr PM_{10} (µg/m^3)	20	20	16	18	18	50
Ballyfermot	Annual Mean PM_{10} (µg/m^3)	12	11	12	16	14	40
	90th%ile 24-hr PM_{10} (µg/m^3)	22	21	21	24	26	50

7.3.2.2 Site-Specific Monitoring Data

Monitoring of NO_2 in proximity to the Proposed Scheme, and roads that have the potential to be impacted by it, was carried out using passive diffusion tubes. The baseline monitoring study was carried out close to the alignment of the Proposed Scheme, with monitoring focusing on areas of greatest potential impact. The results of the monitoring survey allow for an indicative comparison with the annual limit value for NO_2. Diffusion tubes are a useful tool for assessing the spatial variation of NO_2 as they do not require an electrical connection and allow for multiple locations to be monitored at the same time. The results also provide information on the influence of road sources relative to the prevailing background level of these pollutants in the area. The spatial variation in NO_2 levels away from air emission sources is particularly important, as a complex relationship exists between NO, NO_2 and O_3 leading to a non-linear variation of NO_2concentrations with distance from these sources.

A baseline NO_2 monitoring survey was undertaken as part of the air quality assessment for the BusConnects Dublin - Core Bus Corridors Infrastructure Works (hereafter referred to as the CBC Infrastructure Works). Monitoring at 112 locations was completed for a seven-month data collection period (with six diffusion tube change-overs between 15 November 2019 to 8 June 2020). However, due to COVID-19 impacts on the baseline traffic environment, the final two data sets (16 March 2020 to 8 June 2020) are considered non 'typical' baseline data and therefore are not included in the baseline data set.

Under the TII Air Quality Guidelines (TII 2011) a minimum of one-month baseline monitoring is required, ideally extending to at least three months. The TII Air Quality Guidance specifically states:

> *'Monitoring should ideally be carried out for a period of six months, including both summer and winter periods. However, for practical reasons, the monitoring period may be shorter, but, wherever possible, should extend for at least 3 months and should not be less than 1 month'*.

In general, four months of typical (i.e. prior to COVID-19 traffic conditions) baseline data was collected which achieves the minimum monitoring period recommended in the TII Air Quality Guidelines.

Studies in the UK have shown that diffusion tube monitoring results generally have a positive or negative bias when compared to continuous analysers. This bias is laboratory specific and is dependent on the specific analysis procedures at each laboratory. A diffusion tube bias of 0.77 was obtained for the SOCOTEC laboratory (which analysed the diffusion tubes) from the UK DEFRA website (DEFRA 2018). In addition, three diffusion tubes were co-located with the continuous EPA NO_2 monitors at a number of locations across the CBC Infrastructure Works in order to develop a local bias adjustment factor specific to the Proposed Scheme. A bias adjustment factor was calculated for the St. John's Road (near Heuston Station) monitor of 0.76. A bias adjustment factor of 0.77 was selected for the diffusion tube monitoring results as this value was the more conservative of the laboratory derived and site-specific biases.

In addition to the bias adjustment, an annualisation factor is required as the monitoring period did not extend to a full year. The annualisation factor was prepared as per LAQM (TG22) (DEFRA 2022b). The annualisation factor is necessary as NO_2 concentrations vary across the year and this should be accounted for within the baseline monitoring. The factor was calculated using 2019 monitoring data from Ballyfermot, Winetavern, Davitt Road and St. Johns Road using Box 7.10 of LAQM (TG22). This factor was calculated to be 0.986 for the period of the diffusion tube monitoring.

The eight monitored locations in the vicinity of the Proposed Scheme are listed Table 7.17 and shown in Figure 7.1 in Volume 3 of this EIAR.

Table 7.18 and Diagram 7.4 outlines the results of the baseline NO_2 diffusion tube monitoring over the period 15 November 2019 to 16 March 2020.

No locations recorded an exceedance in the annual mean limit value for NO_2. The highest four-month average concentration was recorded at a roadside location on 278 Kimmage Road (tube no. 11.2). Concentrations at this location were 32.5μg/m^3 or 81% of the annual mean limit value with the bias adjustment and annualisation factor applied. The average concentration across all 8 tubes was 26.6μg/m^3 or 67% of the annual mean limit value.

The lowest concentration was recorded at the City Centre location of 14, Vincent's Street South (tube no. 11.8) (22.8μg/m^3). This location is a residential street 100m back from the Proposed Scheme at R137 Clanbrassil Street Upper.

Based on LAQM (TG22), it can be considered that exceedances of the NO_2one-hour limit value may occur at roadside sites if the annual mean is above 60 μg/m^3 (DEFRA 2022b). None of the eight sites monitored are considered likely to exceed the NO_2 one-hour limit value.

Table 7.17: Air Quality Monitoring Locations

Tube No.	Reference	Site	East (ITM)	North (ITM)
11.1	CBC0011DT001	1 Wainsfort Road	713097	730218
11.2	CBC0011DT002	278 Kimmage Road Lower	713655	730911
11.3	CBC0011DT003	23 Mount Argus Court	714019	731335
11.4	CBC0011DT004	83 Kenilworth Park	714413	731430
11.5	CBC0011DT005	27 Clareville Road	714420	731120
11.6	CBC0011DT006	125 Harold's Cross Road	714693	731909
11.7	CBC0011DT007	73 Grove Road	714957	732408
11.8	CBC0011DT008	14 Vincent's Street South	714998	732798

Table 7.18: Air Quality Monitoring Results

Diffusion Tube No.	Site	15 Nov to 15 Dec 2019 (μg/m³)	15 Dec 2019 to 15 Jan 2020 (μg/m³)	15 Jan to 17 Feb 2020 (μg/m³)	15 Feb to 16 Mar 2020 (μg/m³)	Average	Locally Bias Adjusted and Annualised NO_2 Concentration (μg m^{-3}) Note 1, Note 2
11.1	1 Wainsfort Road	Lost	Lost	Lost	Lost	Lost	Lost
11.2	278 Kimmage Road	Lost	46.0	45.2	37.4	42.9	32.5
11.3	23 Mount Argus Court	50.0	Lost	31.1	19.9	33.7	25.5
11.4	83 Kenilworth Park	36.3	Lost	26.7	Lost	31.5	23.9
11.5	27 Clareville Road	38.1	31.4	32.8	19.6	30.5	23.1
11.6	125 Harold's Cross Road	49.1	42.9	33.0	30.5	38.9	29.5
11.7	73 Grove Road	43.3	41.2	39.8	29.4	38.4	29.2
11.8	14 Vincent's Street South	39.1	29.9	Lost	21.0	30.0	22.8
Average		42.7	38.3	34.8	26.3	35.1	26.6
Max		50.0	46.0	45.2	37.4	42.9	32.5
Min		36.3	29.9	26.7	19.6	30.0	22.8

Note 1: Bias adjustment factor: 0.77, Annualisation factor: 0.986

Note 2: Locally bias adjusted concentrations in bold exceed the 80% threshold value for screening modelling

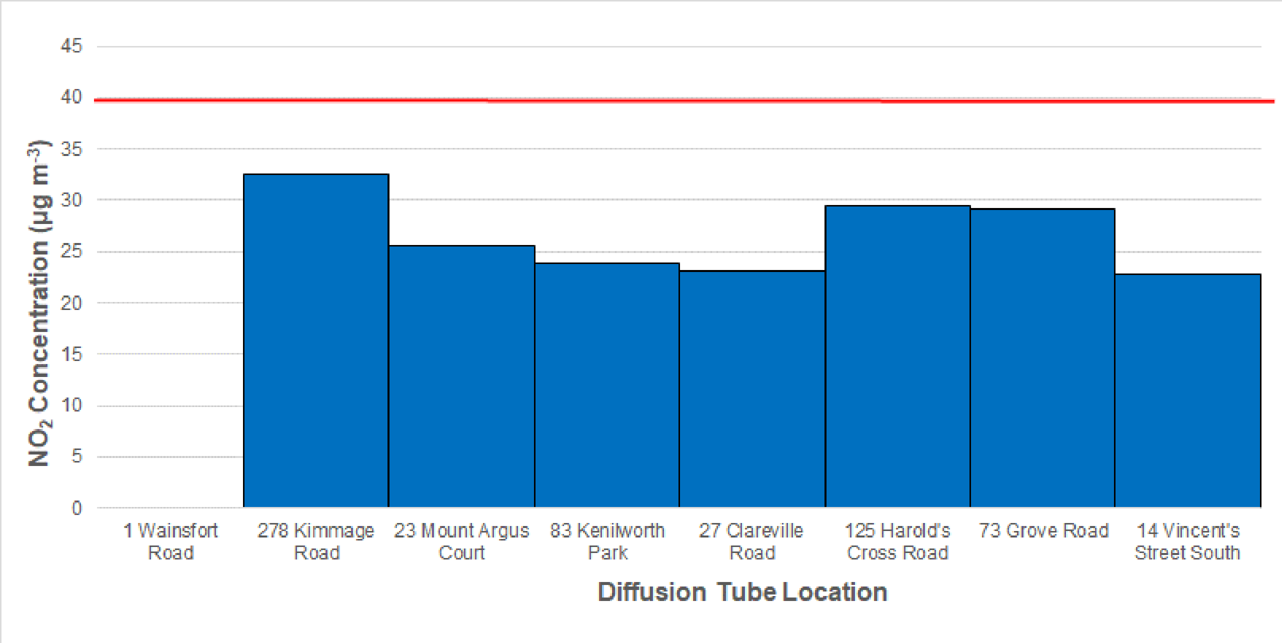

Diagram 7.4: Locally Bias Adjusted and Annualised NO_2 Concentration (µg/m³)

* Annual mean limit value denoted by red line.

7.3.3 Existing Modelled Baseline Scenario

In the Existing Baseline Scenario, the current air quality environment experienced within the study area has been modelled. The Existing Baseline modelling scenario has been modelled using AMDS-Roads for the representative baseline year of 2019, to establish baseline concentrations at receptors within the Proposed Scheme study area. Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24-hour PM_{10} limit value, at selected, most impacted, existing air quality sensitive receptors in the 2019 Existing Baseline scenario are listed in Table 7.19. Locations of these receptors are shown in Figures 7.3 to 7.8, Volume 3 of this EIAR. Statistics for the full list of modelled receptors can be found in Table 1.1 in Appendix A7.1 in Volume 4 of this EIAR).

Table 7.19: Predicted Existing Baseline Scenario Pollutant Statistics at Most Impacted Receptor Locations

Existing Baseline (2019)					
Receptor	Receptor Location (ITM)	Annual Mean Conc. (µg/m³)			No of PM_{10} days > 50 µg/m³
		NO_2	PM_{10}	$PM_{2.5}$	
AQ7	714674,732024	28.5	15.2	10.8	<1
AQ8	714708,732110	30.5	15.3	10.9	<1
AQ31	713870,731222	29.3	15.3	10.9	<1
AQ33	713597,730798	26.1	14.9	10.6	<1
AQ37	713630,730905	27.0	15.1	10.7	<1
AQ40	714863,732387	32.4	15.7	11.1	1
AQ46	713536,730717	26.9	15.0	10.6	<1
AQ48	714812,732326	31.7	15.6	11.0	1
AQ51	715029,733201	33.0	15.8	11.2	1
AQ53	714875,732403	32.5	15.7	11.1	1
AQ56	714884,732459	33.2	15.7	11.1	1

Existing Baseline (2019)					
Receptor	Receptor Location (ITM)	Annual Mean Conc. (µg/m³)			No of PM_{10} days > 50 µg/m³
		NO_2	PM_{10}	$PM_{2.5}$	
AQ58	713973,731312	31.7	15.5	11.0	1
AQ70	714904,732904	31.2	15.5	11.0	<1
AQ71	713665,730965	25.7	14.9	10.6	<1
AQ73	713784,731078	26.8	15.0	10.6	<1
AQ74	714582,731767	28.3	15.2	10.8	<1
AQ79	714736,732112	31.2	15.4	10.9	<1
AQ82	713773,731059	26.3	14.9	10.6	<1
AQ86	714741,732128	31.3	15.5	11.0	1
AQ90	713657,730891	26.1	15.0	10.6	<1
AQ91	714874,732681	32.4	15.8	11.2	1
AQ95	715038,733228	31.5	15.6	11.0	1
AQ98	714868,732748	33.8	15.9	11.2	1
AQ105	713465,730617	29.9	15.5	11.0	1
AQ108	713483,730642	30.2	15.5	11.0	1
AQ115	713812,731135	28.8	15.3	10.8	<1
AQ124	714968,733084	30.4	15.5	11.0	1
AQ131	715024,733168	30.2	15.4	10.9	<1
AQ133	713515,730727	29.3	15.3	10.9	<1
AQ134	713623,730839	26.1	14.9	10.6	<1
AQ138	713527,730748	28.6	15.2	10.8	<1
AQ143	714892,732564	29.9	15.5	11.0	1
AQ144	714997,733092	32.3	15.9	11.2	1
AQ150	714887,732495	32.6	15.6	11.0	1
AQ158	713572,730818	27.1	15.1	10.7	<1
AQ161	714884,732476	33.7	15.7	11.1	1
AQ162	714617,731865	28.0	15.1	10.7	<1
AQ171	713606,730873	26.4	15.0	10.6	<1
AQ173	713515,730683	26.3	14.9	10.6	<1
AQ178	713851,731192	29.2	15.3	10.8	<1
AQ179	714760,732156	31.2	15.6	11.0	1
AQ181	714866,732787	32.0	15.6	11.1	1
AQ184	714867,732767	32.5	15.7	11.1	1
AQ191	714786,732212	32.3	15.6	11.1	1
AQ192	714892,732549	30.0	15.5	11.0	1
AQ194	715012,733120	31.2	15.7	11.1	1
AQ195	714798,732226	30.1	15.3	10.9	<1
AQ212	714880,732870	29.2	15.2	10.8	<1
AQ213	714891,732836	29.5	15.3	10.9	<1
AQ353	715064,733766	40.9	16.8	11.8	1

Existing Baseline (2019)					
Receptor	Receptor Location (ITM)	Annual Mean Conc. (µg/m³)			No of PM_{10} days > 50 µg/m³
		NO_2	PM_{10}	$PM_{2.5}$	
AQ60	714896,732869	37.7	16.4	11.6	1
Air Quality Limit Value Objective		**40**	**40**	**25**	**35**

In the 2019 Existing Baseline scenario, annual mean concentrations of NO_2 are above the relevant national air quality limit value objective at one receptor; one exceedance was modelled on the R137 Patrick Street (AQ353). Concentrations for these receptors can be found in Table 1.1 in Appendix A7.1 (Detailed Modelling Results) in Volume 4 of this EIAR. Some of these have been excluded from results tables in this chapter as these locations do not exceed the NO_2 limit value in the DM or DS scenarios and they experience a negligible impact due to the Proposed Scheme. Annual mean NO_2 concentrations did not exceed 60µg/m³, indicating that exceedances of the NO_2 1-hour mean are unlikely to occur. Annual mean PM_{10} concentrations are below the relevant national air quality limit value objective in 2019 for all modelled receptors. At all receptors, modelling of the maximum 24-hour PM_{10} concentration indicates that there is likely to be no more than one exceedance of the 50µg /m³ ambient limit value compared to the threshold which allows 35 daily exceedances in any one calendar year. Annual mean $PM_{2.5}$ concentrations are also below the relevant national air quality limit value objective for all modelled receptors.

7.4 Potential Impacts

This Section presents the potential impacts that may occur due to the Proposed Scheme, in the absence of mitigation. This informs the need for mitigation or monitoring to be proposed (refer to Section 7.5). Predicted 'residual' impacts taking into account any proposed mitigation are presented in Section 7.6.

7.4.1 Characteristics of the Proposed Scheme

In the context of the Proposed Scheme, the potential air quality impact on the surrounding environment must be considered for two distinct phases:

- Construction Phase; and
- Operational Phase.

7.4.2 Construction Phase

During the Construction Phase of the Proposed Scheme, works will involve predominately utility diversions, road widening works, road excavation works (where required), road and junction reconfiguration and resurfacing works, public realm improvements including landscaping, and construction traffic access routes including movement of machinery and materials within and to and from the three Construction Compounds along the Proposed Scheme.

Other works specific to the Proposed Scheme will include:

- Preparatory and site clearance works including ground investigations and demolition of one bungalow on R137 Clanbrassil Street Upper;
- The setting up of three Construction Compounds; and
- A range of structural works including a boardwalk at Mount Argus as well as footbridges, a retaining wall, and a ramp at Robert Emmet Bridge.

During the Construction Phase, site clearance and preparation, landscaping, road and junction construction works all have the potential to generate dust and gaseous air emissions on-site.

Chapter 5 (Construction) provides a full description of the proposed construction phasing and works for the Proposed Scheme.

For the purposes of the EIAR, seven individual construction sections are set out. Sections may be completed simultaneously and combined in certain areas. Table 5.1 in Chapter 5 (Construction) includes a summary of each section with the estimated time for the completion of works in these areas.

It is envisaged that construction may be completed in the following sections:

- **Section 1:** Lower Kimmage Road from Kimmage Cross Roads to Junction with Harold's Cross Road:
    - **Section 1a:** Kimmage Cross Roads to Ravensdale Park;
    - **Section 1b:** Lower Kimmage Road - Ravensdale Park / Sundrive Road / Harold's Cross Road; and
    - **Section 1c:** Kenilworth Park / Harold's Cross Road Junction.
- **Section 2:** Harold's Cross Road from Harold's Cross Park to Grand Canal;
- **Section 3:** Clanbrassil Street Upper and Lower, and New Street from the Grand Canal to the Patrick Street Junction:
    - **Section 3a:** Grand Canal Bridge / Clanbrassil Street Upper;
    - **Section 3b:** Clanbrassil Street Upper / Clanbrassil Street Lower; and
    - **Section 3c:** Clanbrassil Street Lower / New Street South.

Road works are transient in nature, as the works will progress along the length of the route of the Proposed Scheme. This will include excavation and fill works, structures, and road completion works.

The potential air quality impacts associated with the Construction Phase are set out within Section 7.4.2.1 and Section 7.4.2.2.

7.4.2.1 Construction Dust Assessment

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the sensitivity of the area, as outlined above (Section 7.2.4.4).

The IAQM Guidance (IAQM 2014) outlines the assessment criteria for assessing the impact of dust emissions from construction activities based on both receptor sensitivity and the number of receptors affected. In terms of receptor sensitivity, the study area is characterised as having high, medium and low sensitivity receptors within 350m of the construction activities associated with the Proposed Scheme.

Table 7.11 identifies how the sensitivity of an area may be determined for dust soiling taking into account the number of receptors, the receptor sensitivity and distance from the source. The area in proximity to the Proposed Scheme would be an area of high sensitivity with greater than 100 receptors within 20m of the construction activities.

In addition, the IAQM Guidance outlines the assessment criteria for assessing the impact of PM_{10} emissions from construction activities, based on current annual mean PM_{10} concentration, receptor sensitivity and the number of receptors affected. The current PM_{10} concentration in Zone A locations as reported in Section 7.3.2 is approximately 15µg/m3. Based on the criteria outlined in Table 7.12, the risk to human health from PM_{10} emissions at the nearest residential receptor (high sensitivity, distance less than 20m and with receptor numbers >100) is considered medium under this guidance.

Table 7.13 identifies how the sensitivity of an area may be determined for ecological impacts taking into account the distance from the source to the ecological receptor and the sensitivity of the ecological receptor. The Grand Canal pNHA is an ecological receptor of medium sensitivity in proximity to the Proposed Scheme with a particularly important plant species, where its dust sensitivity is uncertain or unknown within 20m of the construction activities.

The major dust generating activities are divided into four types within the IAQM Guidance to reflect their different potential impacts. These are:

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

7.4.2.1.1 Demolition

Demolition will primarily involve the demolition of one existing residential property at R137 Clanbrassil Street Upper. The dust emission magnitude from demolition can be classified as small, medium or large based on the definitions from the IAQM Guidance (IAQM 2014) as transcribed below:

- **Large:** Total building volume > 50,000m^3 (metres cubed), potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 20 m above ground level;
- **Medium:** Total building volume 20,000m^3 to 50,000m^3, potentially dusty construction material, demolition activities 10m to 20 m above ground level; and
- **Small:** Total building volume < 20,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 10 m above ground, demolition during wetter months.

The dust emission magnitude for the proposed demolition activities can be classified as small as the total building volume is likely to be less than 20,000m^3 and there is low potential for dust release as the demolition will take place from the roof downwards in small sections.

The magnitude for each dust generating activity is combined with the sensitivity of the area to define the risk of dust impacts in the absence of mitigation. The sensitivity of the area is considered to be high for dust soiling and medium for human health impacts. As outlined in Table 7.20, this results in an overall low risk of temporary dust soiling impacts and a low risk of temporary human health impacts as a result of the proposed demolition activities. In relation to ecological impact, as the receptor is of medium sensitivity, the risk associated with the proposed activities is described as low.

Overall, in order to ensure that no dust nuisance occurs during the demolition activities, a range of dust mitigation measures associated with a high risk of dust impacts must be implemented. When the dust mitigation measures detailed in the mitigation section of this Chapter are implemented, fugitive emissions of dust from the site will not have a significant impact at nearby receptors.

Table 7.20: Risk of Dust Impacts - Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

7.4.2.1.2 Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling activities. Activities such as levelling, and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM Guidance (IAQM 2014) as transcribed below:

- **Large:** Total site area > 10,000m^2, 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 2,500m^2 to 10,000m^2, moderately dusty soil type (e.g. silt), 5 to 10 heavy earth moving vehicles active at any one time, formation of bunds 4m to 8 m in height, total material moved 20,000 tonnes to 100,000 tonnes; and
- **Small:** Total site area < 2,500m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <20,000 tonnes, earthworks during wetter months.

The dust emission magnitude for the proposed earthwork activities required for the Proposed Scheme can be classified conservatively as large. The proposed Construction Compounds, plus the Proposed Scheme construction site areas will have a total site area greater than 10,000m² and there is also likely to be potentially dusty material type such as clay.

The sensitivity of the area is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. The sensitivity of the area would be described as high for dust soiling and medium for human health impacts. As outlined in Table 7.21, this results in an overall high risk of temporary dust soiling impacts and an overall medium risk of temporary human health impacts as a result of the proposed earthworks activities. In relation to ecological impact, as the receptor is of medium sensitivity, the risk associated with the proposed earthwork activities is described as medium.

Overall, in order to ensure that no dust nuisance occurs during the proposed earthworks activities, a range of dust mitigation measures associated with a high risk of dust impacts must be implemented. When the dust mitigation measures detailed in the mitigation section of this Chapter are implemented, fugitive emissions of dust from the site will not have a significant impact at nearby receptors.

Table 7.21: Risk of Dust Impacts - Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

7.4.2.1.3 Construction

Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** Total building volume >100,000m³, on-site concrete batching, sandblasting;
- **Medium:** Total building volume 25,000m³ to 100,000m³, potentially dusty construction material (e.g. concrete), on-site concrete batching; and
- **Small:** Total building volume <25,000m³, construction material with low potential for dust release (e.g. metal cladding or timber).

The dust emission magnitude for the proposed construction activities can be classified as small, as the total building volume will be less than 25,000m³ (retaining wall for Robert Emmet Bridge) while the key construction activities after earthworks will be the installation of the paving materials and pre-cast units for the footbridges, which have low potential for dust release.

The sensitivity of the area is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 7.22, this results in an overall low risk of temporary dust soiling impacts and an overall low risk of temporary human health impacts as a result of the proposed construction activities. In relation to ecological impact, as the receptor is of medium sensitivity, the risk associated with the proposed construction activities is described as low.

Overall, in order to ensure that no dust nuisance occurs during the construction activities, a range of dust mitigation measures associated with a low risk of dust impacts will be implemented. When the dust mitigation measures detailed in the mitigation section of this Chapter are implemented, fugitive emissions of dust from the site will not have a significant impact at nearby receptors.

Table 7.22: Risk of Dust Impacts - Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

7.4.2.1.4 Trackout

Trackout is defined as the transport of dust and dirt from the construction activity onto the public road network, where it may be deposited and then re-suspended by vehicles using the roads (IAQM 2014). Factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium:** 10 to 50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m to 100m; and
- **Small:** <10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

The dust emission magnitude for the proposed trackout can be classified as medium with between 10 – 50 HDV outward movements in any one day, and with surface material with a low potential for dust release.

The sensitivity of the area is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 7.23, this results in an overall medium risk of temporary dust soiling impacts and an overall medium risk of temporary human health impacts as a result of the proposed trackout activities. In relation to ecological impact, as the receptor is of medium sensitivity, the risk associated with the proposed trackout is described as medium.

Overall, in order to ensure that no dust nuisance occurs during the trackout activities, a range of dust mitigation measures associated with a medium risk of dust impacts must be implemented. When the dust mitigation measures detailed in the mitigation section of this Chapter are implemented, fugitive emissions of dust from the site will not have a significant impact at nearby receptors.

Table 7.23: Risk of Dust Impacts - Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

7.4.2.1.5 Summary of Potential Dust Impacts

The risk of dust impacts as a result of the Proposed Scheme are summarised in Table 7.24, for each activity. The magnitude of risk determined is used to prescribe the level of site-specific mitigation required for each activity in order to prevent significant impacts occurring.

In accordance with the EPA Guidelines (EPA 2022) the impacts associated with the Construction Phase dust emissions pre-mitigation will overall be Negative, Not Significant and Short-Term.

Table 7.24: Summary of Dust Impact Risk Used to Define Site-Specific Mitigation

Potential Impact	Dust Emission Magnitude			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low risk	High Risk	Low Risk	Medium Risk
Human Health	Low risk	Medium Risk	Low Risk	Medium Risk
Ecological	Low risk	Medium Risk	Low Risk	Medium Risk

7.4.2.2 Construction Traffic Assessment

In addition to direct impacts from the construction works including the proposed Construction Compounds, there is also the potential for air impacts from construction traffic along public roads.

A detailed analysis of construction traffic volumes has been conducted to determine the expected HDV movements required to transport the materials extracted and delivered to site. A total of three public roads have been identified as required construction access routes where construction traffic will be permitted to travel along. Whilst the overall Construction Phase is forecast as 18 months, construction traffic movements are assumed to occur over a 12-month period along construction access routes accessing specific work zones as a worst-case. For national and regional roads serving multiple work zones, a Construction Phase of 18 months has been assumed.

Traffic volumes for the base scenario are based on the 2024 DM flows projected along the local road network. These are AADT flows with percentage HGVs flows. An additional 88 HDV vehicles per day associated with construction traffic along each road including construction deliveries and earthworks material haulage are added to the base traffic volumes. The estimated construction traffic volumes are based on the peak Construction Phase volumes and are therefore, a worst-case assumption. In reality the Proposed Scheme will be constructed in phases with lower volumes and the corridor of the Proposed Scheme will be used for a large bulk of construction delivery vehicles along its route.

In order to determine the potential air quality impacts associated with additional construction traffic on the identified construction access routes, a comparison between ambient air concentrations for the 2024 DMscenario and the 2024 DS (construction) scenario was carried out.

7.4.2.2.1 ‘Do Minimum’ Scenario

The DM is a defined scenario within the traffic modelling exercise in Chapter 6 (Traffic & Transport) and is based on the likely conditions of the road network with all major committed transportation schemes in place that will impact on the use of public transport and private car, not including construction traffic associated with the Proposed Scheme. The output of this analysis and its impact on air quality has been modelled using AMDS-Roads for the construction year of 2024. Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24-hour PM_{10} limit value objective at all modelled receptors can be found in Table 2.1 (Appendix A7.1 in Volume 4 of this EIAR). Locations of these receptors are shown in Figures 7.6 to 7.8, Volume 3 of this EIAR. The Proposed Scheme will be overall negligible in terms of the annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations at all modelled receptors, and as such there are no most impacted receptors. ‘Most impacted’ refers to those receptors with non-negligible impacts due to the Construction Phase of the Proposed Scheme. All results are presented in Appendix A7.1 in Volume 4 of this EIAR.

In the 2024 DM scenario, annual mean concentrations of NO_2 will be above the relevant national air quality limit value objective at one receptor; one exceedance was modelled on R137 Patrick Street (AQ353). Concentrations for this receptor can be found in Table 2.1 (Appendix A7.1, Volume 4 of this EIAR). It has been excluded from this section as this location will experience a negligible impact due to the Proposed Scheme and is therefore not considered a most impacted receptor. Annual mean NO_2 concentrations did not exceed 60µg/m^3, indicating that exceedances of the NO_2 1-hour mean are unlikely to occur. Annual mean PM_{10} concentrations are below the relevant national air quality limit value objective for all modelled receptors. At all receptors, modelling of the maximum 24-hour PM_{10} concentration indicated that there is likely to be no more than one exceedance of the

$50\mu g/m^3$ ambient limit value compared to the threshold which allows 35 daily exceedances in any one calendar year. Annual mean $PM_{2.5}$ concentrations are also below the relevant national air quality limit value objective for all modelled receptors.

7.4.2.2.2 'DS' Scenario

The Do Something is a defined scenario within the traffic modelling exercise in Chapter 6 (Traffic & Transport) and is based on the likely conditions of the road network with all major committed transportation schemes in place that will impact on the use of public transport and private car, including the construction traffic associated with the Proposed Scheme. The output of this analysis and its impact on air quality has been modelled using AMDS-Roads for the construction year of 2024 in line with the methodology set out in Section 7.2.4.1.2. Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24-hour PM_{10} limit value at all modelled receptors can be found in Table 2.2 (Appendix A7.1 in Volume 4 of this EIAR). Locations of these receptors are shown in Figures 7.6 to 7.8, Volume 3 of this EIAR. The Proposed Scheme will be overall negligible in terms of the annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations at all modelled receptors and as such, there are therefore no most impacted receptors. 'Most impacted' refers to those receptors with non-negligible impacts due to the Construction Phase of the Proposed Scheme. All results are presented in Appendix A7.1 in Volume 4 of this EIAR.

In the 2024 DS scenario, annual mean concentrations of NO_2 will be above the relevant national air quality limit value objective at one receptor; one exceedance was modelled on R137 Patrick Street (AQ353). This is no change from the DM scenario. Concentrations for this receptor can be found in Table 2.3 (Appendix A7.1 in Volume 4 of this EIAR). It has been excluded from this section as this location will experience a negligible impact due to the Proposed Scheme and is therefore not considered a most impacted receptor. Annual mean NO_2 concentrations did not exceed $60\mu g/m^3$, indicating that exceedances of the NO_2 1-hour mean are unlikely to occur. Annual mean PM_{10} concentrations are below the relevant national air quality limit value objective for all modelled receptors. At all receptors, modelling of the maximum 24-hour PM_{10} concentration indicated that there is likely to be no more than one exceedance of the $50\mu g/m^3$ ambient limit value compared to the threshold which allows 35 daily exceedances in any one calendar year. Annual mean $PM_{2.5}$ concentrations are also below the relevant national air quality limit value objective for all modelled receptors.

7.4.2.2.3 Comparison of DS with DM

Table 2.3 (Appendix A7.1 in Volume 4 of this EIAR) provides the predicted change in and impact on pollutant concentrations, between the DM and DS in 2024. The significance of the changes in the concentration of each of the ambient receptors has been determined in the context of the TII Air Quality Guidelines (TII 2011).

As shown in Table 2.3 (Appendix A7.1 in Volume 4 of this EIAR) and Figure 7.6 in Volume 3 of this EIAR, the Proposed Scheme will be overall negligible in terms of the annual mean NO_2 concentration, with all receptors experiencing a negligible impact. As shown Table 2.3 (Appendix A7.1 in Volume 4 of this EIAR) and Figure 7.7 in Volume 3 of this EIAR, the Proposed Scheme will be overall neutral in terms of annual mean PM_{10} concentrations, with all receptors experiencing a negligible impact. As shown in Table 2.3 (Appendix A7.1 in Volume 4 of this EIAR) and Figure 7.8 in Volume 3 of this EIAR, the Proposed Scheme will be overall neutral in terms of the annual mean $PM_{2.5}$ concentration with all receptors experiencing a negligible impact.

In accordance with the EPA Guidelines (EPA 2022) the impacts associated with the Construction Phase traffic emissions pre-mitigation will be overall Neutral and Short-Term.

7.4.2.2.4 Ecological Assessment

An assessment of the impact of the Proposed Scheme has been undertaken using the approach outlined in A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (IAQM 2020). The guidance states that where the PEC is less than 70% of the long-term critical level / load, PC is likely to be insignificant. Where the process contribution is greater than 1% of the critical level / load it is recommended that the project ecologist be consulted.

The impact of the Proposed Scheme on the nearby ecologically sensitive areas within 200m of roads impacted by the Proposed Scheme, as defined in Section 7.2.4.1, is outlined in Table 7.25. The annual mean NO_X concentration has been compared to the critical level of 30 µg/m3 at each of the designated habitat sites. All sites exceed the critical level for NO_X in both the DM and the DS scenarios.

Nitrogen deposition levels have been compared to the lower and higher critical loads for the designated habitat sites in Table 7.26. All sites are below the lower critical load for the designated habitat site in both the DM and the DS scenarios.

In accordance with the EPA Guidelines (EPA 2022) the impacts associated with the Construction Phase traffic emissions pre-mitigation will be overall Negative, Slight and Short-Term.

Table 7.25: Significance of Impacts at Key Ecological Receptors (NO_X Annual Mean Concentration In 2024)

Annual Mean NO_X In 2024 At Closest Point Within Ecological Site To Road							
Receptor	Receptor Location (ITM)	Do Minimum (µg/m³)	Distance from road beyond which concentration is below critical level (30 µg/m³) (m)	Do Something (µg/m³)	Distance from road beyond which concentration is below critical level (30 µg/m³) (m)	Impact (DS – DM) (µg/m³)	Change as a percentage of critical level (30 µg/m³) (%)
Grand Canal pNHA (Camac Bridge, western side)	713666, 732686	85.6	>200m	85.8	>200m	0.2	1%
Grand Canal pNHA (Camac Bridge, eastern side)	713694, 732692	71.1	>200m	71.3	>200m	0.2	1%
Grand Canal pNHA (Canal Road)	715821, 732513	65.5	>200m	65.2	>200m	-0.4	-1%
Grand Canal pNHA (Cheltenham Place)	715672, 732497	55.5	>200m	55.6	>200m	0.1	0%
Grand Canal pNHA (Dolphin Road, western side)	713332, 732847	62.6	>200m	62.7	>200m	0.2	1%
Grand Canal pNHA (Dolphin Road, eastern side)	713571, 732721	61.5	>200m	61.5	>200m	-0.1	0%
Grand Canal pNHA (Emmet Bridge, western side)	714864, 732443	84.7	>200m	79.6	>200m	-5.0	-17%
Grand Canal pNHA (Emmet Bridge, eastern side)	714874, 732441	100.3	>200m	93.6	>200m	-6.7	-22%
Grand Canal pNHA (Grove Road, western side)	714919, 732420	63.1	>200m	62.3	>200m	-0.8	-3%
Grand Canal pNHA (Grove Road, centre)	715221, 732446	53.7	>200m	53.5	>200m	-0.2	-1%
Grand Canal pNHA (Grove Road, eastern side)	715565, 732488	56.5	>200m	56.7	>200m	0.1	0%

Annual Mean NO_X In 2024 At Closest Point Within Ecological Site To Road							
Receptor	**Receptor Location (ITM)**	**Do Minimum ($\mu g/m^3$)**	**Distance from road beyond which concentration is below critical level (30 $\mu g/m^3$) (m)**	**Do Something ($\mu g/m^3$)**	**Distance from road beyond which concentration is below critical level (30 $\mu g/m^3$) (m)**	**Impact (DS – DM) ($\mu g/m^3$)**	**Change as a percentage of critical level (30 $\mu g/m^3$) (%)**
Grand Canal pNHA (Herberton Bridge, western side)	713317, 732901	55.9	180m	55.9	>200m	0.0	0%
Grand Canal pNHA (Herberton Bridge, eastern side)	713327, 732858	66.5	>200m	66.5	>200m	0.1	0%
Grand Canal pNHA (Parnell Road, western side)	714169, 732549	53.6	>200m	53.1	>200m	-0.5	-2%
Grand Canal pNHA (Parnell Road, eastern side)	714806, 732427	67.5	>200m	67.1	>200m	-0.5	-2%
Grand Canal pNHA (Sally's Bridge, western side)	714295, 732544	64.5	>200m	64.5	>200m	0.1	0%
Grand Canal pNHA (Sally's Bridge, eastern side)	714305, 732541	74.6	>200m	74.6	>200m	0.1	0%

Table 7.26: Significance of Impacts at Key Ecological Receptors (Nitrogen Deposition In 2024)

Annual Mean N Deposition In 2024 At Closest Point Within Ecological Site To Road									
Receptor	**Receptor Location (ITM)**	**Lower critical load for most sensitive feature (kgN/ha/yr)**	**Do Minimum (kgN/ha/yr)**	**Distance from road beyond which deposition is below critical load (m)**	**Do Something (kgN/ha/yr)**	**Distance from road beyond which deposition is below critical load (m)**	**Change relative to lower critical load (%)**	**Distance from road beyond which the change is <1% (m)**	**Change in deposition (kgN/ha/yr)**
Grand Canal pNHA (Camac Bridge, western side)	713666, 732686	5	4.7	0m	4.7	0m	0%	0m	<0.1
Grand Canal pNHA (Camac Bridge, eastern side)	713694, 732692	5	4.1	0m	4.1	0m	0%	0m	<0.1
Grand Canal pNHA (Canal Road)	715821, 732513	5	3.8	0m	3.8	0m	0%	0m	<0.1
Grand Canal pNHA (Cheltenham Place)	715672, 732497	5	3.4	0m	3.4	0m	0%	0m	<0.1
Grand Canal pNHA (Dolphin Road, western side)	713332, 732847	5	3.7	0m	3.7	0m	0%	0m	<0.1

Annual Mean N Deposition In 2024 At Closest Point Within Ecological Site To Road									
Receptor	Receptor Location (ITM)	Lower critical load for most sensitive feature (kgN/ha/yr)	Do Minimum (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Do Something (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Change relative to lower critical load (%)	Distance from road beyond which the change is <1% (m)	Change in deposition (kgN/ha/yr)
Grand Canal pNHA (Dolphin Road, eastern side)	713571, 732721	5	3.6	0m	3.6	0m	0%	0m	<0.1
Grand Canal pNHA (Emmet Bridge, western side)	714864, 732443	5	4.7	0m	4.4	0m	-4%	0m	-0.2
Grand Canal pNHA (Emmet Bridge, eastern side)	714874, 732441	5	5.3	10m	5.0	10m	-5%	0m	-0.3
Grand Canal pNHA (Grove Road, western side)	714919, 732420	5	3.7	0m	3.7	0m	-1%	0m	<0.1
Grand Canal pNHA (Grove Road, centre)	715221, 732446	5	3.3	0m	3.3	0m	0%	0m	<0.1
Grand Canal pNHA (Grove Road, eastern side)	715565, 732488	5	3.4	0m	3.4	0m	0%	0m	<0.1
Grand Canal pNHA (Herberton Bridge, western side)	713317, 732901	5	3.4	0m	3.4	0m	0%	0m	<0.1
Grand Canal pNHA (Herberton Bridge, eastern side)	713327, 732858	5	3.9	0m	3.9	0m	0%	0m	<0.1
Grand Canal pNHA (Parnell Road, western side)	714169, 732549	5	3.3	0m	3.2	0m	-1%	0m	<0.1
Grand Canal pNHA (Parnell Road, eastern side)	714806, 732427	5	3.9	0m	3.9	0m	0%	0m	<0.1
Grand Canal pNHA (Sally's Bridge, western side)	714295, 732544	5	3.8	0m	3.8	0m	0%	0m	<0.1
Grand Canal pNHA (Sally's Bridge, eastern side)	714305, 732541	5	4.2	0m	4.2	0m	0%	0m	<0.1

7.4.2.3 Regional Air Quality Assessment

The potential changes in regional air emissions due to the Construction Phase traffic impacts of the Proposed Scheme have been assessed using the NTA Environmental Appraisal Tool, which is based on ENEVAL. ENEVAL measures the regional emissions associated with road transport based on the various road links and their corresponding emissions.

Pollutant emissions (in tonnes) produced in both the DM and DS scenarios during the Construction Year (2024) of the Construction Phase are shown in Table 7.27. The Proposed Scheme will be overall detrimental, with increases in emissions of all pollutants modelled. The majority of these increases will result from redistribution of vehicles onto other longer routes, while construction of the Proposed Scheme takes place. To produce these emissions estimates, the traffic model and therefore ENEVAL have applied the peak construction day in 2024 across the whole year. Emissions are therefore worst-case and likely to be lower in reality.

Table 7.27: Construction Phase Regional Pollutant Emissions (tonnes) – Construction Year (2024)

Scenario	Vehicle Class	NO_X (tonnes)	NO_2 (tonnes)	PM_{10} (tonnes)	$PM_{2.5}$ (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)	Butadiene (tonnes)
DM	Car	1624	489	18	18	86	1951	1.5	1.2
DS		1625	489	18	18	87	1952	1.5	1.2
Change		0.9	0.3	0.01	0.01	0.05	0.6	0.001	0.001
% Change		0.06%	0.05%	0.06%	0.06%	0.06%	0.03%	0.05%	0.1%
DM	Goods	1436	408	11	11	43	223	0.4	0.5
DS		1437	408	11	11	43	223	0.4	0.5
Change		0.5	0.1	0.002	0.002	0.02	0.1	0.0003	0.0002
% Change		0.03%	0.03%	0.02%	0.02%	0.04%	0.05%	0.1%	0.05%
DM	Urban Bus	44	4.5	0.7	0.7	1.95	8.86	0	0.05
DS		44	4.5	0.7	0.7	1.95	8.87	0	0.05
Change		0.1	0.01	0.001	0.001	0.003	0.01	0	0.0001
% Change		0.2%	0.2%	0.1%	0.1%	0.1%	0.2%	0%	0.1%
DM	**Total**	**3105**	**901**	**30**	**29**	**132**	**2183**	**1.8**	**1.7**
DS		**3106**	**902**	**30**	**29**	**132**	**2184**	**1.8**	**1.7**
Change		**1.4**	**0.4**	**0.01**	**0.01**	**0.1**	**0.7**	**0.001**	**0.001**
% Change		**0.05%**	**0.04%**	**0.04%**	**0.04%**	**0.05%**	**0.03%**	**0.06%**	**0.07%**

In accordance with the EPA Guidelines (EPA 2022), the regional impacts associated with the Construction Phase traffic emissions (pre-mitigation) will be overall Neutral, and Short-Term.

7.4.3 Operational Phase

7.4.3.1 'Do Minimum' Scenario

The DM is a defined scenario within the traffic modelling exercise in Chapter 6 (Traffic & Transport) and is based on the likely conditions of the road network with all major committed transportation schemes in place that will impact on the use of public transport and private car, not including the Proposed Scheme. The output of this analysis and its impact on air quality has been modelled using AMDS-Roads for the Opening Year (2028). Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24-hour PM_{10} limit value objective, at selected worst-case existing air quality sensitive receptors in the 2028 DM scenario are listed in Table 7.28. Locations of these receptors are shown in Figure 7.3 to Figure 7.5 in Volume 3 of this EIAR. Statistics for the full list of modelled receptors can be found in Table 3.1 in Appendix A7.1 in Volume 4 of this EIAR). 'Most impacted' refers to those receptors with non-negligible impacts due to the Operational Phase of the Proposed Scheme.

Table 7.28: Predicted 2028 Do Minimum Scenario Pollutant Statistics at Most Impacted Receptor Locations

DM (2028)					
Receptor	Receptor Location (ITM)	Annual Mean Conc. (µg/m^3)			No of PM_{10} Days > 50 µg/m^3
		NO_2	PM_{10}	$PM_{2.5}$	
AQ7	714674,732024	28.2	15.2	10.7	<1
AQ8	714708,732110	30.2	15.3	10.8	<1
AQ31	713870,731222	28.8	15.2	10.7	<1
AQ33	713597,730798	25.8	14.9	10.5	<1
AQ37	713630,730905	26.6	15.0	10.6	<1
AQ40	714863,732387	32.5	15.6	11.0	1
AQ46	713536,730717	26.5	14.9	10.6	<1
AQ48	714812,732326	31.6	15.5	10.9	1
AQ51	715029,733201	35.0	15.9	11.2	1
AQ53	714875,732403	32.8	15.6	11.0	1
AQ56	714884,732459	33.5	15.6	11.0	1
AQ58	713973,731312	31.1	15.4	10.9	<1
AQ70	714904,732904	32.4	15.5	10.9	<1
AQ71	713665,730965	25.4	14.9	10.5	<1
AQ73	713784,731078	26.4	14.9	10.6	<1
AQ74	714582,731767	27.9	15.1	10.7	<1
AQ79	714736,732112	30.9	15.4	10.8	<1
AQ82	713773,731059	26.0	14.9	10.5	<1
AQ86	714741,732128	31.1	15.4	10.9	<1
AQ90	713657,730891	25.8	14.9	10.5	<1
AQ91	714874,732681	32.7	15.7	11.0	1
AQ95	715038,733228	33.2	15.7	11.0	1
AQ98	714868,732748	35.9	15.9	11.1	1
AQ105	713465,730617	29.1	15.4	10.8	<1
AQ108	713483,730642	29.5	15.4	10.8	<1
AQ115	713812,731135	28.3	15.2	10.7	<1
AQ124	714968,733084	30.7	15.5	10.9	1
AQ131	715024,733168	32.1	15.5	10.9	1
AQ133	713515,730727	28.8	15.2	10.7	<1
AQ134	713623,730839	25.8	14.9	10.5	<1
AQ138	713527,730748	28.1	15.1	10.7	<1
AQ143	714892,732564	30.2	15.5	10.9	1
AQ144	714997,733092	32.5	15.9	11.1	1
AQ150	714887,732495	32.9	15.5	10.9	1
AQ158	713572,730818	26.7	15.0	10.6	<1
AQ161	714884,732476	33.9	15.6	11.0	1
AQ162	714617,731865	27.6	15.1	10.6	<1
AQ171	713606,730873	26.1	14.9	10.5	<1

DM (2028)					
Receptor	Receptor Location (ITM)	Annual Mean Conc. (µg/m³)			No of PM_{10} Days > 50 µg/m³
		NO_2	PM_{10}	$PM_{2.5}$	
AQ173	713515,730683	25.9	14.8	10.5	<1
AQ178	713851,731192	28.7	15.2	10.7	<1
AQ179	714760,732156	31.2	15.5	10.9	1
AQ181	714866,732787	34.3	15.6	11.0	1
AQ184	714867,732767	34.7	15.7	11.0	1
AQ191	714786,732212	32.3	15.6	11.0	1
AQ192	714892,732549	30.3	15.5	10.9	<1
AQ194	715012,733120	31.6	15.5	10.9	1
AQ195	714798,732226	30.0	15.3	10.8	<1
AQ212	714880,732870	30.1	15.2	10.8	<1
AQ213	714891,732836	30.6	15.3	10.8	<1
AQ353	715064,733766	41.3	16.6	11.6	1
AQ60	714896,732869	39.6	16.4	11.5	1
Air Quality Limit Value Objective		**40**	**40**	**25**	**35**

In the 2028 DM scenario, annual mean concentrations of NO_2 are above the relevant national air quality limit value at one receptor; R137 Patrick Street (AQ353). Concentrations at all receptors with exceedances can be found in Table 3.1 in Appendix A7.1 (Detailed Modelling Results) in Volume 4 of this EIAR. Some of these receptors have been excluded from this section as these locations experience a negligible impact due to the Proposed Scheme and are therefore not considered a most impacted receptor. Annual mean NO_2 concentrations do not exceed 60µg/m³, indicating that exceedances of the NO_2 1-hour mean are unlikely to occur. Annual mean PM_{10} concentrations are below the relevant national air quality limit value objective for all modelled receptors. At all receptors, modelling of the maximum 24-hour PM_{10} concentration indicates that there is likely to be no more than one exceedance of the 50 µg /m³ ambient limit value compared to the threshold which allows 35 daily exceedances in any one calendar year. Annual mean $PM_{2.5}$ concentrations are also below the relevant national air quality limit value objective for all modelled receptors. Reported concentrations are lower in 2028 due to the assumed improvements in vehicle emissions rates between now and then.

7.4.3.2 'Do Something' Scenario

The DS is a defined scenario within the traffic modelling exercise in Chapter 6 (Traffic & Transport) and is based on the likely conditions of the road network with all major committed transportation schemes in place that will impact on the use of public transport and private car, including the Proposed Scheme. The output of this analysis and its impact on air quality has been modelled using AMDS-Roads for the opening year of 2028 in line with the methodology set out in Section 7.2.4.1.2. Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24-hour PM_{10} limit value, at selected most impacted air quality sensitive receptors, both along the Proposed Scheme and on routes affected by traffic diversions in the 2028 DS scenario are listed in Table 7.29. Locations of these receptors are shown in Figure 7.3 to Figure 7.5 in Volume 3 of this EIAR. Statistics for the full list of modelled receptors can be found in Table 3.2 (Appendix A7.1 in Volume 4 of this EIAR). 'Most impacted' refers to those receptors with non-negligible impacts due to the Operational Phase of the Proposed Scheme.

Table 7.29: Predicted 2028 Do Something Pollutant Statistics at Most Impacted Receptor Locations

DS (2028)					
Receptor	Receptor Location (ITM)	Annual Mean Conc. (µg/m^3)			No of PM_{10} Days > 50 µg/m^3
		NO_2	PM_{10}	$PM_{2.5}$	
AQ7	714674,732024	23.5	14.6	10.3	<1
AQ8	714708,732110	26.8	14.9	10.6	<1
AQ31	713870,731222	22.9	14.4	10.3	<1
AQ33	713597,730798	21.3	14.3	10.1	1
AQ37	713630,730905	21.4	14.3	10.2	1
AQ40	714863,732387	30.1	15.2	10.7	<1
AQ46	713536,730717	21.8	14.3	10.2	<1
AQ48	714812,732326	29.3	15.1	10.6	<1
AQ51	715029,733201	30.5	15.4	10.8	<1
AQ53	714875,732403	30.6	15.3	10.8	<1
AQ56	714884,732459	30.2	15.2	10.7	<1
AQ58	713973,731312	25.7	14.7	10.4	<1
AQ70	714904,732904	30.4	15.2	10.8	<1
AQ71	713665,730965	21.2	14.2	10.1	1
AQ73	713784,731078	21.7	14.3	10.2	1
AQ74	714582,731767	23.5	14.5	10.3	<1
AQ79	714736,732112	26.6	14.9	10.5	<1
AQ82	713773,731059	21.6	14.3	10.2	1
AQ86	714741,732128	27.4	15.0	10.6	<1
AQ90	713657,730891	21.4	14.3	10.2	1
AQ91	714874,732681	30.2	15.3	10.8	<1
AQ95	715038,733228	29.7	15.3	10.8	<1
AQ98	714868,732748	33.2	15.6	11.0	1
AQ105	713465,730617	23.1	14.5	10.3	<1
AQ108	713483,730642	22.9	14.4	10.3	<1
AQ115	713812,731135	22.1	14.3	10.2	<1
AQ124	714968,733084	28.5	15.2	10.7	<1
AQ131	715024,733168	28.8	15.2	10.7	<1
AQ133	713515,730727	21.9	14.3	10.2	<1
AQ134	713623,730839	21.3	14.2	10.1	1
AQ138	713527,730748	21.7	14.3	10.2	1
AQ143	714892,732564	27.3	15.1	10.7	<1
AQ144	714997,733092	30.3	15.6	10.9	1
AQ150	714887,732495	29.1	15.1	10.6	<1
AQ158	713572,730818	21.5	14.3	10.2	1
AQ161	714884,732476	29.8	15.1	10.7	<1
AQ162	714617,731865	22.7	14.5	10.3	<1
AQ171	713606,730873	21.3	14.3	10.2	1

DS (2028)					
Receptor	Receptor Location (ITM)	Annual Mean Conc. (µg/m^3)			No of PM_{10} Days > 50 µg/m^3
		NO_2	PM_{10}	$PM_{2.5}$	
AQ173	713515,730683	21.7	14.3	10.2	1
AQ178	713851,731192	22.4	14.4	10.2	<1
AQ179	714760,732156	28.0	15.1	10.6	<1
AQ181	714866,732787	30.8	15.3	10.8	<1
AQ184	714867,732767	31.5	15.4	10.9	<1
AQ191	714786,732212	28.1	15.1	10.6	<1
AQ192	714892,732549	27.2	15.1	10.6	<1
AQ194	715012,733120	29.5	15.3	10.8	<1
AQ195	714798,732226	26.8	14.9	10.5	<1
AQ212	714880,732870	28.1	15.0	10.6	<1
AQ213	714891,732836	28.5	15.1	10.7	<1
AQ353	715064,733766	39.9	16.4	11.5	1
AQ60	714896,732869	35.3	15.9	11.1	1
Air Quality Limit Value Objective		**40**	**40**	**25**	**35**

In the 2028 DS scenario, annual mean concentrations of NO_2 are below the relevant national air quality limit value at all modelled receptors. This is a decrease from the one predicted exceedance modelled in the DM scenario. Concentrations at all receptors with exceedances can be found in Table 3.2 in Appendix A7.1 (Detailed Modelling Results) in Volume 4 of this EIAR. Some of these receptors have been excluded from this section as these locations experience a negligible impact due to the Proposed Scheme and are therefore not considered a most impacted receptor. Annual mean NO_2 concentrations did not exceed 60µg/m^3, indicating that exceedances of the NO_2 1-hour mean are unlikely to occur. Annual mean PM_{10} concentrations are below the relevant national air quality limit value for all modelled receptors. At all receptors, modelling of the maximum 24-hour PM_{10} concentration indicated that there is likely to be no more than one exceedance of the 50µg /m^3 ambient limit value compared to the threshold which allows 35 daily exceedances in any one calendar year. Annual mean $PM_{2.5}$ concentrations are also below the relevant national air quality limit value for all modelled receptors.

7.4.3.3 Comparison of Do Something with Do Minimum

Table 7.30 provides the predicted change in and impact on pollutant concentrations, between the DM and DS in 2028. Statistics for the full list of modelled receptors can be found in Table 3.3 in Appendix A7.1 in Volume 4 of this EIAR and Figure 7.3 to Figure 7.5 in Volume 3 of this EIAR. ‘Most impacted’ refers to those receptors with non-negligible impacts due to the Operational Phase of the Proposed Scheme.

Table 7.30: Predicted Changes in Operational DM and DS and Impact Significance Criteria at Most Impacted Receptor Locations

Receptor	Receptor Location (ITM)	Change in Annual Mean Conc. (µg/m³)			Change in No of PM_{10} Days > 50 µg/m³	Impact on Annual Mean Conc.		
		NO_2	PM_{10}	$PM_{2.5}$		NO_2	PM_{10}	$PM_{2.5}$
AQ7	714674,732024	-4.7	-0.6	-0.4	<1	Slight Beneficial	Negligible	Negligible
AQ8	714708,732110	-3.4	-0.4	-0.2	<1	Slight Beneficial	Negligible	Negligible
AQ31	713870,731222	-5.9	-0.8	-0.5	<1	Slight Beneficial	Negligible	Negligible
AQ33	713597,730798	-4.4	-0.6	-0.4	<1	Slight Beneficial	Negligible	Negligible
AQ37	713630,730905	-5.3	-0.8	-0.5	<1	Slight Beneficial	Negligible	Negligible
AQ40	714863,732387	-2.4	-0.4	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ46	713536,730717	-4.7	-0.6	-0.4	<1	Slight Beneficial	Negligible	Negligible
AQ48	714812,732326	-2.3	-0.4	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ51	715029,733201	-4.5	-0.5	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ53	714875,732403	-2.2	-0.4	-0.2	<1	Slight Beneficial	Negligible	Negligible
AQ56	714884,732459	-3.3	-0.4	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ58	713973,731312	-5.4	-0.7	-0.5	<1	Slight Beneficial	Negligible	Negligible
AQ70	714904,732904	-2.0	-0.2	-0.1	<1	Slight Beneficial	Negligible	Negligible
AQ71	713665,730965	-4.1	-0.6	-0.4	<1	Slight Beneficial	Negligible	Negligible
AQ73	713784,731078	-4.7	-0.6	-0.4	<1	Slight Beneficial	Negligible	Negligible
AQ74	714582,731767	-4.3	-0.6	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ79	714736,732112	-4.3	-0.5	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ82	713773,731059	-4.4	-0.6	-0.4	<1	Slight Beneficial	Negligible	Negligible
AQ86	714741,732128	-3.7	-0.4	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ90	713657,730891	-4.5	-0.6	-0.4	<1	Slight Beneficial	Negligible	Negligible
AQ91	714874,732681	-2.5	-0.5	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ95	715038,733228	-3.5	-0.4	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ98	714868,732748	-2.7	-0.3	-0.2	0	Slight Beneficial	Negligible	Negligible
AQ105	713465,730617	-5.9	-0.9	-0.5	<1	Slight Beneficial	Negligible	Negligible
AQ108	713483,730642	-6.6	-0.9	-0.6	<1	Slight Beneficial	Negligible	Negligible
AQ115	713812,731135	-6.2	-0.8	-0.5	<1	Slight Beneficial	Negligible	Negligible
AQ124	714968,733084	-2.1	-0.3	-0.2	<1	Slight Beneficial	Negligible	Negligible
AQ131	715024,733168	-3.3	-0.3	-0.2	<1	Slight Beneficial	Negligible	Negligible
AQ133	713515,730727	-6.9	-0.9	-0.5	<1	Slight Beneficial	Negligible	Negligible
AQ134	713623,730839	-4.5	-0.6	-0.4	<1	Slight Beneficial	Negligible	Negligible
AQ138	713527,730748	-6.4	-0.8	-0.5	<1	Slight Beneficial	Negligible	Negligible
AQ143	714892,732564	-2.8	-0.4	-0.2	<1	Slight Beneficial	Negligible	Negligible
AQ144	714997,733092	-2.3	-0.3	-0.2	0	Slight Beneficial	Negligible	Negligible
AQ150	714887,732495	-3.8	-0.5	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ158	713572,730818	-5.3	-0.7	-0.4	<1	Slight Beneficial	Negligible	Negligible
AQ161	714884,732476	-4.1	-0.5	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ162	714617,731865	-4.9	-0.6	-0.4	<1	Slight Beneficial	Negligible	Negligible

Receptor	Receptor Location (ITM)	Change in Annual Mean Conc. (µg/m³)			Change in No of PM_{10} Days > 50 µg/m³	Impact on Annual Mean Conc.		
		NO_2	PM_{10}	$PM_{2.5}$		NO_2	PM_{10}	$PM_{2.5}$
AQ171	713606,730873	-4.7	-0.7	-0.4	<1	Slight Beneficial	Negligible	Negligible
AQ173	713515,730683	-4.2	-0.6	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ178	713851,731192	-6.3	-0.8	-0.5	<1	Slight Beneficial	Negligible	Negligible
AQ179	714760,732156	-3.2	-0.4	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ181	714866,732787	-3.6	-0.3	-0.2	<1	Slight Beneficial	Negligible	Negligible
AQ184	714867,732767	-3.3	-0.3	-0.2	<1	Slight Beneficial	Negligible	Negligible
AQ191	714786,732212	-4.2	-0.5	-0.3	<1	Slight Beneficial	Negligible	Negligible
AQ192	714892,732549	-3.0	-0.4	-0.2	<1	Slight Beneficial	Negligible	Negligible
AQ194	715012,733120	-2.1	-0.2	-0.1	<1	Slight Beneficial	Negligible	Negligible
AQ195	714798,732226	-3.3	-0.4	-0.2	<1	Slight Beneficial	Negligible	Negligible
AQ212	714880,732870	-2.0	-0.2	-0.1	<1	Slight Beneficial	Negligible	Negligible
AQ213	714891,732836	-2.1	-0.2	-0.1	<1	Slight Beneficial	Negligible	Negligible
AQ353	715064,733766	-1.5	-0.2	-0.1	0	Slight Beneficial	Negligible	Negligible
AQ60	714896,732869	-4.3	-0.5	-0.3	0	Moderate Beneficial	Negligible	Negligible

The significance of the changes in the concentration of each of the ambient receptors has been determined in the context of the TII Air Quality Guidelines significance criteria (TII 2011). As shown in Table 7.30 and Figure 7.3 in Volume 3 of this EIAR the majority of modelled receptors are estimated to experience a negligible impact due to the Proposed Scheme in terms of the annual mean NO_2 concentration. A slightly beneficial impact is estimated at 50 receptors and a moderate beneficial impact at one receptor due to the diversion of traffic off the Proposed Scheme routes. As shown in Table 7.30 and Figure 7.4 in Volume 3 of this EIAR, the Proposed Scheme will be overall neutral in terms of annual mean PM_{10} concentrations, with all receptors experiencing a negligible impact. As shown in Table 7.30 and Figure 7.5 in Volume 3 of this EIAR, the Proposed Scheme will be overall neutral in terms of the annual mean $PM_{2.5}$ concentration with all receptors experiencing a negligible impact.

In accordance with the EPA Guidelines (EPA 2022), the impacts associated with the Operational Phase traffic emissions pre-mitigation will be overall Neutral and Long-term.

The predictions reported are based on conservative assumptions regarding background pollutant concentrations and the improvement in vehicle emission rates. 2019 background pollutant concentrations have been used to represent 2028 and are likely be lower by the Opening Year (2028), than in 2019. Older fleet projections were used in the absence of a fleet that incorporates the effects of 2021 Climate Action Plan (Government of Ireland 2021) measures, including a larger proportion of electric vehicles planned by the Opening Year (2028) than has been modelled. In reality, total concentrations (and magnitude of change) are likely to be lower than those reported here.

7.4.3.4 Ecological Assessment

An assessment of the operational impact of the Proposed Scheme has been undertaken using the approach outlined in A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (IAQM 2020). The guidance states that where the PEC is less than 70% of the long-term critical level / load, the process contribution is likely to be insignificant. Where the process contribution is greater than 1% of the critical level / load it is recommended that the project ecologist be consulted.

The impact of the Proposed Scheme on the nearby ecologically sensitive areas within 200m of roads impacted by the Proposed Scheme, as defined in Section 7.2.4.1, is outlined in Table 7.31. The annual mean NO_X concentration has been compared to the critical level of 30µg/m3 at each of the designated habitat sites. All sites exceed the critical level for NO_X in both the DM and the DS.

Nitrogen deposition levels have been compared to the lower and higher critical loads for the designated habitat sites in Table 7.32. All sites are below the lower critical load for the designated habitat site in both the DM and the DS scenarios.

In accordance with the EPA Guidelines (EPA 2022) the ecological impacts associated with the Construction Phase traffic emissions are overall Negative, Slight and Long-Term.

Table 7.31: Significance of Impacts at Key Ecological Receptors (NO_X Annual Mean Concentration In 2028)

Annual Mean NO_X In 2028 At Closest Point Within Ecological Site To Road							
Receptor	Receptor Location (ITM)	Do Minimum ($\mu g/m^3$)	Distance from road beyond which concentration is below critical level (30 $\mu g/m^3$) (m)	Do Something ($\mu g/m^3$)	Distance from road beyond which concentration is below critical level (30 $\mu g/m^3$) (m)	Impact (DS – DM) ($\mu g/m^3$)	Change as a percentage of critical level (30 $\mu g/m^3$) (%)
Grand Canal pNHA (Camac Bridge, western side)	713666, 732686	87.0	>200m	87.8	>200m	0.8	3%
Grand Canal pNHA (Camac Bridge, eastern side)	713694, 732692	71.7	>200m	72.5	>200m	0.8	3%
Grand Canal pNHA (Canal Road)	715821, 732513	70.5	>200m	67.7	>200m	-2.8	-9%
Grand Canal pNHA (Cheltenham Place)	715672, 732497	56.4	>200m	55.9	>200m	-0.5	-2%
Grand Canal pNHA (Dolphin Road, western side)	713332, 732847	65.7	>200m	66.0	>200m	0.3	1%
Grand Canal pNHA (Dolphin Road, eastern side)	713571, 732721	64.1	>200m	63.9	>200m	-0.1	0%
Grand Canal pNHA (Emmet Bridge, western side)	714864, 732443	84.8	>200m	76.8	>200m	-8.0	-27%
Grand Canal pNHA (Emmet Bridge, eastern side)	714874, 732441	102.1	>200m	78.6	200m	-23.5	-78%
Grand Canal pNHA (Grove Road, western side)	714919, 732420	66.1	>200m	60.9	>200m	-5.2	-17%
Grand Canal pNHA (Grove Road, centre)	715221, 732446	54.9	>200m	53.3	>200m	-1.6	-5%
Grand Canal pNHA (Grove Road, eastern side)	715565, 732488	58.0	>200m	56.4	>200m	-1.6	-5%
Grand Canal pNHA (Herberton Bridge, western side)	713317, 732901	59.2	200m	60.0	200m	0.8	3%
Grand Canal pNHA (Herberton Bridge, eastern side)	713327, 732858	68.7	>200m	72.0	>200m	3.3	11%
Grand Canal pNHA (Parnell Road, western side)	714169, 732549	56.2	>200m	58.9	>200m	2.7	9%
Grand Canal pNHA (Parnell Road, eastern side)	714806, 732427	71.4	>200m	75.1	>200m	3.7	12%
Grand Canal pNHA (Sally's Bridge, western side)	714295, 732544	66.8	>200m	71.0	>200m	4.1	14%

Annual Mean NO_X In 2028 At Closest Point Within Ecological Site To Road							
Receptor	**Receptor Location (ITM)**	**Do Minimum (μg/m³)**	**Distance from road beyond which concentration is below critical level (30 μg/m³) (m)**	**Do Something (μg/m³)**	**Distance from road beyond which concentration is below critical level (30 μg/m³) (m)**	**Impact (DS – DM) (μg/m³)**	**Change as a percentage of critical level (30 μg/m³) (%)**
Grand Canal pNHA (Sally's Bridge, eastern side)	714305, 732541	78.0	>200m	82.7	>200m	4.8	16%

Table 7.32: Significance of Impacts at Key Ecological Receptors (N Deposition In 2028)

Annual Mean N Deposition In 2028 At Closest Point Within Ecological Site To Road									
Receptor	**Receptor Location (ITM)**	**Lower critical load for most sensitive feature (kgN/ha/yr)**	**Do Minimum (kgN/ha/yr)**	**Distance from road beyond which deposition is below critical load (m)**	**Do Something (kgN/ha/yr)**	**Distance from road beyond which deposition is below critical load (m)**	**Change relative to lower critical load (%)**	**Distance from road beyond which the change is <1% (m)**	**Change in deposition >0.4 kgN/ha/yr?**
Grand Canal pNHA (Camac Bridge, western side)	713666, 732686	5	4.8	0m	4.8	0m	0.0	10m	<0.1
Grand Canal pNHA (Camac Bridge, eastern side)	713694, 732692	5	4.1	0m	4.2	0m	0.0	10m	<0.1
Grand Canal pNHA (Canal Road)	715821, 732513	5	4.1	0m	3.9	0m	0.0	0m	-0.1
Grand Canal pNHA (Cheltenham Place)	715672, 732497	5	3.4	0m	3.4	0m	0.0	0m	<0.1
Grand Canal pNHA (Dolphin Road, western side)	713332, 732847	5	3.8	0m	3.9	0m	0.0	0m	<0.1
Grand Canal pNHA (Dolphin Road, eastern side)	713571, 732721	5	3.8	0m	3.8	0m	0.0	0m	<0.1
Grand Canal pNHA (Emmet Bridge, western side)	714864, 732443	5	4.7	0m	4.3	0m	-0.1	0m	-0.3
Grand Canal pNHA (Emmet Bridge, eastern side)	714874, 732441	5	5.4	0m	4.4	0m	-0.2	0m	-1.0
Grand Canal pNHA (Grove Road, western side)	714919, 732420	5	3.9	0m	3.6	0m	0.0	0m	-0.3
Grand Canal pNHA (Grove Road, centre)	715221, 732446	5	3.3	0m	3.3	0m	0.0	0m	-0.1

Annual Mean N Deposition In 2028 At Closest Point Within Ecological Site To Road									
Receptor	Receptor Location (ITM)	Lower critical load for most sensitive feature (kgN/ha/yr)	Do Minimum (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Do Something (kgN/ha/yr)	Distance from road beyond which deposition is below critical load (m)	Change relative to lower critical load (%)	Distance from road beyond which the change is <1% (m)	Change in deposition >0.4 kgN/ha/yr?
Grand Canal pNHA (Grove Road, eastern side)	715565, 732488	5	3.5	0m	3.4	0m	0.0	0m	-0.1
Grand Canal pNHA (Herberton Bridge, western side)	713317, 732901	5	3.5	0m	3.6	0m	0.0	10m	<0.1
Grand Canal pNHA (Herberton Bridge, eastern side)	713327, 732858	5	4.0	0m	4.1	0m	0.0	10m	0.2
Grand Canal pNHA (Parnell Road, western side)	714169, 732549	5	3.4	0m	3.5	0m	0.0	30m	0.1
Grand Canal pNHA (Parnell Road, eastern side)	714806, 732427	5	4.1	0m	4.3	0m	0.0	10m	0.2
Grand Canal pNHA (Sally's Bridge, western side)	714295, 732544	5	3.9	0m	4.1	0m	0.0	20m	0.2
Grand Canal pNHA (Sally's Bridge, eastern side)	714305, 732541	5	4.4	0m	4.6	0m	0.0	170m	0.2

7.4.3.5 Regional Air Quality Assessment

The potential changes in regional air emissions due to the Operational Phase traffic impacts of the Proposed Scheme have been assessed using the NTA Environmental Appraisal Tool, which is based on ENEVAL. ENEVAL measures the regional emissions associated with road transport based on the various road links and their corresponding emissions.

Pollutant emissions (in tonnes) produced in both the DM and DS scenarios during the Opening Year (2028) of the Operational Phase are shown in Table 7.33. The Proposed Scheme will be overall beneficial, with reductions in emissions of all pollutants modelled. The majority of these reductions result from a predicted modal shift, with decreased car usage (refer to Section 6.4.5.2.2 of Chapter 6 (Traffic & Transport)) and a cleaner and more efficiently routed bus fleet. The NTA has committed to replacing its diesel powered vehicles with plug-in hybrid and fuel cell electric buses by 2028 and zero emission vehicles by 2043, so the reductions in emissions due to the Proposed Scheme will be due to more efficiently operated routes, meeting the Proposed Scheme Objectives.

Table 7.33: Operational Phase Regional Pollutant Emissions (tonnes) – Opening Year (2028)

Scenario	Vehicle Class	NO_X (tonnes)	NO_2 (tonnes)	PM_{10} (tonnes)	$PM_{2.5}$ (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)	Butadiene (tonnes)
DM	Car	90	26	0.7	0.7	6	89	0.1	0.1
DS		89	26	0.7	0.7	6	88	0.1	0.1
Change		-0.8	-0.2	-0.01	-0.01	-0.06	-0.2	-0.001	-0.001
% Change		-1%	-1%	-1%	-1%	-1%	-0.2%	-1%	-1%
DM	Goods	103	28	0.3	0.2	3	23	0.1	0.0
DS		102	28	0.3	0.2	3	23	0.1	0.0
Change		-0.4	-0.2	-0.001	-0.001	-0.03	0.01	0.0003	-0.0005
% Change		-0.4%	-0.6%	-0.5%	-0.5%	-1%	0.03%	0.5%	-1%
DM	Urban Bus	4	0.4	0.03	0.03	0.1	1.2	0	0.001
DS		4	0.4	0.03	0.03	0.1	1.2	0	0.001
Change		-0.04	-0.004	-0.001	-0.001	-0.004	-0.03	0	-0.00002
% Change		-1%	-1%	-2%	-2%	-2%	-2%	0%	-2%
DM	**Total**	**197**	**54**	**1**	**1**	**10**	**113**	**0.1**	**0.15**
DS		**195**	**54**	**1**	**1**	**10**	**113**	**0.1**	**0.14**
Change		**-1.2**	**-0.4**	**-0.01**	**-0.01**	**-0.1**	**-0.2**	**-0.0003**	**-0.001**
% Change		**-0.6%**	**-0.7%**	**-1%**	**-1%**	**-1%**	**-0.2%**	**-0.3%**	**-1%**

Pollutant emissions (in tonnes) that will be produced in both the DM and DS scenarios during the Design Year (2043) of the Operational Phase are shown in Table 7.34. The Proposed Scheme will be overall beneficial, with reductions in emissions of all pollutants modelled.

Table 7.34: Operational Phase Regional Pollutant Emissions (tonnes) – Design Year (2043)

Scenario	Vehicle Class	NO_X (tonnes)	NO_2 (tonnes)	PM_{10} (tonnes)	$PM_{2.5}$ (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)	Butadiene (tonnes)
DM	Car	32	9	0.3	0.3	3	34	0.03	0.04
DS		31	9	0.3	0.3	3	34	0.03	0.04
Change		-0.8	-0.2	-0.01	-0.01	-0.1	-0.7	-0.001	-0.001
% Change		-3%	-3%	-3%	-3%	-3%	-2%	-3%	-3%
DM	Goods	62	15	0.2	0.2	2	14	0.03	0.03
DS		62	15	0.2	0.2	2	14	0.03	0.03
Change		0.2	-0.001	-0.001	-0.001	-0.01	0.02	0.0002	-0.0001
% Change		0.3%	-0.01%	-0.3%	-0.3%	-0.5%	0.1%	0.6%	-0.5%
DM	Urban Bus	0	0	0.03	0.03	0	0	0	0
DS		0	0	0.03	0.03	0	0	0	0
Change		0	0	-0.001	-0.001	0	0	0	0
% Change		0%	0%	-2%	-2%	0%	0%	0%	0%
DM	**Total**	**94**	**24**	**0.5**	**0.5**	**5**	**48**	**0.1**	**0.1**
DS		**93**	**24**	**0.5**	**0.5**	**5**	**48**	**0.1**	**0.1**
Change		**-0.6**	**-0.2**	**-0.01**	**-0.01**	**-0.1**	**-0.7**	**-0.001**	**-0.001**
% Change		**-1%**	**-1%**	**-2%**	**-2%**	**-2%**	**-1%**	**-1%**	**-2%**

In accordance with the EPA Guidelines (EPA 2022), the regional impacts associated with the Operational Phase traffic emissions (pre-mitigation) will be overall Neutral and Long-Term.

7.5 Mitigation and Monitoring Measures

In order to sufficiently ameliorate the likely air quality impact, a schedule of mitigation measures has been formulated for the Construction Phase of the Proposed Scheme.

7.5.1 Construction Phase

7.5.1.1 Construction Dust

In order to minimise dust nuisance occurs, a series of mitigation measures that are applicable to the Construction Phase of the Proposed Scheme will be implemented by the appointed Contractor. In summary, the mitigation measures will include:

- Public roads affected by the Proposed Scheme works will be regularly inspected for soiling associated with construction activities and cleaned, as necessary;
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays (or similar dust suppression methods) will be used as required if particularly dusty activities are necessary during dry or windy periods;
- During movement of dust-generating materials both on and off-site, trucks will be covered with tarpaulin and before entrance onto public roads, trucks will be checked to ensure the tarpaulins are properly in place; and
- The appointed Contractor will provide a site hoarding of 2.4m height along noise sensitive boundaries, at a minimum, at the Construction Compounds which will assist in minimising the potential for dust impacts off-site.

The appointed Contractor will keep the effectiveness of the mitigation measures under review and revise them as necessary. In the event of dust nuisance occurring outside the works boundary associated with the Proposed Scheme, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem.

7.5.1.2 Construction Traffic

Construction vehicles, generators etc. may give rise to some NO_2 and PM_{10} / $PM_{2.5}$ emissions. Table 7.35 summarises the Construction Phase impacts prior and post-mitigation. In terms of construction traffic impacts, the Proposed Scheme will have a neutral impact on air quality. The works will be short-term and temporary in nature, and the impact on air quality will not be significant. Therefore, no specific Construction Phase mitigation measures for construction traffic are required.

Table 7.35: Summary of Predicted Construction Phase Impacts Following the Implementation of Mitigation and Monitoring Measures

Assessment Topic	Predicted Impact (Pre-Mitigation and Monitoring)	Predicted Impact (Post Mitigation and Monitoring)
Construction dust	Negative, Not Significant and Short-term	Neutral, Short-term
Road traffic impacts on local human receptors	Neutral, Short-term	Neutral, Short-term
Road traffic impacts on local ecological receptors	Negative, Slight, Short-term	Negative, Slight, Short-term
Regional air quality	Neutral, Short-term	Neutral, Short-term

7.5.2 Operational Phase

Table 7.36 summarises the Operational Phase impacts, pre and post-mitigation. As the Proposed Scheme will have a generally neutral impact on air quality, no specific Operational Phase mitigation measures are recommended.

Table 7.36: Summary of Predicted Operational Phase Impacts Following the Implementation of Mitigation and Monitoring Measures

Assessment Topic	Predicted Impact (Pre-Mitigation and Monitoring)	Predicted Impact (Post Mitigation and Monitoring)
Road traffic impacts on local human receptors	Neutral, Long-term	Neutral, Long-term
Road traffic impacts on local ecological receptors	Negative, Slight, Long-term	Negative, Slight, Long-term
Regional air quality	Neutral, Long-term	Neutral, Long-term

7.6 Residual Impacts

7.6.1 Construction Phase

When the dust minimisation measures detailed in the mitigation section of this Chapter are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors. Thus, there will be no residual Construction Phase dust impacts.

The air dispersion modelling assessment of Construction Phase traffic emissions has found that the Proposed Scheme will be neutral overall in the study area. There are no substantial or moderate adverse effects expected as a result of the Construction Phase of the Proposed Scheme.

Therefore, overall it is considered that the residual effects as a result of the Proposed Scheme's Construction Phase will be Neutral and Short-term. No significant residual impacts have been identified during the Construction Phase of the Proposed Scheme, whilst meeting the Scheme Objectives set out in Chapter 1 (Introduction).

7.6.2 Operational Phase

The air dispersion modelling assessment has found that the majority of all modelled receptors are predicted to experience negligible impacts due to the Proposed Scheme, and beneficial impacts are also estimated along the length of the Proposed Scheme. There are no substantial or moderate adverse effects expected as a result of the Operational Phase of the Proposed Scheme. In 2028, all receptors will have ambient air quality in compliance with the ambient air quality limit values for the DS scenario. In 2043, all receptors are expected to have ambient air quality in compliance with the ambient air quality standards for the DM and the DS scenarios.

Overall, it is considered that the residual effects as a result of the Proposed Scheme's operation will be Neutral and Long-Term.

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