Chapter 12
Air Quality

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12. AIR QUALITY

12.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) assesses the impact of the DART+ West project hereafter referred to as the 'proposed development' on air quality during the construction and operation phase. This chapter describes and assess the likely direct and indirect significant effects of the proposed development on air quality. This Chapter also provides a characterisation of the receiving environment of the proposed development and within a wider study area in the vicinity of the proposed development.

This Chapter should be read in conjunction with the following Chapters and supporting appendices, which present related impacts arising from the proposed development and proposed mitigation measures to ameliorate the potential impacts:

- Chapter 4 Description of the Proposed Development.
- Chapter 5 Construction Strategy.
- Chapter 6 Traffic and Transportation.
- Chapter 8 Biodiversity.
- Chapter 13 Climate.
- Chapter 23 Human Health.

This chapter identifies, describes and assesses the likely direct, indirect, secondary and cumulative significant impacts of the proposed development on air quality. The assessment is based on a reasonable worst-case scenario with respect to potential air quality impacts arising from the proposed development as described in Chapter 4 and 5 of this EIAR. The proposed development description is based on the design prepared to inform the planning stage of the project and to allow for a robust assessment as part of the Environmental Impact Assessment process.

A reasonable worst-case scenario describes the most significant potential environmental impacts arising from the proposed development based on the project information available at this stage of the project, advised by an experienced and competent project design team. In the event where it is required to make assumptions as the basis of the assessment presented here, these assumptions are based on advice from competent project designers and are clearly outlined within the chapter.

The proposed development consists of 40 km of electrification and re-signalling of the Maynooth and M3 Parkway lines to Dublin city centre. The proposed development will convert journeys that currently have tailpipe emissions from diesel train engines to an electrified service, which will provide increased capacity.

The burning of fossil fuels via diesel engines creates air quality emissions which can impact nearby sensitive human and ecological receptors. The proposed development is designed to attract users to move away from the private car and instead use the public transport. It boosts interconnections with other major proposed public infrastructure projects such as BusConnects, Luas expansions, other DART+ Programme projects and the MetroLink. These interconnections aim to aid in achieving the Climate Action Plans (CAP) commitment to an additional 500,000 public transport and active travel journeys daily by 2035. While the CAP focuses on reductions in greenhouse gas emissions, the knock-on impact on the increased public transport and active travel and diversion from fossil fuel-based transport will aid with the improvement of localised air quality in the city.

During the construction phase, the air quality impact of the redistribution of local road traffic and additional construction vehicles will also be assessed using the same methodology as the operation phase. In addition, potential emissions of construction related dust will be assessed. The air quality assessment conducted for the operation phase of the proposed development focuses on the change in distribution of road vehicles which occurs due to the closure of road level crossings, the change of rail stock and frequency of service, and the potential impact of these changes on local air quality. Electrified rail stock will not have significant local emissions compared to the diesel alternative.

Guidance from the UK Highway Agency (UKHA) 'LA 105 – Air Quality' (UKHA 2019) advises that the assessment of a proposed road scheme should describe the likely significant effects on the environment resulting from both the impact of a project on air quality in the construction and operation phases. The Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (TII 2011) will also be considered when considering the likelihood and significance of effects.

While the proposed development is not a road scheme, the closure of six level crossings is proposed which would result in the closure of some sections of roads at these locations. The guidance provides an applicable methodology for the assessment of the impacts created by road traffic redistribution and construction vehicles.

The assessment methodology has been derived with reference to the most appropriate 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 quality review with a particular focus on NO_2, PM_{10} and $PM_{2.5}$ concentrations to characterise the baseline environment. This was completed by way of a review of monitoring data collected for the proposed development over a six-month period supplemented by a review of available published air quality concentrations.
- A review of the most applicable guidelines for the assessment of air quality to define the significance criteria for the construction and operation phases of the proposed development.
- Predictive calculations to assess the potential regional air quality impacts associated with the proposed electrification of the line and the change in schedules during the operation phase.
- Predictive calculations to assess the potential regional air quality impacts associated with the proposed electrification of the line and the change in schedules during the operation phase.
- Predictive qualification and impact assessments relating to the likely Construction Phase dust impacts of the proposed development including mitigation measures which are provided to ensure no residual dust impacts.
- Predictive calculations to assess the potential air quality impacts associated with construction and operation phases road traffic movements which occur due to the proposed development, including as a result of level crossing closures for the operation phase.
- Review of any other potential minor emission sources.

12.2 Legislation, policy and guidance

12.2.1 Legislation

This assessment has been undertaken in accordance *inter alia* with EU Directive 2011/92/EU as amended by Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment ("the EIA Directive"),the Transport (Railway Infrastructure) Act 2001 (as amended and substituted) ("the 2001 Act"), the European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I. No. 743/2021) which gives further effect to transposition of the EIA Directive by amending the Transport (Railway Infrastructure) Act 2001.

The statutory ambient air quality standards in Ireland are outlined in S.I. No. 180 of 2011 Air Quality Standards Regulations 2011 (hereafter referred to as the Air Quality Regulations), which incorporate 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 12.3.1.1.

The following Environmental Protection Agency (EPA) guidelines were considered and consulted in the preparation of this Chapter:

- Guidelines on the Information to be contained in Environmental Impact Statements (EPA 2002).

- Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) (EPA 2003).
- Draft Advice Notes for Preparing Environmental Impact Statements (EPA 2015).
- Guidelines on the Information to be contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022).

12.3.1.1 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 12-1 below and Appendix A12.1 Ambient Air Quality Standards in Volume 4 of the EIAR).

Table 12-1 Air Quality Regulations (based on the CAFE Directive)

Pollutant	Regulation*	Limit Type	Value
NO_2	S.I. 180 of 2011	Hourly limit for protection of human health - not to be exceeded more than 18 times/year.	200 µg/m^3 NO_2
		Annual limit for protection of human health.	40 µg/m^3 NO_2
Nitrogen Oxides (NO + NO_2)		Critical limit for the protection of vegetation and natural ecosystems.	30 µg/m^3 NO + NO_2
Lead	S.I. 180 of 2011	Annual limit for protection of human health	0.5 µg/m^3
SO_2	S.I. 180 of 2011	Hourly limit for protection of human health - not to be exceeded more than 24 times/year.	350 µg/m^3
		Daily limit for protection of human health - not to be exceeded more than three times/year.	125 µg/m^3
		Critical limit for the protection of vegetation and natural ecosystems (calendar year and winter).	20 µg/m^3
PM (as PM_{10})	S.I. 180 of 2011	24-hour limit for protection of human health - not to be exceeded more than 35 times/year.	50 µg/m^3
		Annual limit for protection of human health.	40 µg/m^3
PM (as $PM_{2.5}$)	S.I. 180 of 2011	Annual limit for protection of human health.	25 µg/m^3
Benzene	S.I. 180 of 2011	Annual limit for protection of human health.	5 µg/m^3
Carbon Monoxide	S.I. 180 of 2011	8-hour limit (on a rolling basis) for protection of human health.	10 mg/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 World Health Organization (WHO) has published Air Quality Guidelines for the protection of human health (hereafter referred to as the WHO Guideline) (WHO 2006 and 2021). The 2005 WHO Guideline values are more stringent than the European Union (EU) statutory limit values for PM_{10} and $PM_{2.5}$, with the 2021 updates further reducing recommended concentrations. In relation to NO_2, the compliance limit values are equivalent. However, the WHO one-hour guideline value is an absolute value while the EU standards allows this limit to be exceeded for 18 hours / annum without breaching the statutory limit value.

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 350 mg/(m^2*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 350 mg/(m^2*day) to the site boundary of quarries. This guidance value can be implemented regarding dust impacts from the construction of the proposed development.

The appropriate limits for the assessment of air quality impacts of the proposed development are those outlined Air Quality Regulations, which incorporate the CAFE Directive.

12.2.2 Policy

12.3.1.2 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 25 kt (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), 108 kt for NH_3 (1% reduction on 2005 levels) and 10 kt for $PM_{2.5}$ (18% reduction on 2005 levels) as shown in Table 12-2. 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 12-2.

There will be no localised emissions from the electrified trains, however the generation of the electricity to run them will contribute to NOx and $PM_{2.5}$ emissions. Energy used to generate electricity accounted for 30.7% (52,140 GWh) of all energy use in Ireland (169,839 GWh) in 2020 (SEAI 2020). NO_x from power generation accounts for 6.1% of the 98 kt of NOx and 2% of $PM_{2.5}$ which was emitted by Ireland in 2019 (EPA 2021).

The report Ireland's Air Pollutant Emissions 1990 – 2030 (EPA 2021) discusses the outlook for future compliance with 2030 targets. It notes that nitrogen oxides targets may be met with the full implementation of the measures in the Climate Action Plan however no measures have yet been set to ensure compliance with nonmethane volatile organic compounds emission ceiling for 2030. Full Implementation at farm level of ammonia abatement measures the AgClimatise plan (Department of Agriculture, Food and the Marine, 2021) should achieve compliance for NH_3 targets and $PM_{2.5}$ are likely to stay in compliance with the NEC Directive ceiling.

Table 12-2 National Air Emission Target (Ireland 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%

Pollutant	2020 to 2029 Reduction Commitments (kt) (and % Reduction Compared to 2005 Levels)	2030 Reduction Commitments (kt) (and % Reduction Compared to 2005 Levels)
NMVOC	56.3	51.1
	-25%	-32%
NH_3	112.1	107.5
	-1%	-5%
$PM_{2.5}$	15.6	11.2
	-18%	-41%

12.3.1.3 Regional Policy

In 2009, the Dublin Regional Air Quality Management Plan 2009 - 2012 (Dublin City Council 2009) was published and a range of strategies and policies defined. 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 of the Plan states that "*The Local Authorities shall encourage Coras Iompair Eireann and its subsidiaries to provide inter-bus service facilities, feeder links to the DART and ARROW suburban rail services to facilitate movement of commuters to and from work*.". The Dart+ West project facilitates the movements of commuters by extending the network and increasing capacity within the network.

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 2009–2012 Plan. 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.

In 2021 the EPA notified the four Dublin Local Authorities and informed them that an updated Air Quality Management Plan must be prepared and submitted to the European Commission by the end of 2021 due to breaches in the annual mean EU limit value for NO_2 at some EPA Air Quality Zone A monitoring stations during 2019. As a consequence, the Dublin Region Air Quality Management Plan - Air Quality Plan to improve Nitrogen Dioxide levels in Dublin Region (DCC 2021) was published in late 2021 with an aim to remediate exceedances in the air quality limit values. The plan sets out 14 measures to be put in place to achieve these aims. These measures include:

- Integrate "15 Minute Neighbourhoods" concept in City and County Development Plans.
- Public Parking Controls.
- Continued Delivery of the Active Travel Programme.
- Introduction of Clean Air Zones/ Low Emission Zones.
- Enhanced Air Quality Monitoring and Modelling.
- Air Quality and Health Research.
- Air Quality - Citizen Engagement.

Objective 64 of the National Policy Framework - Project Ireland 2040 (Government Ireland 2018) relates to ensuring improvements in air quality and preventing unacceptable levels of pollution in our urban and rural areas through integrated land use and spatial planning that supports public transport. The DART is specifically discussed and noted as a key priority as part of the Metropolitan Area Strategic Plan.

12.2.3 Guidance

In addition to the specific statutory air quality standards, the assessment has referred 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:

- The IAQM Guidance (IAQM 2016).
- 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 (PG16) (hereafter referred to as LAQM (PG16)) (DEFRA 2016).
- Part IV of the Environment Act 1995: Local Air Quality Management Policy Guidance (PG16) (hereafter referred to as LAQM (PG16)) (DEFRA 2016).
- Part IV of the Environment Act 1995: Local Air Quality Management Technical Guidance (TG16) (hereafter referred to as LAQM (TG16)) (DEFRA 2018).
- 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 2021 (hereafter referred to as the WHO Air Quality Guidelines) (WHO 2021).

12.3 Methodology

12.3.2 Study Area

The proposed DART+ West development consists of the electrification of the Maynooth & M3 Parkway rail lines, with a total length of approximately 40 kilometres.

The proposed development has been divided into six zones (A-F) which are detailed in Chapter 4 in Volume 2 of this EIAR. As a reference for this particular chapter the names of the sections are provided below:

- Zone A Loop Line Bridge to Phibsborough/ Glasnevin (on GSWR line) and East Wall Junction (on Northern line).
- Zone B Spencer Dock Station to Glasnevin Junction.
- Zone C Glasnevin junction/ Phibsborough to Clonsilla Station/Junction.
- Zone D Clonsilla Station/Junction to M3 Parkway Station.
- Zone E Clonsilla Station/Junction to Maynooth Station.
- Zone F Maynooth Station to Depot.

Some of the proposed works are common to all zones of the proposed development and include:

- Overhead line electrification equipment (OHLE) will be required to provide electrical power to the network´s new electrified train fleet.
- Signalling upgrades and additional signalling.
- Improved boundary walls and fencing.
- Utility diversions, vegetation management and other ancillary works.

Construction Phase Study Area

During the construction phase, the focus is on air quality sensitive receptors adjacent to dust generating activities or roads impacted due to construction activities. Activities that have the potential to generate dust include construction compounds, spoil and material transport and construction activity associated with the construction of the proposed development, including construction of ancillary structures (bridges, maintenance depots, level crossing road replacement infrastructure etc.) and construction traffic haul routes. The extent of the overall study area for construction phase dust impacts is typically up to a maximum of 350 m from a specific area of construction work (Institute of Air Quality Management (IAQM 2016)). This is shown in Section 12.4.3 which discusses the sensitivity classification for different receptors with respect to dust impacts.

In addition to the study area considered with respect to construction dust, additional areas must also be considered with respect to emissions from vehicles on impacted public roads. The extent of the study area was determined using the output from the traffic models in combination with the assessment criteria for impacted road links as set out in the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (NRA, 2011) and UKHA DMRB LA - 105 Guidance (UKHA 2019). The study area is up to 200m from roads that experience a significant change in traffic numbers, road alignment or speed band, as per the UKHA DMRB LA - 105 Guidance (UKHA 2019), due to the construction phase of the proposed development set out in Section 12.3.5.1. The assessment study area is focused on sensitive human receptors and designated ecological sites in proximity to the impacted routes. Potential impacts to air quality relate to alterations to traffic patterns close to Spencer Dock, R148, Jackson's Bridge, Deey Bridge, Collins Rail Bridge and Pike Bridge.

The study areas for the modelling of the traffic impacts are chosen as per the impact criteria in Section 12.3.5.1.1.

12.3.2.1 Operation Phase Study Area

The DART + West Project will upgrade the rail line to an electrified system and as a result is not predicted to have significant adverse direct air quality emissions. By transitioning from fossil fuel to electrical traction local air emissions are beneficially impacted along the rail line. The proposed development will also increase passenger carrying capacity of the DART which has the potential for indirect positive impacts by improving public transport offering and assisting the reducing private car mode of transport reliance. A review of potential emissions from operational maintenance activities at depots and boilers at the depot have been scoped out from having significant impacts. Further details on this are detailed in Section 12.5.1.10. Therefore, the operation phase air quality assessment study area was determined using the output from the traffic models in combination with the assessment criteria for impacted road links as set out in the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (NRA, 2011) and UKHA DMRB LA - 105 Guidance (UKHA 2019). The study area is up to 200m from roads that experience a significant change in traffic numbers (Ashtown, Coolmine and Clonsilla), road alignment or speed band due to the proposed development as set out in Section 12.3.5.1, as per the UKHA DMRB LA - 105 Guidance (UKHA 2019). The assessment study area is focused on sensitive human receptors and designated ecological sites in proximity to the impacted rail line and road links.

12.3.3 Survey methodology

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

12.3.3.1 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 quality assured 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, Air Quality in Ireland 2020 (EPA 2021a), details the range and scope of monitoring undertaken throughout Ireland. The Urban

Environmental Indicators: Nitrogen Dioxide levels in Dublin report (EPA 2020a) assessed spatial variations in ambient air quality in Dublin using indicative diffusion tube sampling and detailed air dispersion modelling. The study found that there were potential exceedances of the ambient air quality standards 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 12.4.2.

A review of potentially sensitive ecological areas has also been conducted using the EPA online mapping services. This review is discussed in Section 12.4.3.

12.3.3.2 Site-Specific Baseline Surveys

A site-specific baseline monitoring study was undertaken from September 2020 to March 2021 as part of the air quality assessment for NO_2 using diffusion tube monitoring as shown in Drawing no. MAY-MDC-ENV-ROUT-DR-V-120000-D to 120003-D of Volume 3A of the EIAR. The impact of COVID-19 on the baseline traffic, which is the primary source of NO_2 in the areas monitored, should be considered when reviewing the data captured during this baseline study. Due to the duration of lockdowns and extended impacts on traffic it was not possible to avoid this impact on baseline survey data.

Passive sampling of NO_2 involves the molecular diffusion of NO_2 molecules through a polycarbonate tube and their subsequent adsorption onto a stainless steel disc coated with triethanolamine. Following sampling, the tubes were analysed using ultraviolet (UV) spectrophotometry, at a UKAS accredited laboratory (SOCOTEC Laboratories in Burton-on-Trent, UK).

The Transport Infrastructure Ireland (TII) Air Quality Guidelines (TII 2011) note that NO_2 diffusion tube monitoring provides a simple, cost-effective means of monitoring at several 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).

Monitoring of NO_2 in proximity to the proposed development, and roads that have the potential to be impacted by it, was carried out using passive diffusion tubes (see Drawing no. MAY-MDC-ENV-ROUT-DR-V-120000-D to 120003-D of Volume 3A of the EIAR). The baseline monitoring study was carried out close to the alignment and in areas of potential impact due to level crossing closures because of the proposed development. Consideration was also given to locations from a previous monitoring study completed in 2011 to provide some comparison with historical results. 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_2 concentrations with distance from these sources.

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 (UK DEFRA 2021).

In addition to the bias adjustment, an annualization factor is required as the monitoring period did not extend to a full year. The annualization factor was prepared as per UK DEFRA LAQM.TG (16) guidance (UK DEFRA 2018). The annualization 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 co-location at Ballyfermot, Winetavern Street, Saint Johns Road, Blanchardstown and Pearse Street using Box 7.10 of LAQM.TG (16) (UK DEFRA 2018). This factor was calculated to be 0.83 for the period of the diffusion tube monitoring. It should be noted that while this data was downloaded from the EPA website, it is not yet ratified by the EU for use (ratification of 2020 data will occur in October 2021/November 2021, with ratification of the 2021 data in October 2022/November 2022).

12.3.4 Consultation

Consultation is important to ensure that a sufficiently robust environmental baseline is established for the proposed development and its surroundings with full details of the consultations detailed in Chapter 3 Alternatives in Volume 2 of this EIAR. Consultation helps to identify specific concerns and issues relating to air quality early in the process. Public consultation was conducted as part of the early-stage design of the proposed development. The following organisations were also consulted:

- Dublin County Council.
- Fingal County Council.
- Meath County Council.
- Kildare County Council.
- EPA.

No specific air quality issues were raised as part of the consultation process by these organisations.

12.3.5 Appraisal Method for the Assessment of Impacts

During the construction phase the air quality impact of the redistribution of local road traffic and additional construction vehicles will be assessed using the same methodology as the operation phase. In addition, potential emissions of construction related dust will be assessed.

As noted previously, the operation phase air quality assessment conducted for the proposed development reviews the change in distribution of road vehicles which occurs due to the closure of several level crossings and the potential impact of these changes on local air quality. A regional air quality assessment of the change in emissions from rolling stock and rail service frequency will also be considered as part of the assessment.

12.3.5.1 Air Quality Impact Assessment from Traffic Emissions in Construction and Operation Phases

The air quality assessment has been carried out following procedures described in the publications by the EPA (EPA 2002; EPA 2003; EPA 2015; EPA 2022) and using the methodology outlined in LA 105 Air Quality (UKHA 2019), LAQM (PG16) (DEFRA 2016) and LAQM (TG16) (DEFRA 2018). The general approach outlined in the LA 105 Air Quality, LAQM (PG16) and LAQM (TG16) 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). The significance criteria have been adopted for the proposed development and are detailed in Section 12.3.6.1. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the annual mean limit values (40 µg/m^3). However, the criteria have also been applied to the predicted annual $PM_{2.5}$ concentrations for the purpose of this assessment.

12.3.5.1.1 Local Road Traffic 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 several historical guidance documents (HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15). The revised document outlines several changes of approach when assessing the air quality impact of road schemes. Historically, the DMRB air quality spreadsheet was used for most assessments in Ireland with detailed modelling only required in circumstances where the screening tool indicated compliance issues with the EU air quality standards. The DMRB spreadsheet tool, however, was last revised in 2007 and thus does not include changes to vehicle emission standards in Europe over the last 13 years. In addition, the model does not account for electric or hybrid vehicle use and thus may be viewed as a somewhat outdated assessment tool.

In acknowledgement of the DMRB air quality spreadsheet limitations, LA 105 - Air Quality (UKHA 2019) states that the DMRB spreadsheet tool may still be used for simple air quality assessments where it is deemed unlikely to lead to a breach of the air quality standards. Due to its use of an older and thus 'dirtier' fleet, vehicle emissions levels would be higher than more modern models and therefore any results will be conservative in nature and will provide a worst-case assessment of potential adverse impacts.

LA 105 - Air Quality also states that modelling should be conducted for NO_2 for the base, opening and design years for both the Do Minimum (or Do Nothing) and Do Something scenarios. 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 (or Do Nothing) and Do Something scenarios. The LA 105 - Air Quality 2019 guidance states that modelling of $PM_{2.5}$ is not required. The guidance suggests that modelling of PM_{10} can be used to show that the proposed development does not impact on the $PM_{2.5}$ limit value on the basis that assuming compliance with the PM_{10} limit is achieved then compliance with the $PM_{2.5}$ limit will also be achieved.

Historically modelling of CO, lead and benzene was required. As concentrations of these pollutants have been monitored to be significantly below their air quality limit values in recent years, even in urban centres CO, lead and benzene have been scoped out of detailed assessment (EPA 2021a).

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 Something traffic (with the proposed development) compared to the Do Minimum traffic (without the proposed development):

- Annual average daily traffic (AADT) changes by 1,000 or more.
- Heavy duty vehicle (HDV) AADT changes by 200 or more.
- A change in speed band.
- A change in carriageway alignment by 5m or greater.

The above scoping criteria has been used in the current assessment to determine the road links required for inclusion in the modelling assessment. Sensitive receptors within 200 m of impacted road links were included within the modelling assessment as detailed in LA 105 - Air Quality (UKHA 2019).

12.3.5.1.2 ADMS-Roads Dispersion Model for Road Traffic

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

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

LA 105 Air Quality (UKHA 2019) 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. A high-risk project is one which is likely to result in significant traffic changes that are not localised to the project and will impact traffic flows over a much wider area. Due to the nature of the proposed development's impact on traffic i.e. closures of level crossings, both the impact on construction and operation phase traffic are classified as low risk.

LA 105 Air Quality states that a low sensitivity environment includes areas that have annual mean NO_2 concentrations of less than 36 µg/m^3 combined with a low number of sensitive receptors near the impacted roads. The proposed development stretches across three of the four air quality zones in Ireland and will have varying degrees of background concentrations. Areas towards the city centre and Connolly Station have the potential for concentrations in the region of 36 µg/m^3 however concentrations of this level are highly unlikely in suburban and rural locations as is shown with the project specific monitoring in Section 12.4.1.2. The operation phase impacts to road traffic are primarily localised to the areas in proximity to level crossing closures, which are in suburban or rural areas and showed concentrations significantly below 36 µg/m^3 (see Section 12.4.2). Consideration should also be given to the number of receptors that have the potential to be impacted.

The sensitivity environment criteria with respect to background air quality will be considered when the requirement for detailed modelling is conducted. For areas with lower background concentrations, low density of receptors and low risk of the project LA 105 Air Quality states that a simple model is sufficient to confirm that the proposed project does not result in any exceedances of the air quality thresholds or significant impacts. If the simple assessment indicated the potential for exceedances of the limit value, then a detailed assessment will be conducted.

Guidance from LA 105 - Air Quality states that a medium sensitivity environment includes areas that have annual mean NO_2 concentrations of 36 µg/m^3 or above combined with sensitive receptors within 50 m of the impacted roads. The Spencer Dock area during the construction phase was deemed to require a detailed modelling assessment due to high background concentrations. The detailed assessment was conducted using the below methodology will be followed. All other areas were deemed to be scoped out of a detailed assessment and a simple assessment was proceeded with.

Where required by the criteria above, vehicle-derived air emissions for areas impacted by significant changes in AADT will be modelled using the detailed ADMS-Roads dispersion model (Version 5.1) for both construction and operation phases. ADMS-Roads has been developed by Cambridge Environmental Research Consultants (CERC). The model is a steady-state Gaussian plume model used to assess ambient pollutant concentrations associated with road sources.

Road traffic emission rates for use with ADMS Roads dispersion model (Version 5.1) are derived using traffic data for the peak construction year provided by the traffic consultant and using emission factors from the COPERT V database (EMISIA 2020) which has been incorporated into the UK DEFRA Emission Factor Toolkit (EFT) Version 11.0 (DEFRA 2021b). As a 2016 base year has been provided an older version (Version 9.0) (DEFRA 2019) of the EFT has been utilised for this year as Version 11.0 only provides emissions factors from 2018 onwards.

The EFT Version 11.0 has been incorporated into the ADMS-Roads model. The toolkit provides emission rates and traffic emissions for the proposed development were based on the following assumptions:

- EFT Version 11.0 is based on eight vehicle categories including petrol cars, diesel cars, diesel Light Goods Vehicles (LGV), rigid HGVs and buses.
- 2017 emission factors were used for detailed modelling of the 2016 base year due to a comparison with available monitoring data for model verification, 2026 emission factors were used as conservatively representative of the peak construction year. The use of an intermediate year to represent a future opening year is standard modelling practice, to counteract some of the fleet projection uncertainties.
- EFT Version 11.0 incorporates updated NOX (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 is based on European emission standards from pre-Euro 1 to Euro 6/VI.
- Improvements in the quality of fuel and some degree of retrofitting; technology conversion in the national fleet.

In addition, a conservative assumption regarding improvement in vehicle emission rates similar conservative assumptions are made with respect to background pollutant concentrations. Older fleet projections were used in the absence of a fleet that incorporates the effects of 2021 Climate Action Plan measures – a larger proportion of electric vehicles is planned by the opening year than has been modelled. Construction traffic data has been modelled based on a peak construction period, while in practice the construction works will be phased. This data therefore represents a worst-case scenario. Total concentrations (and magnitude of change) are likely to be lower.

Traffic Data Verification Study

Model verification investigates the level of agreement between modelled and measured concentrations. Difference 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.TG16 (DEFRA 2018), an adjustment to the modelled results, by applying a calculated factor, 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 which was received from the traffic model (Section 12.5.1.2.2) and EIAR Volume 2 Chapter 6 Traffic and Transportation for year 2017. 2017 was chosen as the verification year as the base year of the traffic data was 2016 and the closest year with relevant baseline data in the study area was 2017. 2017 met data was also used in the verification. 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 four locations in the study area for 2017. This data has been used to compare model predictions of NO_2 to monitored NO_2 concentrations.

Background data were based on nitric oxide (NO) and NO_2 from Ballyfermot for 2017 and data from Rathmines for 2017. 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 200 m from a main roadway. The backgrounds were also utilised in the detail assessment modelling for the construction phase.

The emission data for the ADMS-Roads model were based on EFT Version 11.0 and the ADMS-Roads model input parameters selected are summarised in Table 12-3. This input information is provided within the model which will allows the model to best predict the future concentrations and emissions.

Table 12-3 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 preset pollutants can be selected in ADMS-Roads for modelling.	NO_X, NO_2, PM_{10} and $PM_{2.5}$ 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.
Road Emission Factors	ADMS-Roads has a range of emission factors including the recent UK Emission Factor Tool (EFT) v.11.0 dataset.	UK Emission Factor Tool (EFT) v.11.0 Basic Split 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.	2017 for verification, 2019 data from Casement Meteorological Station 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 Meteorological Station. 1 is the appropriate value for a city, while 0.1 is representative of the airport setting.
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	A representative Primary NO_2 was calculated using the EFT for each modelling scenario. • 2017 Base – 19.4% • 2026 Construction Do Minimum (Do-Nothing) – 19.4% • 2026 Construction Do Something – 19.5%
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.TG16, is to consider the performance of the model. Modelled and measured road NO_X contribution are compared. Monitored data includes the proposed development specific survey and EPA diffusion tubes monitored in conjunction with DCC locations (Table 12-4). The collection methodology was completed in the same manner as detailed in Section 12.3.3.2. Some of the monitoring locations were not considered suitable for model verification, due to proximity to minor road links not included in the traffic model or monitoring data, or other spatial considerations. A total of 5 monitoring sites were included in the verification exercise. The comparison is shown in Figure 12-1, as the red points and trendline, and also in Table 12-4. This shows that on average, the unadjusted model under predicts total NO_2 concentrations by around 37.7%.

Table 12-4 Diffusion Tube Monitoring Data Used for Model Verification

Diffusion Tube No.	Modelled NOx concentration (µg/m³)	Modelled NO_2 concentration (µg/m³)	Monitored NO_x concentration (µg/m³)	Monitored NO_2 concentration (µg/m³)	Difference [(modelled – monitored) / (monitored) *100]	Adjustment Factor
North Wall 1	21.55	26.4	82.47	47.9	21.55	3.769
North Wall 2	12.89	22.6	44.77	35.6	12.89	
North Wall 3	12.73	22.6	57.02	39.9	12.73	
North Wall 4	14.73	23.4	49.22	37.2	14.73	
DART Monitoring Location 3	21.55	26.4	82.47	47.9	21.55	1.253
Average NO_2 Difference					-37.7%	3.326

In line with LAQM.TG16, 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_2 Calculator (DEFRA 2020). Additionally, the adjustment was applied to the road source contribution only rather than total NO_X, again in line with LAQM.TG16. 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 the following collective bias adjustment factors across the study area, which were then applied to the modelled road contributions at the air quality sensitive receptors most represented by them, before being converted into total NO_2 concentrations:

- 3.769 – "Quays". Applied to modelled receptors closest to North Wall Quay.
- 1.253 – "Other". Applied to all other receptors.

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 Figure 12-1 as the blue points and trendline. This shows that on average, the adjusted model is within the target 10% of the air quality standard, with a root mean square error (RMSE) of 1.82 µg/m³. 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.

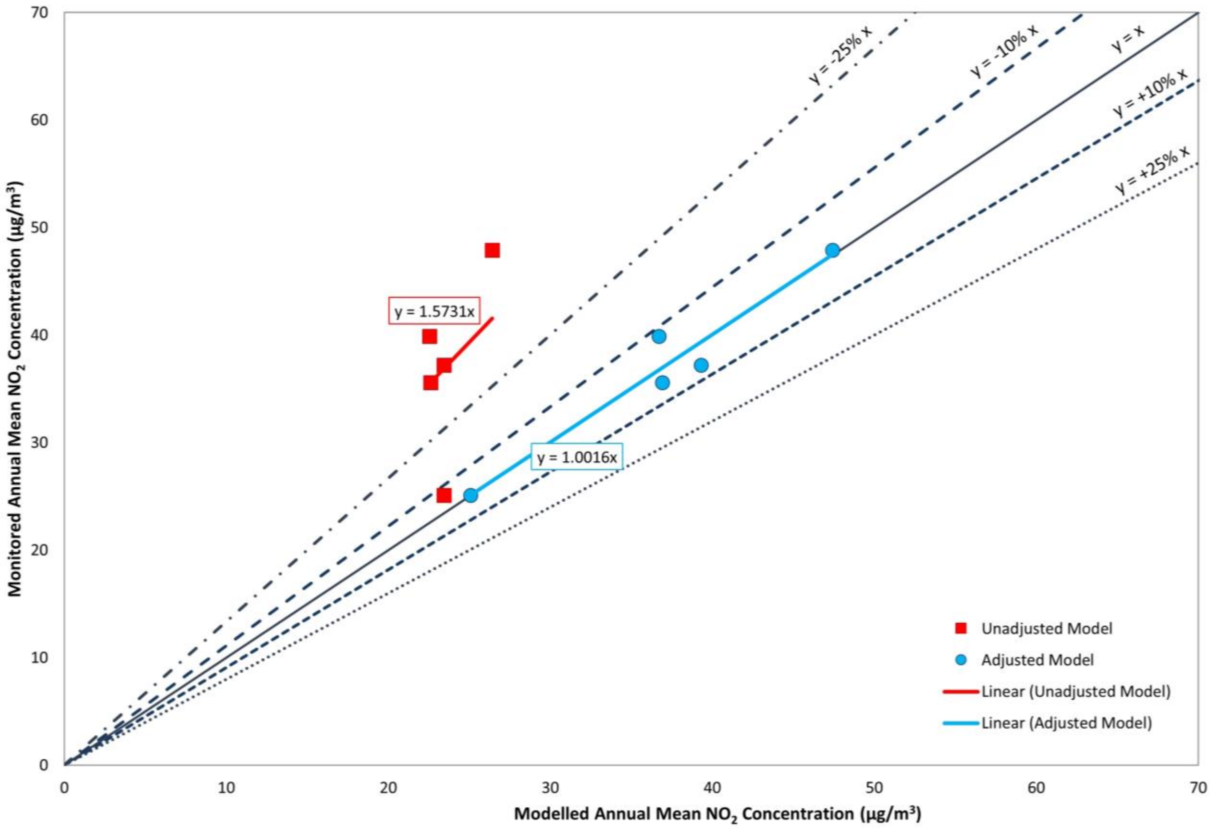

Figure 12-1 Dispersion Model Verification - Comparison of Monitored and Modelled NO_2 Concentrations (µg/m^3)

12.3.5.1.3 Ecological Assessment

For impacted roads which pass within 2 km of a designated area of conservation (either Irish or European designation) the TII Air Quality Guidelines (TII, 2011) requires the Air Quality Specialist to consult with the Project Ecologist. However, in practice the potential for impact on an ecological site is highest within 200 m of the proposed development and within 200m of roads where significant changes in AADT (>5%) occur (CERC, 2020). While the TII guidelines (TII 2011) were developed for road schemes they are relevant and regularly used for developments have impacts on road traffic or alignment.

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 the IAQM document A Guide To The Assessment of Air Quality Impacts On Designated Nature Conservation Sites (IAQM, 2020).

The following assessment criteria is used to determine whether an assessment for nitrogen deposition should be conducted:

- There is a designated area of conservation within 200 m of the proposed development.
- There is a significant change in AADT flows.

In circumstances where the above criteria are met, there is the potential for impacts on ecology because of nitrogen deposition and thus an assessment should be undertaken. For road transport sources within 200 m of a designated habitat, individual ecological receptors along a transect at 10 m intervals are modelled. Ecological receptors are modelled up to a maximum distance of 200 m regardless of whether the habitat extends beyond 200 m. It is considered that the greatest impacts will have occurred in proximity to the road. LA 105 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 200 m transect are modelled using the methodology for sensitive human receptors in Section 12.3.5.1.1.

Designated sites which are within 2 km of the boundary of the proposed development are:

- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA) (Site Code: 004024).
- North Dublin Bay pNHA (Site Code: 000206).
- Rye Water Valley/Carton SAC (Site Code: 001398).
- Liffey Valley pNHA (Site Code: 000128).
- Rye Water Valley/Carton pNHA (Site Code: 001398).
- Grand Canal pNHA (Site Code 002104).
- Royal Canal pNHA (Site Code 002103).

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*'.

Consultation with the project's ecologist has been undertaken and habitats of particular ecological importance at this is 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.

12.3.5.2 Construction Dust Impact Assessment

DART+ West project will be constructed along the existing operational railway and therefore this will reduce the potential for dust emissions compared to a new major infrastructure project which would require significantly greater construction works.

Dust generation rates depend on the site activity, particle size, the moisture content of the material and weather conditions. Dust emissions are dramatically reduced where rainfall has occurred due to the cohesion created between dust particles and water and the removal of suspended dust from the air. It is typical to assume no dust is generated under "wet day" conditions where rainfall greater than 0.2 mm (USEPA 2006) has fallen (Casement Aerodrome had on average 211 days annual over a 30-year averaging period (1981-2010)). High levels of moisture either retained in soil or because of rainfall help suppress the generation of dust due to the cohesive nature of water between dust particles. Rain also assists in removing dust from the atmosphere through washout. Wind can lift particles up into the air and transport the dust downwind as well as drying out the surface. Therefore, the worst dust deposition conditions typically occur during dry conditions with strong winds. The potential for dust due to some of the specific proposed works is discussed in Appendix A12.2 Potential Dust Generating Activities in Volume 4 of the EIAR.

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. Due to the scale of the proposed development, construction sites are likely to be in operation for extended periods and therefore detailed consideration of potential dust impacts and how to mitigate them is required.

The criteria for appraisal of the magnitude of dust emissions is reviewed for each site compound area within Table 12-5 to Table 12-8 under the headings of demolition, earthworks, construction and trackout based on a series of criteria set out by the IAQM (IAQM 2016). The risk of potential for dust impacts with respect to dust nuisance, human health and ecology are a function of magnitude of the dust generation at each construction site in combination with the sensitivity of the surrounding area. The sensitivity of each of the construction compounds are established in Section 12.4.3.

Demolition

Dust emission magnitude from demolition can be classified as small, medium or large and are described as follows.

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

Table 12-5 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

Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling. This may also involve levelling the site and landscaping. Dust emission magnitude from earthworks can be classified as small, medium or large and are described as follows.

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

Table 12-6 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

Construction

Dust emission magnitudes from construction can be classified as small, medium or large and are described as follows.

- Large: Total building volume > 100,000 m^3, on-site concrete batching, sandblasting.
- Medium: Total building volume 25,000 m^3 –100,000 m^3, potentially dusty construction material (e.g. concrete), on-site concrete batching.
- Small: Total building volume < 25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Table 12-7 Risk of Dust Impacts - Construction

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

Trackout

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, vehicle numbers, geology and duration. Trackout refers to the dirt, mud, or other debris tracked or carried onto the public road network on the wheels of vehicles exiting construction sites. Dust emission magnitude from Trackout can be classified as small, medium or large and are described as follows.

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

Table 12-8 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

12.3.6 Impact Assessment Criteria

12.3.6.1 Air Quality Assessment Criteria for Traffic Impacts in Construction and Operation Phases

The TII guidance document Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (TII 2011) details 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 (Table 12-9, Table 12-10 and Table 12-11) and relative impact of the proposed development. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the annual mean limit values (40 µg/m^3). However, the criteria have also been applied to the predicted annual $PM_{2.5}$ concentrations for the purpose of this assessment.

Table 12-9 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

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

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No. Days with PM_{10} Concentration > 50 µg/m³	Annual Mean $PM_{2.5}$
Imperceptible	Increase / decrease < 0.4 µg/m³	Increase / decrease <1 day	Increase / decrease < 0.25 µg/m³

Source: Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes - Transport Infrastructure Ireland (TII 2011)

Table 12-10 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	Moderate	Large
Increase with proposed development			
Above Objective/Limit Value With Scheme (≥40 µg/m³ of NO_2 or PM_{10}) (≥25 µg/m³ of $PM_{2.5}$)	Slight adverse	Moderate adverse	Substantial adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m³ of NO_2 or PM_{10}) (22.5 µg/m³ - <25 µg/m³ of $PM_{2.5}$)	Slight adverse	Moderate adverse	Moderate adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m³ of NO_2 or PM_{10}) (18.75 µg/m³ - <22.5 µg/m³ of $PM_{2.5}$)	Negligible	Slight adverse	Slight adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m³ of NO_2 or PM_{10}) (<18.75 µg/m³ of $PM_{2.5}$)	Negligible	Negligible	Slight adverse
Decrease with proposed development			
Above Objective/Limit Value With Scheme (≥40 µg/m³ of NO_2 or PM_{10}) (≥25 µg/m³ of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Substantial beneficial
Just Below Objective/Limit Value With Scheme (36 µg/m³ - <40 µg/m³ of NO_2 or PM_{10}) (22.5 µg/m³ - <25 µg/m³ of $PM_{2.5}$)	Slight beneficial	Moderate beneficial	Moderate beneficial
Below Objective/Limit Value With Scheme (30 µg/m³ - <36 µg/m³ of NO_2 or PM_{10}) (18.75 µg/m³ - <22.5 µg/m³ of $PM_{2.5}$)	Negligible	Slight beneficial	Slight beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m³ of NO_2 or PM_{10}) (<18.75 µg/m³ of $PM_{2.5}$)	Negligible	Negligible	Slight beneficial

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

Source: Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes - Transport Infrastructure Ireland (TII 2011)

Table 12-11 Air Quality Impact Significance Criteria

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

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	Medium	Large
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

Source: Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes - Transport Infrastructure Ireland (TII 2011)

12.3.6.2 Ecology

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 guidance 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. However, in relation to NO_X, PECs less than 70% of the critical level are rare in urban areas and thus this is unlikely to relevant for the current Project.

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 pNHA 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 (5 kg(N)/ha/yr to 10 kg(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 publication 'AGTAG06 – Technical Guidance On Detailed Modelling Approach For An Appropriate Assessment For Emissions To Air' (EA, 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 (TII 2011) and IAQM Guidance document (IAQM 2020) for NO_2 in grassland and forestry. Once the dry deposition flux (µg m^{-2} s^{-1}) 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 (EA 2014)). The conversion factor for nitrogen is 0.071428. LA 105 Air Quality (UKHA 2019) states that if the change in N deposition is greater than 0.4 kg N/ha/yr or 1% of the critical level/load, consultation with the project ecologist should occur.

12.3.6.3 Assessment of the Magnitude of Impact from Construction Dust

To determine the level of dust mitigation required during the construction phase, the potential dust emission magnitude for each dust generating activity needs to be considered, along with the sensitivity of the area which is established in Section 12.4.3. These major dust generating activities are divided into four types (where relevant) to reflect their different potential impacts as outlined below:

- Demolition - Any activity involved with the removal of an existing structure (or structures).
- Earthworks - The processes of soil-stripping, ground-levelling, excavation and landscaping.

- Construction - Any activity involved with the provision of a new structure (or structures), its modification or refurbishment.
- Trackout - 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.

An assessment of the sensitivity of the proposed development is completed in Section 12.4.3 with respect to the criteria shown in Table 12-20 to Table 12-22.

12.3.6.4 Rail Emission Screening Assessment

Fossil fuel powered trains have the potential to have impacts on air quality. The proposed development aims to reduce local and regional emissions of fossil fuels by the electrification of the rail line. The proposed do-something system will become heavily weighted towards electric multiple units (EMUs) with some diesel multiple units (DMUs) on the line due to shared use with intercity lines. Unlike the diesel units, the electric DART units will have no localised tailpipe emissions.

To ensure that with increased service provision (6 trains presently to 12 trains in the future per hour) there will be an improvement in local air quality for nearby sensitive receptors, a screening assessment of mass emissions on the rail line was conducted. The screening assessment compared the mass emissions of pollutants from the "Do Minimum" (DM) (or "Do-Nothing" (DN)) and "Do Something" (DS) scenarios for proposed development. Rail emissions will be calculated using detailed information on the current and future service plans and emissions data for the rail stock. Iarnród Éireann have provided data for 2017 and 2018 diesel usage and km travelled broken down into periods by Iarnród Éireann, see Table 12-12. The data shows that in 2018 (1.54 km/l) carriages travelled more distance per litre of fuel than 2017 (1.53 km/l). An average of the two years was taken when assessing the fuel usage and associate emissions per km.

In addition, information has been provided on the electric power required to power an EMU (DART Unit 8537) for a km (1.43 kWh/km). For the DS the power usage has been modelled as requiring 80% of the DM. Therefore, in the for the DS the proposed 10 car trains has been assumed to require the same power as the DM 8 car trains.

Table 12-12 Carriage travelled and Diesel Usage 2017/2018

Pollutant – Period	Distances Travelled (km)		Diesel (litre)	
	2017	2018	2017	2018
1	859,000	805,680	541,860	599,354
2	878,336	912,508	579,619	633,243
3	849,628	836,668	581,485	551,694
4	832,716	899,436	547,197	551,671
5	834,792	917,884	552,673	579,933
6	853,556	932,132	553,821	584,583
7	872,560	926,316	566,192	616,416
8	903,808	898,712	583,991	562,102
9	876,036	968,788	574,646	579,342
10	874,336	921,464	566,053	566,252
11	806,840	899,684	517,088	566,928
12	858,084	951,060	564,088	606111
13	814,816	919,472	545,726	643316
Average	**854,962**	**906,908**	**559,572**	**587,765**

Emissions for diesel units are provided using the European Monitoring and Evaluation Programme (EMEP) and European Environment Agency (EEA) 2019 Air Pollutant Emission Inventory Guidebook for Railways (EMEP and EEA 2019). The guidebook is part of a series published which are designed to facilitate reporting of emission inventories by countries to the UNECE Convention on Long-range Transboundary Air Pollution and the EU National Emission Ceilings Directive.

Emissions from diesel engines can be broken in three categories:

- shunting locomotives.
- rail-cars.
- line-haul locomotives.

Table 12-13 Emission Factors for Rail

Tier 2 Shunting Locomotives			
Pollutant	**Kg/Fuel Tonne Note 1**	**Kg Pollutant/Km Note 2**	**g Pollutant /Km**
NO_x	54.4	0.031	30.50
PM_{10}	2.1	0.00 12	1.18
$PM_{2.5}$	2	0.00 11	1.12
SO_2 (Tier 1 only) Note 3	0.4	0.0002	0.22
Tier 2 Rail Cars			
Pollutant	**Kg/Fuel Tonne Note 1**	**Kg Pollutant/Km Note 2**	**g Pollutant /Km**
NO_x	39.9	0.02 2	22.37
PM_{10}	1.1	0.00062	0.62
$PM_{2.5}$	1	0.00056	0.56
SO_2	N/A	N/A	N/A
Tier 2 Line-Haul Locomotives			
Pollutant	**Kg/Fuel Tonne Note 1**	**Kg Pollutant/Km Note 2**	**g Pollutant /Km**
NO_x	63	0.035	35.32
PM_{10}	1.2	0.00067	0.67
$PM_{2.5}$	1.1	0.00062	0.62
SO_2	N/A	N/A	N/A

Note 1: Emissions factors from Air Pollutant Emission Inventory Guidebook for Railways (EMEP and EEA 2019)

Note 2: Emission factors based on Air Pollutant Emission Inventory Guidebook for Railways (EMEP and EEA 2019) and Iarnród Éireann average Diesel usage

Note 3: IE confirmed sulphur content is less than 0.2%. Only Tier one emissions are available for SO_2 as per Air Pollutant Emission Inventory Guidebook for Railways (EMEP and EEA 2019).

The approach for the DMUs, referred to as Tier 2 in the Guidance (EMEP and EEA 2019), is based on apportioning the total fuel used by railways to that used by different locomotive technology types as the measure of activity. It assumes that the fuel can be apportion for example using statistics on the number of locomotives, categorised by type, and their average usage, e.g. from locomotive maintenance records. For the DM the DMUs carriage numbers are taken from the 2021 timetables and in the DS they are assumed to be 6 car units. These assumptions were provided by IDOM. SO_2 is the exception to the use of Tier 2 emissions as only Tier 1 factors are available (EMEP and EEA 2019). As per the guidance (EMEP and EEA 2019) the SO_2 factor is calculated using the sulphur content of the fuel utilised. IÉ use an ultra-low sulphur diesel with less than 0.2% sulphur (EN590).

EMUs are powered by electricity generated at stationary power plants as well as other sources. As the rail stock move from DMUs to EMUs the associated emissions will be emitted at the powerplants generating electricity rather than through the DMU tailpipe. Emissions related to the electricity produced are discussed in Section 12.3.6.5.

12.3.6.5 Energy Requirements

The emissions of pollutants generated due to the electricity power demand for the EMUs can be calculated using the carbon intensity of the fuel mix used in the generation of electricity nationally. In addition to the running of the rail line there will be energy required for running the proposed depot and Spencer Dock Station. The closure of the Docklands station will act to reduce some energy requirements. These are used to assess the impact of the proposed development on regional pollutants and compare with Ireland's National Emissions Reduction Directive (Directive 2001/81/EC) 2030 targets.

The pollutant intensity is the amount of a specific pollutant that will be released per kilowatt hour (kWh) of energy of a given fuel. For most fossil fuels the emissions per unit is almost constant, but in the case of electricity it will depend on the fuel mix used to generate the electricity and on the efficiency of the technology employed. A figure for carbon (CO_2) is updated by Sustainable Energy Authority of Ireland (SEAI) annually. However, no figure for other pollutants (i.e. NOx, $PM_{2.5}$, SO_2) is provided by SEAI or the EPA. The provisional 2020 carbon intensity figure of 295.1 gCO_2/kWh has been published on the SEAI website (SEAI 2020). For other regional pollutants of local concern (NOx, $PM_{2.5}$, SO_2) which do not have an intensity figure linked to their usage, estimated rates of emissions per kWh can be estimated for 2019 using data produced by the EPA (2020a) and SEAI (SEAI 2020). This is done using the emissions related to energy production for those pollutants EPA (2020a) and comparing it to the total energy produced. The emission factors are shown in Table 12-14.

The estimate generated will be valid for 2019 however it is expected that the pollution intensity per kWh will reduce by the opening year. The 2021 Climate Action Plan (CAP) has set a national target of up to 80% of electricity demand by renewables by 2030 for the national electricity grid. Currently, roughly 40% of the national grid electricity comes from renewable sources. Increasing the proportion of renewables, which will not have any additional fossil fuel emissions associated with them, will reduce the emissions per kWh of electricity produced on the national grid. IÉ have agreed to purchase up to 80% of its operational demand from certified low or zero carbon electricity for operations. A Corporate Power Purchase Agreement (CPPA) is a financial contract with a renewable generator that will allow for a guaranteed source of renewable power for the operation of the proposed development in future. This will ensure that should the CAP target of 80% renewables not be achieved, the proposed development will still achieve the target within itself. For the purposes of the assessment it has been assumed both the DM and DS have 80% renewables.

The remaining power on the national grid will be supplied by fossil fuels, the emissions of which are carefully controlled by the EPA under the suppliers Industrial Emissions Directive, which ensures that no significant impacts occur due to air quality emissions of air pollutants (including NO_2, particulates and VOCs) to nearby sensitive human or ecology receptors.

Table 12-14 Emission Factors of Regional Pollutants per kWh

Pollutant	Kg Pollutant/kWh
Estimated Emission Factors at 80% Renewables	
NO_x	0.0000324
SO_2	0.000012
$PM_{2.5}$	0.0000013
CO_2	0.10204

12.3.7 Difficulties encountered / Limitations

There were no significant difficulties encountered in compiling information for this assessment.

12.4 Receiving environment

The following sections describe the baseline conditions in the vicinity of the proposed development based on a review of published data and onsite monitoring.

12.4.1 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 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 8 km south of the proposed development 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. Results indicate that the prevailing wind direction is from south to westerly in direction over the period 2016 to 2020.

12.4.2 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 sub-urban area). Baseline air quality is the current air quality at a specific location including all local and non-local sources. To obtain a 'background' concentration from a specific measurement location, it is necessary to subtract the local sources of air emissions.

A desk study of the EPA air quality monitoring programs has been undertaken. The most recent annual report on air quality, Air Quality in Ireland 2020 (EPA 2021a), details the range and scope of monitoring undertaken throughout Ireland. In addition, specific baseline air quality monitoring has been conducted along the proposed development. 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 development.

In 2020 the EPA reported (EPA 2021a) that Ireland was compliant with EU legal limits at all locations, however this was largely due to the reduction in traffic due to Covid-19 restrictions. The EPA report details the effect that the Covid-19 restrictions had on stations, which included reductions of up to 50% at some monitoring stations which have traffic as a dominant source. The report also notes that CSO figures show that while traffic volumes are still slightly below 2019 levels, they have significantly increased since 2020 levels. 2020 concentrations are therefore predicted to be an exceptional year and not consistent with long-term trends. For this reason they have not been included in the baseline section.

12.4.1.1 EPA Data

12.4.1.1.1 EPA Air Quality Zone A Monitoring

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 2021a). Dublin is defined as EPA Air Quality Zone A and Cork as EPA Air Quality Zone B. EPA Air Quality 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 EPA Air Quality Zone D. In terms of air monitoring zoning, the area of the proposed development is located within EPA

Air Quality Zone A, C and D, as shown in Figure 12-2 (EPA 2021). EPA Air Quality Zone A monitoring stations have the most potential to exceed air quality limit values and therefore are of the most concern.

Sufficient data was available for suburban stations in Swords, Rathmines, Dún Laoghaire and Ballyfermot to observe long-term trends over the period 2015 to 2019. Results average between 15 µg/m^3 to 22 µg/m^3 for the annual mean concentrations at each location compared to the annual limit value of 40 µg/m^3 with no exceedances of the one-hour limit value of 200 µg/m^3. Rathmines, Dún Laoghaire and Ballyfermot had average NO_2 concentrations of 19 µg/m^3 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 development. Concentrations of NO_2 were below the annual and 1-hour limit values, with annual average levels ranging from 27µg/m^3 to 37 µg/m^3 over the period 2015 to 2019 compared to the annual limit value of 40 µg/m^3. The average concentration in 2019 was 28 µg/m^3.

The ambient NO_2 monitoring results for Winetavern Street, Swords, Blanchardstown, Ballyfermot and Rathmines over the period 2015 to 2019, based on a three-year rolling average, are shown in Figure 12-2. The data and trend line indicate that levels are reasonably constant at each location over the five-year period.

The ambient NO_x monitoring results for suburban sites Swords, Rathmines, Dún Laoghaire and Ballyfermot to observe long-term trends over the period 2015 to 2019. Results average between 21 µg/m^3 to 34 µg/m^3 for the annual mean concentrations at each location compared to the annual limit value of 30 µg/m^3 which is set for the protection of sensitive ecology. The long-term annual average for 2015 to 2019 for these four sites was 26.5 µg/m^3.

Table 12-15 Trends in Suburban and Urban NO_2 Concentration (ug/m^3) In EPA Air Quality Zone A 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/m^3)	31	37	27	29	28	40
		99.8th%ile 1-hr NO_2 (µg/m^3)	128	120	110	115	115	200
Rathmines	Urban Background	Annual Mean NO_2 (µg/m^3)	18	20	17	20	22	40
		99.8th%ile 1-hr NO_2 (µg/m^3)	105	88	86	87	102	200
Ballyfermot	Suburban Background	Annual Mean NO_2 (µg/m^3)	16	17	17	17	20	40
		99.8th%ile 1-hr NO_2 (µg/m^3)	127	90	112	101	101	200
Blanchardstown	Urban Traffic	Annual Mean NO_2 (µg/m^3)	25	30.2	26	25	31	40
		99.8th%ile 1-hr NO_2 (µg/m^3)	141	128	147	131	143	200
Swords	Suburban Background	Annual Mean NO_2 (µg/m^3)	13	16	14	16	15	40
		99.8th%ile 1-hr NO_2 (µg/m^3)	93	96	79	85	80	200

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

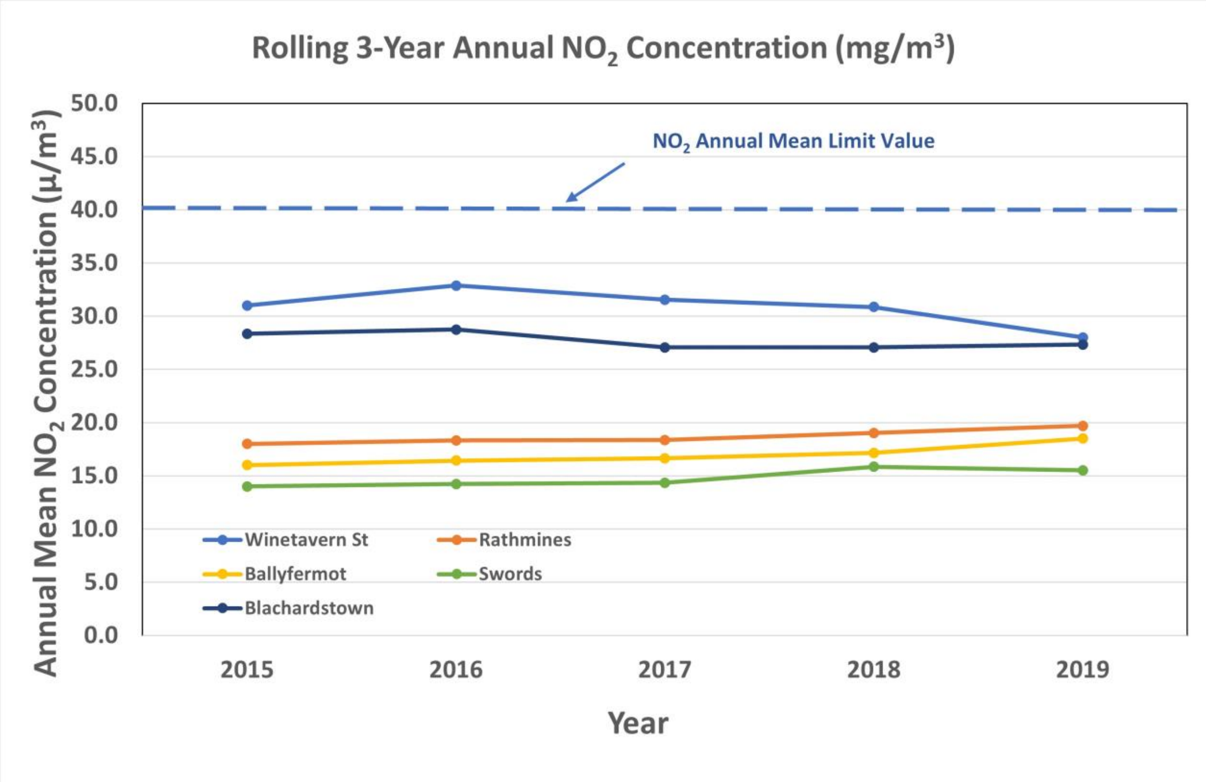

Figure 12-2 Rolling Three-Year Annual NO_2 Concentration (ug/m^3)

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 development (EPA 2021b). The diffusion tube sampling was carried out in conjunction with Dublin City Council. Monitoring is for single year periods, therefore long-term averages are not available at diffusion tube locations. Further detail on the diffusion tube methodology is discussed in Section 12.4.1.1.2 as part of the site-specific monitoring study. The roadside monitoring locations in proximity to Connolly Station (Amiens Street) were found to exceed the annual mean NO_2 concentration in 2017, 2018 and 2019.

Table 12-16 EPA NO_2 Diffusion Tube Monitoring Data

Monitoring Site	Monitoring Year	Annual Mean NO_2 Concentration (µg m^{-3})
Marino College	2019	41.1
Amiens Street North	2017	46.1
Bus Aras Environs 3 (Amiens St. Upper)	2019	54.7
Bus Aras Environs 3 (Amiens St. Upper)	2018	43.6
North Wall 1	2017	47.9
North Wall 2	2017	35.6
North Wall 3	2017	39.9
North Wall 4	2017	37.2
North Wall 1	2018	51
North Wall 2	2018	33.1
North Wall 3	2018	35.2
North Wall 4	2018	26.3

Continuous PM_{10} monitoring carried out at the suburban locations of Marino, Finglas, Tallaght, Dún Laoghaire, Ballyfermot, Rathmines, St Anne's Park and Phoenix Park showed level ranging between 11 µg/m^3 – 15 µg/m^3

in 2019, with a maximum of nine exceedances (at Rathmines) of the 24-hour limit value of 50 µg/m^3 (35 exceedances are permitted per year). Longer term averages for Ballyfermot, Dun Laoghaire, Rathmines and Phoenix Park from 2015 to 2019 show an average concentration of 13 µg/m^3 compared to the annual limit value of 40 µg/m^3 as shown in Table 12-17.

Average PM_{10} levels at the urban traffic monitoring location of Blanchardstown Station, which is in close proximity to the proposed development, were reviewed. The annual averages range from 15 µg/m^3 to 19 µg/m^3 in 2015 to 2019, with between 2 and 11 exceedance of the 24-hour limit value of 50 µg/m^3. The City Centre monitoring location of Winetavern Street has a long-term average (2015 to 2019) of 14 µg/m^3 with an annual average in 2019 of 15 µg/m^3.

Continuous $PM_{2.5}$ monitoring carried out at the EPA Air Quality Zone A locations of Ballyfermot, Phoenix Park, Finglas, Rathmines, St Anne's Park and Marino showed levels ranging between 8 µg/m^3 – 10 µg/m^3 in 2019. The Phoenix Park monitoring station is located near sections of the proposed development. The annual average concentration measured in Phoenix Park was 8 µg/m^3 in 2019, with the average concentrations of 6 µg/m^3 in 2018 compared to the annual limit value of 25 µg/m^3. Phoenix Park 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 Phoenix Park was 0.73 in 2019.

Table 12-17 Trends in Suburban and Urban PM_{10} Concentration (µg/m^3) In EPA Air Quality Zone A 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
Blanchardstown	Annual Mean PM_{10} (µg/m^3)	17	18	15	17	19	40
	90th%ile 24-hr PM_{10} (µg/m^3)	36	33	36	32	31	50
Tallaght	Annual Mean PM_{10} (µg/m^3)	14	14	12	15	12	40
	90th%ile 24-hr PM_{10} (µg/m^3)	26	28	22	24	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

12.4.1.1.2 EPA Air Quality Zone C Monitoring

Long-term NO_2 monitoring was carried out at two urban EPA Air Quality Zone C locations – Kilkenny and Dundalk (EPA, 2021a). The NO_2 annual average from 2015 to 2019 at the two locations was 8 µg/m^3. Monitoring was also recorded for two years at a suburban traffic location in Dundalk with 2018-2019 annual average NO_2 concentrations of 13 µg/m^3. Hence long-term average concentrations measured at these locations were significantly lower than the annual average limit value of 40 µg/m^3. Based on the above information, a conservative estimate of the background NO_2 concentration for the urban EPA Air Quality Zone C regions of the proposed development is 8 µg/m^3.

Long-term PM_{10} monitoring is carried out at three suburban EPA Air Quality Zone C Galway, Ennis and Portlaoise. The average PM_{10} concentration measured at the sites in 2015-2019 was 14 µg/m^3. Monitoring for PM_{10} was also opened in Dundalk in 2018, with 2018-2019 annual average PM_{10} concentrations of 15 µg/m^3. Based on the above information a conservative estimate of the background PM_{10} concentration for the EPA Air Quality Zone C region of the proposed development is 14 µg/m^3. Hence, long-term average PM_{10}

concentrations for rural segments of the proposed development are predicted to be lower than the annual average limit value of 40 µg/m^3.

Continuous $PM_{2.5}$ monitoring carried out at two EPA Air Quality Zone C suburban locations of Bray and Ennis which showed annual average levels ranging from 5 µg/m^3 to 14 µg/m^3 over 2015 to 2019. The annual average level measured at these locations between 2015 and 2019 was 9 µg/m^3.

12.4.1.1.3 EPA Air Quality Zone D Monitoring

Long-term NO_2 monitoring was carried out at two rural (Emo and Kilkitt) and one urban (Castlebar) EPA Air Quality Zone D locations in Ireland (EPA, 2021a). The NO_2 annual average from 2015 to 2019 across both rural sites was 3 µg/m^3 and the annual average across the urban location was 8 µg/m^3. Hence long-term average concentrations measured at these locations were significantly lower than the annual average limit value of 40 µg/m^3. Based on the above information, a conservative estimate of the background NO_2 concentration for the rural EPA Air Quality Zone D regions of the proposed development is 8 µg/m^3.

Long-term PM_{10} monitoring is carried out at two rural and two urban EPA Air Quality Zone D locations in 2019. The average concentration measured at the rural and urban sites respectively in 2019 was 10 µg/m^3 and 17 µg/m^3. Based on the above information a conservative estimate of the background PM_{10} concentration for the region of the proposed development which is mainly rural is 11 µg/m^3. Hence, long-term average PM_{10} concentrations for rural segments of the proposed development are predicted to be lower than the annual average limit value of 40 µg/m^3.

Continuous $PM_{2.5}$ monitoring carried out at two EPA Air Quality Zone D locations of Longford and Claremorris which showed annual average levels ranging from 4 µg/m^3 to 9 µg/m^3 over 2015 to 2019. The annual average level measured in Claremorris in 2019, which is more representative of the air quality in proximity to the proposed development, was 5.5 µg/m^3. Based on this information, a conservative a background $PM_{2.5}$ concentrations in the EPA Air Quality Zone D region of the proposed development of 4 µg/m^3.

12.4.1.2 Site-Specific Monitoring Data

The 19 monitored locations in the vicinity of the proposed development are shown Table 12-18 and Drawing no. MAY-MDC-ENV-ROUT-DR-V-120000-D to 120003-D in Volume 3A of the EIAR. Table 12-19 outlines the results of the baseline NO_2 diffusion tube monitoring over the six-month period from 17/09/2020 to 04/03/2021.

The highest six-month average concentration was recorded at a roadside location at Glasnevin (Location 4) which was the closest monitoring location to the City Centre. Concentrations at this location were 36.1 µg/m^3 or 90% of the annual mean limit value with the bias adjustment and annualization factor applied. This is the location that ties into both the proposed BusConnects and MetroLink projects and both projects completed monitoring at the same location.

MetroLink: Monitoring was conducted from September 2018 to September 2019. Concentrations at this location averaged 47.8 µg/m^3 or 120% of the annual mean limit value.

BusConnects: Monitoring 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 during the initial lockdown in 2020, the final two data sets (16 March 2020 to 8 June 2020) are considered non 'typical' baseline data and therefore were not included in the baseline data set. Concentrations at this location were 43.7 µg/m^3 or 109% of the annual mean limit value with the bias adjustment and annualization factor applied.

The baseline monitoring conducted for the proposed development indicated an improvement in background concentrations at the Glasnevin location (Location 4) compared to MetroLink and BusConnects. This may be a result of both an improvement in car emissions with engine technology changes in the time elapsed between 2019 and 2021 but is more likely to be as a result of lower traffic volumes or congestion due to COVID-19 lockdowns. Consideration has been given to this when interpreting monitoring results and where background concentrations are considered for assessment conservative background values have been used.

In addition to exceedances at Location 4, monitored concentrations were also high at Locations 2 and 3. This was in line with expectations due to their roadside locations in very heavily traffic locations. While Location 1 is also centrally located, it is more than 100 m from a busy road and therefore concentrations would be expected to be lower than roadside monitoring locations next to busy roads.

Monitoring data shows a trend of concentrations reducing as it moves further from the city centre, with all concentrations outside the M50 (except for the co-location with the Blanchardstown EPA monitoring location, which is in close proximity to the M3 and M50) being below 40% of the limit value.

The lowest concentration was recorded at the Location 16 on Sterling Road, Co. Meath, which is on the M3 parkway spur of the rail line (6.9 µg/m^3). This location is a commercial shopping area and located along the proposed development.

Based on guidance from DEFRA, it can be considered that exceedances of the NO_2 one-hour objective may occur at roadside sites if the annual mean is above 60 µg/m^3 (DEFRA 2018). None of the 19 sites monitored are considered likely to exceed the NO_2 one-hour objective.

Table 12-18 Air Quality Monitoring Locations

Site	Estimated Location	East (ITM)	North (ITM)	EIAR Vol 3A Drawing reference no.
Location 1	Ferrymans Crossing	717134	734970	MAY-MDC-ENV-ROUT-DR-V-120001-D
Location 2	Amiens Street	716588	735073	MAY-MDC-ENV-ROUT-DR-V-120001-D
Location 3	North Strand Road	717041	735677	MAY-MDC-ENV-ROUT-DR-V-120001-D
Location 4	Glasnevin	715017	736370	MAY-MDC-ENV-ROUT-DR-V-120001-D
Location 5	Claremont Court	713857	737091	MAY-MDC-ENV-ROUT-DR-V-120001-D
Location 6	Ratoath Estate	712758	737276	MAY-MDC-ENV-ROUT-DR-V-120001-D
Location 7	Ashtown	710910	737468	MAY-MDC-ENV-ROUT-DR-V-120001-D
Location 8	Coolmine	706964	737617	MAY-MDC-ENV-ROUT-DR-V-120001-D
Location 9	Porterstown Road	706073	737734	MAY-MDC-ENV-ROUT-DR-V-120002-D
Location 10	Clonsilla	704968	738195	MAY-MDC-ENV-ROUT-DR-V-120002-D
Location 11	River Forest, Confey	700016	737146	MAY-MDC-ENV-ROUT-DR-V-120002-D
Location 12	Lock 13, Royal Canal	697886	736987	MAY-MDC-ENV-ROUT-DR-V-120002-D
Location 13	Parklands Lodge	694657	737538	MAY-MDC-ENV-ROUT-DR-V-120003-D
Location 14	Woodlands, Maynooth	692879	737204	MAY-MDC-ENV-ROUT-DR-V-120003-D
Location 15	Connaught Street, Kilcock	688705	739419	MAY-MDC-ENV-ROUT-DR-V-120003-D
Location 16	Sterling Road	702332	739970	MAY-MDC-ENV-ROUT-DR-V-120002-D
Location 17	Elton Grove, Dunboyne	702001	741876	MAY-MDC-ENV-ROUT-DR-V-120002-D
Location 18	M3 Parkway Station	701711	743737	MAY-MDC-ENV-ROUT-DR-V-120002-D
Location 19	Blanchardstown Continuous Monitor Co-Location	708471	738498	MAY-MDC-ENV-ROUT-DR-V-120001-D

Table 12-19 Air Quality Monitoring Results

Site Location	Month 1 ($\mu g\ m^{-3}$)	Month 2 ($\mu g\ m^{-3}$)	Month 3 ($\mu g\ m^{-3}$)	Month 4 ($\mu g\ m^{-3}$)	Month 5 ($\mu g\ m^{-3}$)	Month 6 ($\mu g\ m^{-3}$)	Average	Locally Bias adjusted NO_2 Concentration ($\mu g\ m^{-3}$)	Locally Bias adjusted Annualised NO_2 Concentration ($\mu g\ m^{-3}$)
Location 1	28.2	31.0	**33.8**	28.7	**37.3**	24.0	30.5	23.5	19.6
Location 2	**35.7**	**41.2**	**42.3**	**41.9**	**37.7**	**42.3**	**40.2**	30.9	25.8
Location 3	26.8	**37.8**	**43.2**	**42.2**	**46.5**	**38.3**	**39.1**	30.1	25.1
Location 4	**53.5**	**58.3**	**60.1**	**56.5**	**58.1**	**51.3**	**56.3**	**43.4**	**36.1**
Location 5	18.3	21.5	26.5	23.0	22.5	18.2	21.7	16.7	13.9
Location 6	18.8	20.2	24.1	**LOST**	**LOST**	17.2	20.1	15.5	12.9
Location 7	20.4	**LOST**	27.1	25.6	28.2	19.7	24.2	18.6	15.5
Location 8	21.7	29.0	23.1	23.5	26.5	22.7	24.4	18.8	15.7
Location 9	10.7	16.2	15.7	14.1	12.3	15.2	14.0	10.8	9.0
Location 10	23.1	21.9	26.2	22.8	25.4	18.6	23.0	17.7	14.7
Location 11	13.4	17.9	20.2	15.3	**LOST**	14.4	16.2	12.5	10.4
Location 12	22.0	19.5	18.8	18.3	17.9	19.3	19.3	14.9	12.4
Location 13	**LOST**	14.0	13.0	14.0	16.6	10.8	13.7	10.5	8.8
Location 14	8.5	13.1	12.3	11.0	14.8	11.2	11.8	9.1	7.6
Location 15	12.8	15.4	15.8	14.1	17.5	12.5	14.7	11.3	9.4
Location 16	9.2	12.8	13.6	9.5	9.3	10.6	10.8	8.3	6.9
Location 17	10.7	12.0	13.1	11.4	14.0	10.9	12.0	9.3	7.7
Location 18	14.0	16.0	**LOST**	12.5	16.2	14.5	14.6	11.3	9.4
Location 19	**49.8**	**44.1**	**38.4**	**46.5**	**49.2**	**34.5**	**43.7**	**33.7**	28.0
Average	22.1	24.6	26.0	23.9	26.5	21.4	23.7	18.3	15.2
Max	**53.5**	**58.3**	**60.1**	**56.5**	**58.1**	**51.3**	**56.3**	**43.4**	**36.1**
Min	8.5	12.0	12.3	9.5	9.3	10.6	10.8	8.3	6.9

Note 1: Bias adjustment factor: 0.77, Annualization factor: 0.83

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

Note 3: “LOST” in the table refers to diffusion tubes not recovered from sampling location due to theft or accidental loss.

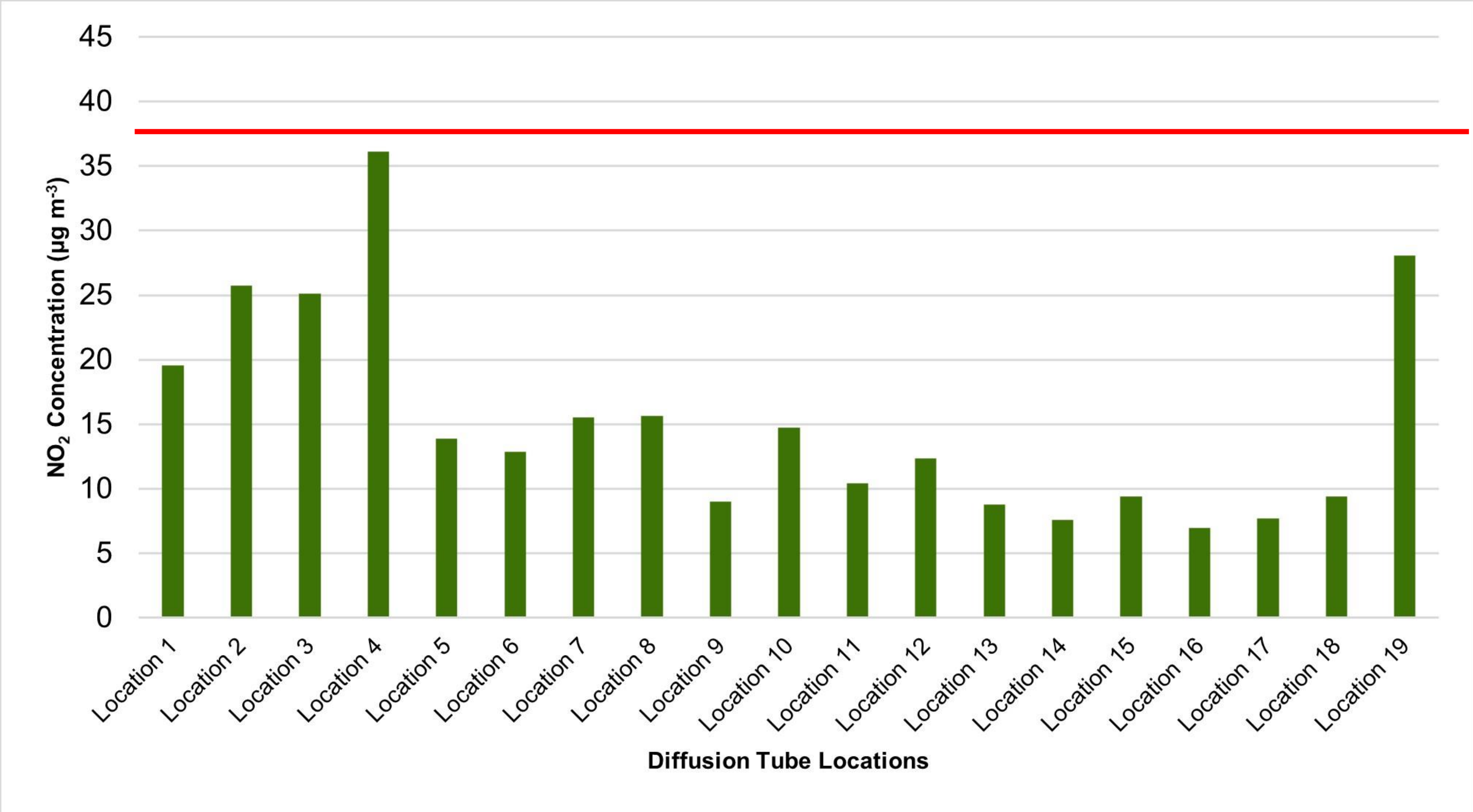

Figure 12-3 Locally Bias Adjusted and Annualized NO2 Concentration (µg/m^3)

Note: NO_2 Annual mean limit value denoted by red line

12.4.3 Existing Baseline Dust Sensitivity Assessment

The greatest potential impact on air quality during the construction phase is 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 (1 µm to 75 µm). Deposition of dust typically occurs in close proximity to the source and with IAQM Guidance (IAQM 2016) defining a maximum impact area of 350 m 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 because of dust soiling, health impacts and ecological 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.
  - 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.
  - 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.
  - 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 objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).
  - 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 objective for PM_{10} (in the case of the 24-hour objectives, relevant location would be one where individuals may be exposed for eight hours or more in a day).

- 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.
  - 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.
  - 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.
  - Indicative example is a Site of Special Scientific Interest (SSSI) 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.
  - 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.
- Ecological Impacts.

The sensitivity of the area is considered as per the criteria outlined in the IAQM Guidance and as reproduced in Table 12-20, Table 12-21 and Table 12-22.

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 12-20 the sensitivity of the area to dust soiling can be established. The sensitivity will change along the linear project with some areas more sensitive to potential dust soiling effects than others. As there are greater than 10 receptors within 20 m of the rail boundary, the sensitivity of the area to dust soiling effects on people and property is considered high.

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 12-21. The annual mean background PM_{10} concentration was reviewed in Section 12.4.1.1. This found EPA Air Quality Zone A, C and D PM_{10} concentrations to be significantly less than 24 µg/m^3. With this taken into consideration, as there are greater than 100 residential receptors within 20m of the redline boundary, the sensitivity of the area to human health impacts is considered medium.

In addition to the track alignment there are other areas with the potential for dust emissions these include; temporary construction compounds (construction depots, substation locations, the depot location, proposed Spencer Dock Station), permanent maintenance compounds and substation locations. Details of these compounds are available in Chapter 5 Construction Strategy in Volume 2 of this EIAR. The sensitivity of any of these individual compounds will not be greater than that of the rail alignment.

An assessment of the proposed development was completed with respect to the sensitivity criteria Table 12-20 and Table 12-21. Where the number of receptors was not clear, 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 development is discussed in Section 12.4.2.

Table 12-20 Sensitivity of the Area to Dust Soiling Effects on People and Property (IAQM 2016)

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 12-21 Sensitivity of the Area to Human Health Impacts (IAQM 2016)

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from Source (m)				
			<20	<50	<100	<200	<350
High	> 32 µg/m³	>100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 µg/m³ - 32 µg/m³	>100	High	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 µg/m³ - 28 µg/m³	>100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	< 24 µg/m³	>100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	> 32 µg/m³	>10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28 µg/m³ - 32 µg/m³	>10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 µg/m³ - 28 µg/m³	>10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	< 24 µg/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 50 m of the boundary of the site or within 50 m of the haulage route used by construction vehicles on public highways up to a distance of 500 m from a construction site entrance can be affected according to the IAQM Guidance. The proposed development will be within close proximity to the Royal Canal pNHA and Rye Water Valley/Carton SAC and pNHA which are classed as a highly sensitive receptors. As shown in Table 12-22 the worst-case sensitivity of the area to ecological impacts is considered high under this guidance without adequate mitigation.

An overall summary of the baseline to dust nuisance, human health and ecological impacts is shown in Table 12-23. Further details of the construction compounds and the works carried out in them is contained in Chapter 5 in Volume 2 of this EIAR.

Table 12-22 Sensitivity of the Area to Ecological Impacts (IAQM 2016)

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 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.
- Trackout.

Table 12-23 Summary of Sensitivity of the Area to Dust

Compound Code	Location	Chainage	Nuisance Sensitivity	Human Health Sensitivity	Ecology Sensitivity
Rail line			High	Medium	High (Royal Canal pNHA and Rye Water Valley / Carton SAC and pNHA)
CC-SET-S4-00000-B	Main Storage and Distribution Centre (MSDC)	-	Low	Low	N/A
CC-SUB-S2A-20280, CC-STA-S4-40230-B, CC-SET-S4-40280-B, CC-PW-S2A-20750-B, CC-STA-S4-40250-B, CC-PW-S4-40380-B	Spencer Dock (+ Station and Substation)	20+280, 40+230, 40+280, 20+750, 40+250, 40+380	High	Low	High (Royal Canal pNHA)
CC-PW-S1-10300-B, CC-STA-S1-7800-B	Connolly (+ North Strand Works)	10+300, 7+800	Medium	Low	High (Royal Canal pNHA)
CC-PW-S3-33340-B, CC-SUB-S3-33460, CC-PW-S4-43200-B	Glasnevin (+ Substation)	33+340, 33+460, 43+200	Medium	Low	High (Royal Canal pNHA)
CC-SET-S3-00000-B	Cabra Road	00+000	Medium	Low	N/A
CC-STR-S5-51480-B	OBG5	51+480	Medium	Low	High (Royal Canal pNHA)
CC-SET-S5-51530-B, CC-SET-S5-52180-B	Reilly	51+530, 52+180	Medium	Low	High (Royal Canal pNHA)
CC-SUB-S5-53600, CC-STA-S5-53660-B, CC-LC-S5-53820-B	Ashtown (+ Substation)	53+600, 53+660, 53+820	High	Low	High (Royal Canal pNHA)
CC-SET-S5-54750-B	Navan Road (Permanent)	54+750	Low	Low	High (Royal Canal pNHA)
CC-STR-S5-56060-B, CC-STR-S5-56130-B	OBG9	56+060, 56+130	Low	Low	High (Royal Canal pNHA)
CC-STR-S5-56460-B, CC-SUB-S5-56500	Castleknock (+ Substation)	56+460, 56+500	Low	Low	High (Royal Canal pNHA)
CC-SUB-S5-57550-B, CC-STA-S5-57900-B, CC-LC-S5-58670-B	Coolmine (+ Substation)	57+550, 57+900, 58+670	Medium	Low	High (Royal Canal pNHA)
CC-PW-S5-59970-B, CC-LC-S5-60150-B	Clonsilla	59+970, 60+150	Medium	Low	High (Royal Canal pNHA)
CC-LC-S5-58800-B	Porterstown	58+800	Medium	Low	High (Royal Canal pNHA)
CC-LC-S6-71100-B, CC-SET-S6-70700-B	Barberstown	71+100, 70+700	Low	Low	High (Royal Canal pNHA)
CC-PW-S6-72830-B	OBG13	72+830	Low	Low	High (Royal Canal pNHA)
CC-SUB-S6-74680-B, CC-STR-S6-74660	Leixlip (Confey) (+ substation)	74+680, 74+660	High	Low	High (Royal Canal pNHA)

Compound Code	Location	Chainage	Nuisance Sensitivity	Human Health Sensitivity	Ecology Sensitivity
CC-STR-S6-76470-B, CC-STR-S6-76540-B	Leixlip (Louisa Bridge)	76+470, 76+540	Medium	Low	High (Royal Canal pNHA)
CC-SUB-S6-78180, CC-SET-S6-78200-B	Blakestown (+ substation)	78+180, 78+200	Low	Low	High (Royal Canal pNHA)
CC-PW-S6-79950-B	OBG18	79+950	Low	Low	High (Royal Canal pNHA)
CC-SUB-S6-82260	Maynooth (+ substation)	82+260	Medium	Low	High (Royal Canal pNHA)
CC-STR-S7-91880-B, CC-PW-S7-92340-B, CC-SET-S7-92100-B	Millfarm	91+880, 92+340, 92+100	Low	Low	N/A
CC-STR-S7-92850-U, CC-STR-S7-92900-B	OBG23A	92+850, 92+900	Low	Low	High (Royal Canal pNHA)
CC-DEP-S7-93060-D, CC-DEP-S7-UP-93370-U	Depot (+ substation)	93+060, 93+370	Low	Low	High (Royal Canal pNHA)
CC-SUB-S8-101070	Hansfield (+ substation)	101+070	Medium	Low	N/A
CC-PW-S8-101660	OBCN286	101+660	Low	Low	N/A
CC-PW-S8-104970, CC-SUB-S8-105060	Dunboyne (+ substation)	104+970, 105+060	Low	Low	N/A
CC-PW-S8-106950-B, CC-SET-S8-106950-B, CC-SUB-S8-106950	M3 Parkway	106+950, 106+950, 106+950	Medium	Low	N/A

12.5 Description of potential impacts

The proposed development will involve the electrification of the Maynooth & M3 Parkway rail lines and links Iarnród Éireann, Dublin Bus, proposed MetroLink and Luas services, assisting in creating fully integrated public transport in the Greater Dublin Area. The total length of the proposed development is approximately 40 km. When considering a development of this nature, the potential air quality impact on the surroundings must be considered for each of two distinct stages:

- Construction phase.
- Operation phase.

12.5.1 Potential Construction Impacts

12.5.1.1 Introduction to Construction Road Traffic Impacts

- For the construction phase, both a detailed assessment and a simple assessment model have been utilised. The detailed assessment focuses on the region close to the proposed Spencer Dock station where the background NO_2 concentration exceeded the limit value during past monitoring. A simple assessment was deemed suitable for all other areas due to the nature of the work and background concentrations which were well below 36 µg/m^3.
- Areas which the traffic consultant has deemed to have the potential for impact due to traffic redistribution associated with the proposed development construction phase have been assessed. Impact scenarios have been modelled representing the worst-case traffic impacts, as advised by the proposed development traffic consultants.
- The road links (a road link is a segment of road between two junctions) modelled are shown in Table 12-25, Table 12-30, Table 12-50 and Table 12-56 and Drawing no. MAY-MDC-ENV-ROUT-DR-V-120004-D in Volume 3A of this EIAR. Further details on the proposed development traffic redistribution are contained within Appendix A6.3 Construction Traffic Management Plan in Volume 4 of this EIAR.

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 Something traffic (with the proposed development) compared to the Do-Nothing traffic (without the proposed development):

- Annual average daily traffic (AADT) changes by 1,000 or more.
- Heavy duty vehicle (HDV) AADT changes by 200 or more.
- A change in speed band.
- A change in carriageway alignment by 5m or greater.

The above scoping criteria has been used in the current assessment to determine the road links required for inclusion in the modelling assessment. The development traffic consultant has been advised of these scoping criteria in order to ensure that additional roads, other than those included in the current assessment, do not increase above the scoping criteria as a result of traffic redistribution during the operation phase. Sensitive receptors within 200m of impacted road links were included within the modelling assessment as detailed in LA 105 - Air Quality (UKHA 2019). In addition to this criterion some professional judgement may be used to scope in additional areas to increase the robustness of the assessment. The traffic consultant provided a set of 36 road links between proposed Spencer Dock station and the proposed depot for comparison with the scoping criteria. Of these, 27 links were identified as impacted according to the scoping criteria, 21 of which were in the Spencer Dock area. The six impacted roads outside of this area were;

- R148, east of L5041.
- Jackson's Bridge.
- R148, west of L5041.
- Pike Bridge.
- Deey Bridge.

- Collins Rail Bridge.

As noted in Section 12.3.5.1.2, LA 105 Air Quality (UKHA 2019) 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. Due to the nature of the impact on traffic of the proposed development the construction phase traffic is classified as low risk. The level crossing closure falls under this low-risk category as it can be classed as junction congestion relief project i.e. small junction improvements, signalling changes (UKHA 2019). LA 105 Air Quality (UKHA 2019) states that the impact of construction activities on vehicle movements shall be assessed where construction activities are programmed to last for more than 2 years. If the construction activities are less than 2 years, it is unlikely that the construction activities would constitute a significant air quality effect or impinge on Ireland's ability to comply with the legal limit values given the shorter-term duration of the construction activities as opposed to the long-term operation of the proposed development. The Guidance states that the assessment of construction traffic impacts on sensitive receptors shall be proportionate and limited to the areas of key risk of exceeding air quality thresholds.

LA 105 Air Quality states that a low sensitivity environment includes areas that have annual mean NO_2 concentrations of less than 36 µg/m^3 combined with a low number of sensitive receptors near the impacted roads. The six impacted road links outside the Spencer Dock area which are impacted by the proposed development during the construction phase have background concentrations significantly lower than 36 µg/m^3. Project specific monitoring (Section 12.3.3.2) in these areas included location 12, 13, 14 and 15 (Table 12-19, which show a maximum annualised concentration of 12.4 µg/m^3. A review of long-term EPA air quality in representative areas in EPA Air Quality Zone C and D (Table 12-15) also indicates that concentrations are significantly lower than 36 µg/m^3 on the road links impacted. Thus, in line with appropriate guidance such as LA 105 Air Quality Guidance, it is not deemed necessary to undertake detailed air modelling for areas outside the Spencer Dock area. The screening DMRB model will be appropriate for assessment on the following six roads;

- R148, east of L5041.
- Jackson's Bridge.
- R148, west of L5041.
- Pike Bridge.
- Deey Bridge.
- Collins Rail Bridge.

For the Spencer Dock area as the screening assessment indicates the potential for exceedances of the ambient air quality limit value, a detailed assessment, as per Section 12.3.5.1.2, will be undertaken.

12.5.1.2 Construction Traffic Impacts on Human Receptors

12.5.1.2.1 Simple DMRB Assessment

The degree of impact is determined based on both the absolute and relative impact of the proposed development. Results are compared against the 'Do-Nothing' scenario (DN), which assumes that the proposed development is not in place in future years, to determine the degree of impact. The traffic data modelled is included in Table 12-25. Impacts were assessed at 18 no. worst-case sensitive receptors (Table 12-24 within 200 m of the road links impacted by the proposed development (see MAY-MDC-ENV-ROUT-DR-V-120005-D in Volume 3A of this EIAR). These sensitive receptors include residential receptors and schools which are representative samples of sensitive receptors on the impacted roads. When choosing receptors consideration was given to choosing the worst-case location on a particular road link i.e. closest to the impacted roads. An impacted road is one which meets the scoping criteria detailed in Section 12.3.5.1.1. All road links provided by the traffic consultant are shown, however not all meet the scoping criteria and therefore some do not have sensitive receptors modelled.

Table 12-24 Representative Air Quality Receptors Construction Phase Simple Assessment

Site	East (ITM)	North (ITM)	Site	East (ITM)	North (ITM)
ConPhase_R1	691858	737797	ConPhase_R10	697871	736995
ConPhase_R2	691687	737837	ConPhase_R11	702814	735952
ConPhase_R3	691497	737915	ConPhase_R12	702999	735652
ConPhase_R4	691507	737248	ConPhase_R13	702738	736174
ConPhase_R5	690004	738952	ConPhase_R14	694264	737824
ConPhase_R6	692668	737754	ConPhase_R15	693997	737795
ConPhase_R7	695890	737221	ConPhase_R16	690636	738493
ConPhase_R8	695943	737331	ConPhase_R17	697321	737209
ConPhase_R9	697883	737015	ConPhase_R18	695065	737676

Table 12-25 Traffic Data Construction Phase Simple Assessment

Link Number	Base Year	Do-Nothing		Do-Something		Impacted?
		AADT (HGV%)	Speed (kph)	AADT (HGV%)	Speed (kph)	
1	4,392 (4%)	5,010 (2.9%)	59	5,637 (13.3%)	59	Impacted
2	2,222 (1.5%)	2,617 (1.6%)	65	2,866 (6.5%)	65	Impacted
3	6,080 (3.3%)	7,012 (2.6%)	59	7,325 (6.6%)	58	Impacted
4	2,645 (9.7%)	3,195 (7.8%)	60	3,423 (14.3%)	60	Impacted
5	7,159 (8.9%)	10,035 (9.7%)	64	10,107 (10.3%)	63	No
6	7,994 (4.8%)	10,219 (7.3%)	64	10,291 (8%)	63	No
7	11,946 (3.2%)	14,446 (5.2%)	62	14,674 (5.8%)	61	No
8	174 (1.1%)	189 (1.1%)	30	345 (11.6%)	30	Impacted
9	5,794 (4.4%)	7769 (6.8%)	66	7,841 (7.7%)	65	No
10	11,194 (0%)	9,708 (1.3%)	45	9,947 (3%)	46	No
11	14,108 (2.8%)	9,930 (4.8%)	50	10,188 (6.7%)	52	Impacted
12	21,765 (6.4%)	17,919 (8.9%)	43	17,919 (8.9%)	45	No
13	31,807 (8.2%)	25,438 (13.3%)	39	25,635 (13.9%)	43	No
14	38,801 (9.5%)	31,323 (13.2%)	41	31,323 (13.2%)	46	No
15	29,246 (8.8%)	25,111 (10.5%)	44	25,111 (10.5%)	45	No
16	4,691 (3.9%)	6,835 (5.8%)	40	6,835 (5.8%)	40	No
17	20,619 (3.5%)	25,764 (3.3%)	40	25,764 (3.3%)	40	No

The results of the assessment of the impact of the proposed development on NO_2 during the construction phase are shown in Table 12-26. The annual average concentration is in compliance with the limit value at all worst-case receptors during the construction phase. Concentrations of NO_2 are at most 35% of the annual limit value of 40 µg/m^3. The hourly limit value for NO_2 is 200 µg/m^3 and is expressed as a 99.8th percentile (i.e. it must not be exceeded more than 18 times per year). The maximum 1-hour NO_2 concentration is not predicted to be exceeded in any modelled year (Table 12-27).

The impact of the proposed development on annual mean NO_2 concentrations can be assessed relative to 'Do Nothing' (DN) levels. Relative to baseline levels, there are predicted to be some imperceptible increases in NO_2 concentrations at the worst-case receptors assessed. Concentrations will increase by at most 3.1% of the annual EU NO_2 limit value at receptor ConPhase_R5 which is located in west of the proposed depot in proximity to road link 1.

Concentrations of PM_{10} were modelled for the baseline construction year. The modelling showed that concentrations were in compliance with the annual limit value of 40 µg/m^3 at all receptors assessed, therefore, further modelling for the opening and design years was not required as per UK HA LA105 Guidance. The base year modelled contribution reached at most 0.11 µg/m^3. When a background concentration of 13 µg/m^3 is included, the overall concentration is 37% of the annual limit value at the worst-case receptor in the base year. Although not required in Guidance, a sensitivity study of the PM_{10} (Table 12-28) and $PM_{2.5}$ (Table 12-29) concentration was conducted. With respect to $PM_{2.5}$, annual mean concentrations of $PM_{2.5}$ reached at most 38% of the EU limit value of 25 µg/m^3. Concentrations will increase by at most 0.28% of the annual PM_{10} EU limit value at receptor ConPhase_R5.

Using the assessment criteria outlined in Table 12-9 to Table 12-11, the impact of the proposed development in terms of NO_2, PM_{10} and $PM_{2.5}$ is considered negligible. Therefore, the overall impact of NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of the proposed development is *short-term, negative and imperceptible*.

In accordance with TII guidance (TII 2011), the likely effects of the proposed development on ambient air quality in the construction phase is considered *short-term, localised, negative and imperceptible*. In accordance with the EPA Guidelines (EPA 2022) the likely effects associated with the construction phase traffic emissions pre-mitigation are not significant and short-term.

Table 12-26 Predicted Annual Mean NO_2 Concentrations

Receptor	Impact Construction Phase			
	DN	DS	DS-DN	Description (TII Criteria)
ConPhase_R1	11.4	12.0	0.66	Small Increase
ConPhase_R2	10.4	11.3	0.87	Small Increase
ConPhase_R3	10.6	11.7	1.08	Small Increase
ConPhase_R4	9.6	9.7	0.11	Negligible
ConPhase_R5	10.8	12.0	1.23	Small Increase
ConPhase_R6	10.6	11.0	0.41	Small Increase
ConPhase_R7	10.5	10.9	0.44	Small Increase
ConPhase_R8	10.2	10.4	0.21	Negligible
ConPhase_R9	12.2	12.4	0.25	Negligible
ConPhase_R10	10.6	10.8	0.18	Negligible
ConPhase_R11	12.6	13.0	0.45	Small Increase
ConPhase_R12	12.2	12.7	0.41	Small Increase
ConPhase_R13	12.7	13.2	0.47	Small Increase
ConPhase_R14	13.1	13.2	0.13	Negligible
ConPhase_R15	13.7	13.9	0.15	Negligible
ConPhase_R16	10.6	11.7	1.11	Small Increase
ConPhase_R17	12.0	12.1	0.10	Negligible
ConPhase_R18	12.3	12.4	0.10	Negligible

Table 12-27 Predicted 99.8th percentile of Daily Maximum 1-hour NO_2 Concentrations (µg/m^3).

Receptor	Construction Phase	
	DN	DS
ConPhase_R1	39.8	42.1
ConPhase_R2	36.4	39.4
ConPhase_R3	37	40.8

Receptor	Construction Phase	
	DN	DS
ConPhase_R4	33.6	34
ConPhase_R5	37.7	42
ConPhase_R6	37.2	38.6
ConPhase_R7	36.7	38.3
ConPhase_R8	35.7	36.5
ConPhase_R9	42.5	43.4
ConPhase_R10	37.2	37.9
ConPhase_R11	44	45.6
ConPhase_R12	42.9	44.3
ConPhase_R13	44.6	46.2
ConPhase_R14	45.7	46.2
ConPhase_R15	48	48.5
ConPhase_R16	37.1	41
ConPhase_R17	41.8	42.2
ConPhase_R18	42.9	43.3

Table 12-28 Annual Mean PM_{10} Concentrations (µg/m^3).

Receptor	Impact Construction Phase			
	DN	DS	DS-DN	Description (TII Criteria)
ConPhase_R1	14.4	14.5	0.06	Negligible
ConPhase_R2	14.2	14.3	0.08	Negligible
ConPhase_R3	14.2	14.3	0.09	Negligible
ConPhase_R4	14.1	14.1	0.01	Negligible
ConPhase_R5	14.3	14.4	0.11	Negligible
ConPhase_R6	14.3	14.3	0.04	Negligible
ConPhase_R7	14.2	14.2	0.04	Negligible
ConPhase_R8	14.1	14.2	0.02	Negligible
ConPhase_R9	14.5	14.5	0.03	Negligible
ConPhase_R10	14.2	14.2	0.02	Negligible
ConPhase_R11	14.6	14.7	0.03	Negligible
ConPhase_R12	14.6	14.6	0.03	Negligible
ConPhase_R13	14.7	14.7	0.04	Negligible
ConPhase_R14	14.6	14.6	0.01	Negligible
ConPhase_R15	14.7	14.7	0.01	Negligible
ConPhase_R16	14.3	14.4	0.10	Negligible
ConPhase_R17	14.4	14.4	0.01	Negligible
ConPhase_R18	14.5	14.5	0.01	Negligible

Table 12-29 Annual Mean $PM_{2.5}$ Concentrations (µg/m³).

Receptor	Impact Opening Year			
	DN	DS	DS-DN	Description (TII Criteria)
ConPhase_R1	9.27	9.31	0.04	Negligible
ConPhase_R2	9.14	9.18	0.05	Negligible
ConPhase_R3	9.16	9.22	0.06	Negligible
ConPhase_R4	9.03	9.04	0.01	Negligible
ConPhase_R5	9.18	9.25	0.07	Negligible
ConPhase_R6	9.17	9.19	0.02	Negligible
ConPhase_R7	9.12	9.14	0.02	Negligible
ConPhase_R8	9.09	9.10	0.01	Negligible
ConPhase_R9	9.31	9.33	0.02	Negligible
ConPhase_R10	9.14	9.16	0.02	Negligible
ConPhase_R11	9.42	9.44	0.02	Negligible
ConPhase_R12	9.37	9.39	0.02	Negligible
ConPhase_R13	9.44	9.46	0.02	Negligible
ConPhase_R14	9.37	9.38	0.01	Negligible
ConPhase_R15	9.44	9.45	0.01	Negligible
ConPhase_R16	9.16	9.23	0.06	Negligible
ConPhase_R17	9.28	9.29	0.01	Negligible
ConPhase_R18	9.29	9.30	0.01	Negligible

12.5.1.2.2 Detailed ADMS Assessment

The base year scenario is assessed for the receptors which are modelled for the construction phase in the Spencer Dock area using ADMS-Roads for the baseline year of 2017. The base year for the traffic data is 2016 however, there is no 2016 monitoring data available in the study area. Therefore, 2017 monitoring data was considered representative for the model verification (Section 12.3.5.1.2). The traffic data used in the detailed assessment is shown in Table 12-30. Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24-hour PM_{10} objective, at selected worst-case existing air quality sensitive receptors in the baseline for the construction phase are listed in Table 12-31. Statistics for the full list of modelled receptors can be found in Table 12.1 to Table 12.4 of Appendix 12.3 in Volume 4 of the EIAR and are shown in MAY-MDC-ENV-ROUT-DR-V-120007-D to 120012-D in Volume 3A of this EIAR. 'Worst-case' refers to those receptors which exceed the annual mean limit value in the baseline scenario. Receptors for this scenario are prefixed with CP_DA to denote Construction Phase Detailed Assessment.

Table 12-30 Traffic Data Construction Phase Detailed Assessment

Link Number	Baseline		Do-Nothing		Do-Something		Impacted?
	AADT (HGV%)	Speed (kph)	AADT (HGV%)	Speed (kph)	AADT (HGV%)	Speed (kph)	
18	28101 (8.7%)	38	25215 (10.8%)	38	27976 (10.8%)	38	Impacted
19	8969 (3.4%)	40	12012 (2.3%)	40	0 (0%)	40	Impacted
20	10284 (8.7%)	40	15167 (10.2%)	40	20247 (8.2%)	40	Impacted
21	15322 (5.5%)	40	22675 (7.6%)	40	20247 (8.2%)	40	No
22	2542 (18.7%)	35	2830 (12.8%)	35	3899 (6.8%)	35	Impacted
23	17736 (8.2%)	40	25598 (8.3%)	40	24242 (8.1%)	40	No

Link Number	Baseline		Do-Nothing		Do-Something		Impacted?
	AADT (HGV%)	Speed (kph)	AADT (HGV%)	Speed (kph)	AADT (HGV%)	Speed (kph)	
24	17806 (15.1%)	40	11980 (29.4%)	40	14271 (22.9%)	40	Impacted
25	25410 (6.9%)	40	24884 (9.3%)	38	23488 (9.8%)	38	No
26	9562 (24.2%)	40	10606 (27.6%)	38	12915 (21.6%)	38	Impacted
27	4805 (12.6%)	40	6365 (6%)	40	2150 (29.1%)	40	Impacted
28	3045 (20.5%)	40	5929 (10.3%)	40	3359 (24.8%)	40	Impacted
29	2901 (19.8%)	40	5972 (14.6%)	40	3612 (30.9%)	40	Impacted
30	27496 (22.8%)	44	30385 (27.4%)	44	28446 (29.7%)	44	No
31	26781 (23.3%)	45	29247 (29%)	44	27505 (31.3%)	44	No
32	21246 (31.8%)	45	27169 (32.8%)	44	25577 (35.6%)	44	No
33	24645 (23.1%)	42	24981 (30.1%)	42	26013 (28.2%)	42	Impacted
34	26892 (22.6%)	39	26482 (28.5%)	38	27538 (26.8%)	38	Impacted
35	18216 (16.3%)	42	18886 (27.9%)	41	20119 (26.5%)	41	Impacted
36	2316 (29.2%)	35	2269 (36.6%)	35	3932 (17.1%)	35	Impacted
37	9707 (25.5%)	40	10292 (25.7%)	40	12326 (20.3%)	40	Impacted
38	16137 (6.1%)	40	15572 (10.7%)	40	21057 (8.2%)	40	Impacted

Detailed ADMS Model - Baseline Assessment

In the baseline construction phase scenario annual mean concentrations of NO_2 are above the relevant national air quality objective at 14 locations along the Quays. The locations shown in Table 12-31 show the worst case impacted receptors. During modelling, these were found to have increases in concentrations of annual mean NO_2 due to the proposed development of 0.4 µg/m^3 or above. As per Section 12.3.6.1, impacts below 0.4 µg/m^3 are considered imperceptible and are therefore excluded from the tables below but can be located in Appendix A12.3 Detailed Modelled Results in Volume 4 of the EIAR. At all receptors, modelling of the maximum 24-hour PM_{10} concentration indicates that there is likely to be no more than five exceedance of the 50 µg/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 objectives for all modelled receptors.

Table 12-31 Predicted Baseline Pollutant Statistics At Worst-Case Receptor Locations for the Construction Phase Detailed Assessment

Receptor	Receptor Location (ITM)	Annual Mean Concentration (µg/m^3)			No of PM_{10} days > 50 µg/m^3
		NO_2	PM_{10}	$PM_{2.5}$	
CP_DA11	717801,734432	47.8	19.7	13.5	3
CP_DA5	717024,734919	24.0	17.8	12.3	1
CP_DA10	717736,734441	40.9	18.2	12.6	2
CP_DA67	716976,734977	23.1	17.3	12.0	1
CP_DA1	716946,735013	23.6	17.6	12.2	1
CP_DA71	716954,735004	23.2	17.4	12.0	1
CP_DA72	716949,735010	23.3	17.4	12.1	1
CP_DA78	716869,735106	24.4	18.1	12.5	2
CP_DA73	717004,734946	22.9	17.2	11.9	1
CP_DA68	716958,735000	22.9	17.2	11.9	1

Receptor	Receptor Location (ITM)	Annual Mean Concentration (µg/m^3)			No of PM_{10} days > 50 µg/m^3
		NO_2	PM_{10}	$PM_{2.5}$	
CP_DA66	716983,734971	22.8	17.1	11.9	1
CP_DA9	717678,734448	38.7	17.7	12.3	1
CP_DA65	716988,734965	22.7	17.1	11.9	1
CP_DA69	716966,734991	22.8	17.1	11.9	1
CP_DA74	717012,734937	22.8	17.1	11.9	1
CP_DA8	717650,734451	38.3	17.6	12.2	1
CP_DA79	716866,735111	23.9	17.8	12.3	1
CP_DA60	717052, 73489	22.3	16.9	11.7	1
CP_DA61	717067,734874	22.6	17.1	11.8	1
CP_DA64	717037,734911	22.1	16.8	11.7	1
CP_DA63	717043,734905	22.1	16.8	11.7	1
CP_DA62	717062,734881	22.3	16.9	11.7	1
CP_DA58	717074,734866	22.5	17.0	11.8	1
CP_DA83	716806,735190	22.0	16.8	11.7	1
CP_DA84	716800,735197	22.0	16.8	11.7	1
CP_DA82	716813,735183	21.9	16.7	11.6	1
CP_DA85	716792,735208	21.8	16.7	11.6	1
CP_DA89	716772,73523	21.9	16.8	11.7	1
CP_DA81	716890,735100	21.1	16.3	11.4	1
CP_DA77	716895,735043	20.1	15.8	11.1	1
CP_DA76	716907,735030	20.1	15.8	11.1	1
CP_DA80	716897,735095	20.8	16.1	11.3	1
CP_DA75	716921,735013	19.8	15.6	11.0	1

Detailed ADMS Model - Do Nothing Assessment

The 'Do Nothing' (DN) was provided by the Traffic and Transport Consultant for the proposed development (Chapter 6 Traffic and Transportation) with traffic volumes shown in Table 12-30. The output of this analysis and its impact on air quality has been modelled using ADMS-Roads for the construction period, see Section 12.3.5.1.2. Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24-hour PM_{10} objective at all modelled receptors can be found in Table 12-32 (see the full list in Appendix A12.3 in Volume 4 of the EIAR). The proposed development is 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 worst-case receptors. All results are presented in Appendix A12.3 Detailed Modelled Results in Volume 4 of the EIAR. In the construction DN, the air quality limit values are not exceeded at any receptors. Consequently, the predicted annual mean NO_2 concentrations did not exceed 60 µg/m^3 at any locations indicating that exceedances of the NO_2 1-hour mean are unlikely to occur. Predicted annual mean PM_{10} concentrations are below the relevant national air quality objectives for all modelled receptors. At all receptors, modelling of the maximum 24-hour PM_{10} concentration predicted that there is likely to be no more than six exceedances of the 50 µg/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 predicted to be below the relevant national air quality objectives for all modelled receptors.

Table 12-32 Predicted DN Pollutant Statistics At Worst-Case Receptor Locations for the Construction Phase Detailed Assessment

Receptor	Receptor Location (ITM)	Annual Mean Concentration (µg/m^3)			No of PM_{10} days > 50 µg/m^3
		NO_2	PM_{10}	$PM_{2.5}$	
CP_DA11	717801,734432	31.5	19.8	13.2	3
CP_DA5	717024,734919	23.8	19.0	12.8	2
CP_DA10	717736,734441	28.3	18.1	12.3	2
CP_DA67	716976,734977	23.2	18.3	12.4	2
CP_DA1	716946,735013	23.2	18.2	12.3	2
CP_DA71	716954,735004	23.2	18.2	12.3	2
CP_DA72	716949,735010	23.1	18.2	12.3	2
CP_DA78	716869,735106	22.9	17.9	12.2	2
CP_DA73	717004,734946	23.1	18.2	12.3	2
CP_DA68	716958,735000	23.0	18.0	12.2	2
CP_DA66	716983,734971	23.0	18.0	12.2	2
CP_DA9	717678,734448	27.4	17.6	12.0	1
CP_DA65	716988,734965	23.0	18.0	12.2	2
CP_DA69	716966,734991	23.0	18.0	12.2	2
CP_DA74	717012,734937	23.0	18.1	12.3	2
CP_DA8	717650,734451	27.2	17.5	11.9	1
CP_DA79	716866,735111	22.7	17.6	12.0	1
CP_DA60	717052, 73489	22.7	17.7	12.0	1
CP_DA61	717067,734874	23.0	18.0	12.2	2
CP_DA64	717037,734911	22.6	17.6	12.0	1
CP_DA63	717043,734905	22.6	17.5	12.0	1
CP_DA62	717062,734881	22.8	17.7	12.1	1
CP_DA58	717074,734866	22.9	17.8	12.1	2
CP_DA83	716806,735190	21.8	16.6	11.4	1
CP_DA84	716800,735197	21.8	16.6	11.4	1
CP_DA82	716813,735183	21.8	16.5	11.4	1
CP_DA85	716792,735208	21.8	16.5	11.4	1
CP_DA89	716772,73523	21.8	16.5	11.4	1
CP_DA81	716890,735100	21.5	16.2	11.2	1
CP_DA77	716895,735043	21.4	16.1	11.1	1
CP_DA76	716907,735030	21.4	16.1	11.1	1
CP_DA80	716897,735095	21.3	16.0	11.1	1
CP_DA75	716921,735013	21.4	16.0	11.1	1

Detailed ADMS Model - Do Something Assessment

The 'Do-Something' (DS) is a defined within the traffic modelling exercise in EIAR Volume 2 Chapter 6 Traffic and Transportation with traffic volumes shown in Table 12-30. The output of this analysis and its impact on air quality has been modelled using ADMS-Roads for the construction period, see Section 12.3.5.1.2. Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$ and the number of exceedances of the 24 hour PM_{10} objective at all modelled receptors can be found in Table 12-32 (full list available in Appendix A12.3

Detailed Modelled Results in Volume 4 of the EIAR). The proposed development is 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 worst-case receptors. All results are presented in Appendix A12.3 Detailed Modelled Results in Volume 4 of the EIAR. In the construction DS, the air quality limit values are not exceeded at any receptors. Consequently, the predicted annual mean NO_2 concentrations did not exceed 60 µg/m^3 at any locations indicating that exceedances of the NO_2 1-hour mean are unlikely to occur. Predicted annual mean PM_{10} concentrations are below the relevant national air quality objectives for all modelled receptors. At all receptors, modelling of the maximum 24-hour PM_{10} concentration predicted that there is likely to be no more than six exceedances of the 50 µg/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 predicted to be below the relevant national air quality objectives for all modelled receptors.

Table 12-33 Predicted DS Pollutant Statistics At Worst-Case Receptor Locations for the Construction Phase Detailed Assessment

Receptor	Receptor Location (ITM)	Annual Mean Concentration (µg/m^3)			No of PM_{10} days > 50 µg/m^3
		NO_2	PM_{10}	$PM_{2.5}$	
CP_DA11	717801,734432	32.8	20.3	13.4	4
CP_DA5	717024,734919	24.8	20.2	13.4	4
CP_DA10	717736,734441	29.3	18.5	12.5	2
CP_DA67	716976,734977	24.2	19.4	13.0	3
CP_DA1	716946,735013	24.1	19.3	12.9	3
CP_DA71	716954,735004	24.1	19.3	12.9	3
CP_DA72	716949,735010	24.0	19.2	12.9	3
CP_DA78	716869,735106	23.8	19.0	12.8	2
CP_DA73	717004,734946	24.0	19.2	12.9	3
CP_DA68	716958,735000	23.9	19.0	12.8	2
CP_DA66	716983,734971	23.9	19.0	12.8	2
CP_DA9	717678,734448	28.2	17.9	12.2	2
CP_DA65	716988,734965	23.8	19.0	12.8	2
CP_DA69	716966,734991	23.8	19.0	12.8	2
CP_DA74	717012,734937	23.9	19.1	12.8	3
CP_DA8	717650,734451	28.0	17.8	12.1	1
CP_DA79	716866,735111	23.5	18.6	12.5	2
CP_DA60	717052, 73489	23.4	18.5	12.5	2
CP_DA61	717067,734874	23.7	18.8	12.6	2
CP_DA64	717037,734911	23.3	18.3	12.4	2
CP_DA63	717043,734905	23.3	18.3	12.4	2
CP_DA62	717062,734881	23.4	18.5	12.5	2
CP_DA58	717074,734866	23.5	18.5	12.5	2
CP_DA83	716806,735190	22.4	17.2	11.8	1
CP_DA84	716800,735197	22.4	17.2	11.8	1
CP_DA82	716813,735183	22.3	17.1	11.7	1
CP_DA85	716792,735208	22.3	17.1	11.7	1
CP_DA89	716772,73523	22.3	17.1	11.7	1
CP_DA81	716890,735100	22.0	16.7	11.5	1

Receptor	Receptor Location (ITM)	Annual Mean Concentration (µg/m³)			No of PM_{10} days > 50 µg/m³
		NO_2	PM_{10}	$PM_{2.5}$	
CP_DA77	716895,735043	21.9	16.6	11.4	1
CP_DA76	716907,735030	21.8	16.6	11.4	1
CP_DA80	716897,735095	21.8	16.4	11.4	1
CP_DA75	716921,735013	21.8	16.5	11.4	1

Impact Assessment DS-DN

Table 12-34 provides the predicted change in and impact on pollutant concentrations, between the DN and DS for the construction phase. Statistics for the full list of modelled receptors can be found in Appendix A12.3 Detailed Modelled Results in Volume 4 of the EIAR. 'Worst-case' refers to receptors during modelling which were found to have increases in concentrations of annual mean NO_2 due to the proposed development of 0.4 µg/m³ or above.

Table 12-34 Predicted Changes in Construction DN and DS and Impact Significance Criteria At Worst-Case 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 Concentration		
		NO_2	PM_{10}	$PM_{2.5}$		NO_2	PM_{10}	$PM_{2.5}$
CP_DA11	717801,734432	1.3	0.5	0.3	1	Negligible	Negligible	Negligible
CP_DA5	717024,734919	1.0	1.2	0.7	2	Negligible	Negligible	Negligible
CP_DA10	717736,734441	1.0	0.3	0.2	0	Negligible	Negligible	Negligible
CP_DA67	716976,734977	0.9	1.1	0.6	1	Negligible	Negligible	Negligible
CP_DA1	716946,735013	0.9	1.1	0.6	1	Negligible	Negligible	Negligible
CP_DA71	716954,735004	0.9	1.1	0.6	1	Negligible	Negligible	Negligible
CP_DA72	716949,735010	0.9	1.0	0.6	1	Negligible	Negligible	Negligible
CP_DA78	716869,735106	0.9	1.0	0.6	0	Negligible	Negligible	Negligible
CP_DA73	717004,734946	0.9	1.0	0.6	1	Negligible	Negligible	Negligible
CP_DA68	716958,735000	0.9	1.0	0.6	0	Negligible	Negligible	Negligible
CP_DA66	716983,734971	0.9	1.0	0.6	0	Negligible	Negligible	Negligible
CP_DA9	717678,734448	0.9	0.3	0.2	1	Negligible	Negligible	Negligible
CP_DA65	716988,734965	0.9	1.0	0.5	0	Negligible	Negligible	Negligible
CP_DA69	716966,734991	0.9	1.0	0.6	0	Negligible	Negligible	Negligible
CP_DA74	717012,734937	0.9	1.0	0.5	1	Negligible	Negligible	Negligible
CP_DA8	717650,734451	0.8	0.3	0.2	0	Negligible	Negligible	Negligible
CP_DA79	716866,735111	0.8	0.9	0.5	1	Negligible	Negligible	Negligible
CP_DA60	717052, 73489	0.7	0.8	0.4	1	Negligible	Negligible	Negligible
CP_DA61	717067,734874	0.7	0.8	0.4	0	Negligible	Negligible	Negligible
CP_DA64	717037,734911	0.7	0.8	0.4	1	Negligible	Negligible	Negligible
CP_DA63	717043,734905	0.7	0.8	0.4	1	Negligible	Negligible	Negligible
CP_DA62	717062,734881	0.7	0.7	0.4	1	Negligible	Negligible	Negligible
CP_DA58	717074,734866	0.6	0.7	0.4	0	Negligible	Negligible	Negligible
CP_DA83	716806,735190	0.6	0.7	0.4	0	Negligible	Negligible	Negligible
CP_DA84	716800,735197	0.6	0.7	0.4	0	Negligible	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 Concentration		
		NO_2	PM_{10}	$PM_{2.5}$		NO_2	PM_{10}	$PM_{2.5}$
CP_DA82	716813,735183	0.6	0.6	0.4	0	Negligible	Negligible	Negligible
CP_DA85	716792,735208	0.6	0.6	0.3	0	Negligible	Negligible	Negligible
CP_DA89	716772,73523	0.6	0.6	0.3	0	Negligible	Negligible	Negligible
CP_DA81	716890,735100	0.5	0.5	0.3	0	Negligible	Negligible	Negligible
CP_DA77	716895,735043	0.5	0.5	0.3	0	Negligible	Negligible	Negligible
CP_DA76	716907,735030	0.4	0.5	0.3	0	Negligible	Negligible	Negligible
CP_DA80	716897,735095	0.4	0.5	0.3	0	Negligible	Negligible	Negligible
CP_DA75	716921,735013	0.4	0.5	0.3	0	Negligible	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 significance criteria (TII 2011). As shown in Table 12-34 and MAY-MDC-ENV-ROUT-DR-V-120007-D, MAY-MDC-ENV-ROUT-DR-V-120009-D and MAY-MDC-ENV-ROUT-DR-V-120011-D in Volume 3A of this EIAR all modelled receptors are estimated to experience a negligible impact due to the proposed development in terms of the annual mean NO_2, PM_{10} and $PM_{2.5}$ concentration during the construction phase. Therefore, it is considered that the effects with the EPA Guidelines (EPA 2022) and considering the potential impact of emissions from the proposed development construction, the likely effects are considered overall short-term, localised and not significant.

The predictions reported are based on conservative assumptions regarding background pollutant concentrations and the improvement in vehicle emission rates. 2019 backgrounds have been used to represent the construction year and are likely be lower by the peak construction year than in 2019. Older fleet projections were used in the absence of a fleet that incorporates the effects of 2021 Climate Action Plan (DECC 2021) measures – a larger proportion of electric vehicles is planned by the opening year than has been modelled. Traffic data have been modelled based on a peak construction period, while in practice the construction works will be phased. These data therefore represent a worst-case scenario. In reality, total concentrations (and magnitude of change) are likely to be lower than those reported here over much of the construction period.

12.5.1.3 Construction Traffic Impacts on Ecological Receptors

12.5.1.3.1 Simple DMRB Assessment

The impact of the proposed development on the nearby ecologically sensitive areas during the construction phase simple assessment is outlined in Table 12-35. The annual mean NO_X concentration has been compared to the critical level of 30 µg/m³ at each of the designated habitat sites (pNHAs). The predicted concentration of mean annual NOx at all sections modelled did not exceed the critical level for NO_X. There is a contribution at the following locations of above 1% of the critical level therefore the project ecologist was consulted and no significant concerns were raised.

- Royal Canal pNHA (Deey Bridge).
- Royal Canal pNHA (R149) West of Kilcock.
- Royal Canal pNHA (L5041) Laraghbryan.
- Royal Canal pNHA (Pike Bridge).
- Royal Canal pNHA (R149) and Liffey Valley pNHA (R149).

Table 12-35 Impacts at Key Ecological Receptors for the Construction Phase Simple Assessment (NOX Annual Mean Concentration)

Receptor	Receptor Location (ITM)	Do Nothing (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 – DN) (μg/m³)	Change as a percentage of critical level (30 μg/m³) (%)
Royal Canal pNHA (Deey Bridge)	697879, 736992	22.0	0m	22.4	0m	0.43	1.4%
Royal Canal pNHA (R149) West of Kilcock	689507, 739133	21.9	0m	24.6	0m	2.70	9.0%
Royal Canal pNHA (L5041) Millfarm	691839, 737797	19.1	0m	19.2	0m	0.04	0.1%
Royal Canal pNHA (L5041) Laraghbryan	691732, 737635	20.5	0m	21.3	0m	0.76	2.5%
Royal Canal pNHA (Pike Bridge)	696074, 737404	29.3	0m	30.7	30m	1.37	4.6%
Royal Canal pNHA (R149) and Liffey Valley pNHA (R149)	702687, 736789	25.6	0m	26.6	0m	0.97	3.2%

Note: Two decimal places have been provided where required in order to provide clarity of results.

Nitrogen deposition levels have been compared to the lower and higher critical loads for the designated habitat sites in Table 12-36. All sites are below the lower critical load for the designated habitat site. In accordance with the EPA Guidelines (EPA 2022) the ecological likely effects associated with the Construction Phase traffic emissions will overall be *negative, slight and short-term*.

Table 12-36 Impacts at Key Ecological Receptors for the Construction Phase Simple Assessment (NO_2 Deposition)

Receptor	Receptor Location (ITM)	Lower critical load for most sensitive feature (kgN/ha/yr)	Do Nothing (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)
Royal Canal pNHA (Deey Bridge)	697879, 736992	5	1.2	0m	1.2	0m	0.5%	0m	0.02
Royal Canal pNHA (R149) West of Kilcock	689507, 739133	5	1.2	0m	1.3	0m	2.9%	0m	0.15
Royal Canal pNHA (L5041) Millfarm	691839, 737797	5	1.0	0m	1.0	0m	0.0%	0m	0.00
Royal Canal pNHA (L5041) Laraghbryan	691732, 737635	5	1.1	0m	1.1	0m	0.8%	0m	0.04
Royal Canal pNHA (Pike Bridge)	696074, 737404	5	1.6	0m	1.6	0m	1.4%	0m	0.07

Receptor	Receptor Location (ITM)	Lower critical load for most sensitive feature (kgN/ha/yr)	Do Nothing (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)
Royal Canal pNHA (R149) and Liffey Valley pNHA (R149)	702687, 736789	5	1.4	0m	1.4	0m	1.0%	0m	0.05

Note: Two decimal places have been provided where required in order to provide clarity of results.

12.5.1.3.2 Detailed ADMS Assessment

The impact of the proposed development on the nearby ecologically sensitive areas during the construction phase is outlined in Table 12-37. The annual mean NO_X concentration has been compared to the critical level of 30µg/m^3 at each of the designated habitat sites (pNHAs). The predicted concentration of mean annual NOx at the Royal Canal for all sections modelled exceed the critical level for NO_X. There is a contribution at some intersections with the Royal Canal pNHA Hanover Quay/South of Guild Street and Royal Canal pNHA at North of Sheriff Street due to the proposed development of above 1% of the critical level. Therefore, the project ecologist was consulted however as the critical load for nitrogen deposition was not exceeded no significant concerns were raised.

Table 12-37 Impacts at Key Ecological Receptors for the Construction Phase Detailed Assessment (NO_X Annual Mean Concentration)

Receptor	Receptor Location (ITM)	Do Nothing (µg/m^3)	Distance from road beyond which concentration is below critical level (30 µg/m^3) (m)	Do Something (µg/m^3)	Distance from road beyond which concentration is below critical level (30 µg/m^3) (m)	Impact (DS – DN) (µg/m^3)	Change as a percentage of critical level (30 µg/m^3) (%)
Royal Canal pNHA (Hanover Quay/South of Guild Street)	717149, 734489	66.3	>200 m	70.0	>200 m	3.6	12.1%
Royal Canal pNHA (North of Guild Street)	717156, 734655	32.7	>200 m	32.9	>200 m	0.2	0.6%
Royal Canal pNHA (North of Sheriff Street)	717170, 734825	35.0	60 m	30.0	10 m	3.6	12.1%
Royal Canal pNHA (East of Newcomen Bridge)	716885, 735472	41.7	60 m	43.2	60 m	0.0	0.0%
Royal Canal pNHA (West of Newcomen Bridge)	716874, 735480	40.5	60 m	41.9	60 m	0.2	0.6%

Note: Two decimal places have been provided where required in order to provide clarity of results.

Nitrogen deposition levels have been compared to the lower and higher critical loads for the designated habitat sites in Table 12-38. All sites are below the lower critical load for the designated habitat site. In accordance with the EPA Guidelines (EPA 2022) the ecological likely effects associated with the construction phase traffic emissions will overall be *negative, slight and short-term*.

Table 12-38 Impacts at Key Ecological Receptors for the Construction Phase Detailed Assessment (NO_2 Deposition)

Receptor	Receptor Location (ITM)	Lower critical load for most sensitive feature (kgN/ha/yr)	Do Nothing (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)
Royal Canal pNHA (Hanover Quay/South of Guild Street)	717149, 734489	5	3.6	10 m	3.8	0 m	2.76%	0 m	0.14
Royal Canal pNHA (North of Guild Street)	717156, 734655	5	2.2	0 m	2.2	0 m	0.16%	0 m	0.01
Royal Canal pNHA (North of Sheriff Street)	717170, 734825	5	2.3	0 m	2.1	0 m	-4.74%	0 m	-0.24
Royal Canal pNHA (East of Newcomen Bridge)	716885, 735472	5	2.6	0 m	2.7	0 m	1.32%	0 m	0.07
Royal Canal pNHA (West of Newcomen Bridge)	716874, 735480	5	2.6	0 m	2.6	0 m	1.22%	0 m	0.06

Note: Two decimal places have been provided where required in order to provide clarity of results.

12.5.1.4 Construction Dust

The greatest potential impact on air quality during the construction phase is from construction dust emissions, PM_{10} and $PM_{2.5}$ emissions and the potential for nuisance dust. Dust is characterised as encompassing particulate matter with a particle size of between 1 and 75 microns (1- 75 µm), therefore includes both PM_{10} and $PM_{2.5}$. Deposition typically occurs in close proximity to each site and potential impacts generally occur within 350 m of the haulage route used by construction vehicles on the public road, up to 500 m from the site entrance.

Large particle sizes (greater than 75 microns) fall rapidly out of atmospheric suspension and are subsequently deposited in close proximity to the source. Particle sizes of less than 75 microns are of interest as they can remain airborne for greater distances and give rise to the potential dust nuisance at the sensitive receptors.

This section of the chapter provides an overview of the typical activities that have potential for dust impacts during the construction phase of the proposed development. The potential for dust emissions due to construction can vary substantially day to day and are strongly influenced by the level of activity, the specific operations, and the prevailing meteorological conditions. While each individual site compound will differ, the processes that have the potential for the generation of construction dust will be similar, these processes are discussed with respect to activities leading to potential dust emissions in Appendix A12.2 Potential Dust Generating Activities in Volume 4 of the EIAR. Further details on construction methods can be found in EIAR Volume 2 Chapter 5 which contains an overview of the typical activities and methods that are anticipated to be used during construction and commissioning of the proposed development.

The following operations are the main dust generating sources or activities:

- Vegetation Clearance – removes grass and other soil covering prevented emission generation.
- Demolition – detailed demolition plans will be required to minimise dust.
- Movement of trucks along paved public roads – potential of trackout of dust on vehicle tyres from construction sites or resuspension of dust.
- Movement of trucks along unpaved haul roads (this will only be relevant for a number of sites for instance at the proposed depot) – potential for resuspension of dust as vehicles move around the site.
- Extraction of material – works will be broken down into different types however all will involve the movement of potentially dusty material which has the potential to generate dust.
- Stockpiling of material – stockpiles have the potential to generate dust due to dry material movement and wind erosion.

12.5.1.4.1 Assessment of Potential Sensitivity and Potential Impact to Construction Dust

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude (Section 12.3.6.3 for each dust generation at each site needs to be taken into account in conjunction with the previously established sensitivity of the area (Section 12.4.3). Using the appraisal criteria for the assessment of risk at sensitive receptors as detailed in Table 12-5 to Table 12-8, a summary of dust emission magnitudes from the main construction sites is shown in Table 12-39. Where compounds or sites are located in proximity of each other, they have been grouped with respect to dust assessment. This is due to them acting as a single potential source with respect to dust emission magnitudes. The resultant requirement levels (i.e. high, medium or low levels of mitigation) for mitigation with respect to nuisance dust, health impacts and ecological impacts are shown in Table 12-40 to Table 12-43 and an overall summary provided in Table 12-44. The mitigation requirement levels take into account the sensitivity of the location established in Section 12.4.3 and the activities conducted on site which may generate dust. The assessment finds that a high level of dust mitigation is required for the majority of sites. Dust mitigation measures will also be put in place at any auxiliary sites not listed in the table below. Given the interconnected nature of the sites it is recommended that a high level of mitigation is provided at all locations.

Consistent implementation of good dust minimisation practices will ensure that the likely effects from construction dust is *localised, reversible and not significant* when considered with respect to the EPA description of effects (EPA 2022).

Table 12-39 Summary of Emission Magnitude

Compound Code	Location	Chainage	Demolition	Earthworks	Construction	Trackout
Rail line			Medium	Large	Large	Medium
CC-SET-S4-00000-B	Main Storage and Distribution Centre (MSDC)	-	N/A	Large	Small	Medium
CC-SUB-S2A-20280, CC-STA-S4-40230-B, CC-SET-S4-40280-B, CC-PW-S2A-20750-B, CC-STA-S4-40250-B, CC-PW-S4-40380-B	Spencer Dock (+ Station, Substation, Dock Road)	20+200, 40+230, 40+280, 40+380	Medium	Large	Large	Large
CC-PW-S1-10300-B, CC-STA-S1-7800-B	Connolly (+ North Strand Works)	10+300, -10+000	N/A	Medium	Small	Medium
CC-PW-S3-33340-B, CC-SUB-S3-33460, CC-PW-S4-43200-B	Glasnevin (+ Substation)	33+340, 33+460, 43+200	Small	Medium	Small	Medium
CC-SET-S3-00000-B	Cabra Road	-	N/A	Medium	Small	Medium
CC-STR-S5-51480-B	OBG5	51+480	Medium	Small	Medium	Medium
CC-SET-S5-51530-B, CC-SET-S5-52180-B	Reilly	51+530, 52+200	N/A	Medium	Small	Large
CC-SUB-S5-53600, CC-STA-S5-53660-B, CC-LC-S5-53820-B	Ashtown (+ Substation)	53+600, 53+650, 63+400	N/A	Large	Large	Medium
CC-SET-S5-54750-B	Navan Road (Permanent)	54+750	N/A	Medium	Small	Medium
CC-STR-S5-56060-B, CC-STR-S5-56130-B	OBG9	56+060, 56+130	N/A	Small	Medium	Medium
CC-STR-S5-56460-B, CC-SUB-S5-56500	Castleknock (+ Substation)	56+460, 56+500	N/A	Medium	Medium	Medium
CC-SUB-S5-57550-B, CC-STA-S5-57900-B, CC-LC-S5-58670-B	Coolmine (+ Substation)	57+550, 57+920, 67+900	Medium	Small	Small	Medium
CC-PW-S5-59970-B, CC-LC-S5-60150-B	Clonsilla	59+970, 69+700	N/A	Medium	Medium	Medium
CC-LC-S5-58800-B	Porterstown	68+500	N/A	Small	Medium	Medium
CC-LC-S6-71100-B, CC-SET-S6-70700-B	Barberstown	71+000, 70+700	N/A	Large	Large	Large
CC-PW-S6-72830-B	OBG13	72+830	N/A	Small	Medium	Medium
CC-SUB-S6-74680-B, CC-STR-S6-74660	Leixlip (Confey) (+ substation)	74+680, 74+660	N/A	Large	Medium	Medium
CC-STR-S6-76470-B, CC-STR-S6-76540-B	Leixlip (Louisa Bridge)	76+470, 76+540	N/A	Small	Small	Large
CC-SUB-S6-78180, CC-SET-S6-78200-B	Blakestown (+ substation)	78+180, 78+200	Medium	Small	Small	Large
CC-PW-S6-79950-B	OBG18	79+950	N/A	Small	Small	Medium

Compound Code	Location	Chainage	Demolition	Earthworks	Construction	Trackout
CC-SUB-S6-82260	Maynooth (+ substation)	82+230	N/A	Small	Small	Medium
CC-STR-S7-91880-B, CC-PW-S7-92340-B, CC-SET-S7-92100-B	Millfarm	91+880, 92+340, 92+180	N/A	Large	Medium	Medium
CC-STR-S7-92850-U, CC-STR-S7-92900-B	OBG23A	92+850, 92+900	Medium	Medium	Medium	Medium
CC-DEP-S7-93060-D, CC-DEP-S7-UP-93370-U	Depot (+ substation)	92+980, 93+280	N/A	Large	Large	Large
CC-SUB-S8-101070	Hansfield (+ substation)	101+060	N/A	Small	Small	Medium
CC-PW-S8-101660	OBCN286	101+660	N/A	Medium	Small	Medium
CC-PW-S8-104970, CC-SUB-S8-105060	Dunboyne (+ substation)	104+970, 105+060	N/A	Medium	Small	Medium
CC-PW-S8-106950-B, CC-SET-S8-106950-B, CC-SUB-S8-106950	M3 Parkway	106+950, 106+950, 106+950	N/A	Medium	Small	Medium

Note: Magnitude as per IAQM 2016 Guidance (IAQM 2016)

Table 12-40 Summary of Demolition Risk to Define Site-Specific Mitigation

Compound Code	Location	Chainage	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Rail line			Medium	Medium	Medium
CC-SET-S4-00000-B	Main Storage and Distribution Centre (MSDC)	-	N/A	N/A	N/A
CC-SUB-S2A-20280, CC-STA-S4-40230-B, CC-SET-S4-40280-B, CC-PW-S2A-20750-B, CC-STA-S4-40250-B, CC-PW-S4-40380-B	Spencer Dock (+ Station, Substation, Dock Road)	20+200, 40+230, 40+280, 40+380	Medium	Low	Medium
CC-PW-S1-10300-B, CC-STA-S1-7800-B	Connolly (+ North Strand Works)	10+300, -10+000	N/A	N/A	N/A
CC-PW-S3-33340-B, CC-SUB-S3-33460, CC-PW-S4-43200-B	Glasnevin (+ Substation)	33+340, 33+460, 43+200	Medium	Low	Medium
CC-SET-S3-00000-B	Cabra Road	-	N/A	N/A	N/A
CC-STR-S5-51480-B	OBG5	51+480	Medium	Low	Medium
CC-SET-S5-51530-B, CC-SET-S5-52180-B	Reilly	51+530, 52+200	N/A	N/A	N/A
CC-SUB-S5-53600, CC-STA-S5-53660-B, CC-LC-S5-53820-B	Ashtown (+ Substation)	53+600, 53+650, 63+400	N/A	N/A	N/A
CC-SET-S5-54750-B	Navan Road (Permanent)	54+750	N/A	N/A	N/A
CC-STR-S5-56060-B, CC-STR-S5-56130-B	OBG9	56+060, 56+130	N/A	N/A	N/A
CC-STR-S5-56460-B, CC-SUB-S5-56500	Castleknock (+ Substation)	56+460, 56+500	N/A	N/A	N/A
CC-SUB-S5-57550-B, CC-STA-S5-57900-B, CC-LC-S5-58670-B	Coolmine (+ Substation)	57+550, 57+920, 67+900	Medium	Low	Medium
CC-PW-S5-59970-B, CC-LC-S5-60150-B	Clonsilla	59+970, 69+700	N/A	N/A	N/A
CC-LC-S5-58800-B	Porterstown	68+500	N/A	N/A	N/A
CC-LC-S6-71100-B, CC-SET-S6-70700-B	Barberstown	71+000, 70+700	N/A	N/A	N/A
CC-PW-S6-72830-B	OBG13	72+830	N/A	N/A	N/A
CC-SUB-S6-74680-B, CC-STR-S6-74660	Leixlip (Confey) (+ substation)	74+680, 74+660	N/A	N/A	N/A
CC-STR-S6-76470-B, CC-STR-S6-76540-B	Leixlip (Louisa Bridge)	76+470, 76+540	N/A	N/A	N/A
CC-SUB-S6-78180, CC-SET-S6-78200-B	Blakestown (+ substation)	78+180, 78+200	Low	Low	Medium
CC-PW-S6-79950-B	OBG18	79+950	N/A	N/A	N/A
CC-SUB-S6-82260	Maynooth (+ substation)	82+230	N/A	N/A	N/A
CC-STR-S7-91880-B, CC-PW-S7-92340-B, CC-SET-S7-92100-B	Millfarm	91+880, 92+340, 92+180	N/A	N/A	N/A
CC-STR-S7-92850-U, CC-STR-S7-92900-B	OBG23A	92+850, 92+900	Low	Low	Medium

Compound Code	Location	Chainage	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
CC-DEP-S7-93060-D, CC-DEP-S7-UP-93370-U	Depot (+ substation)	92+980, 93+280	N/A	N/A	N/A
CC-SUB-S8-101070	Hansfield (+ substation)	101+060	N/A	N/A	N/A
CC-PW-S8-101660	OBCN286	101+660	N/A	N/A	N/A
CC-PW-S8-104970, CC-SUB-S8-105060	Dunboyne (+ substation)	104+970, 105+060	N/A	N/A	N/A
CC-PW-S8-106950-B, CC-SET-S8-106950-B, CC-SUB-S8-106950	M3 Parkway	106+950, 106+950, 106+950	N/A	N/A	N/A

Note: Summary of Risk defined as per IAQM Guidance (IAQM 2016)

Note: N/A indicates that demolition will not take place at this location as part of the proposed development works.

Table 12-41 Summary of Earthworks Risk to Define Site-Specific Mitigation

Compound Code	Location	Chainage	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Rail line			High	Medium	High
CC-SET-S4-00000-B	Main Storage and Distribution Centre (MSDC)	-	Low	Low	N/A
CC-SUB-S2A-20280, CC-STA-S4-40230-B, CC-SET-S4-40280-B, CC-PW-S2A-20750-B, CC-STA-S4-40250-B, CC-PW-S4-40380-B	Spencer Dock (+ Station, Substation, Dock Road)	20+200, 40+230, 40+280, 40+380	High	Low	High
CC-PW-S1-10300-B, CC-STA-S1-7800-B	Connolly (+ North Strand Works)	10+300, -10+000	Medium	Low	Medium
CC-PW-S3-33340-B, CC-SUB-S3-33460, CC-PW-S4-43200-B	Glasnevin (+ Substation)	33+340, 33+460, 43+200	Medium	Low	Medium
CC-SET-S3-00000-B	Cabra Road	-	Medium	Low	N/A
CC-STR-S5-51480-B	OBG5	51+480	Low	Negligible	Low
CC-SET-S5-51530-B, CC-SET-S5-52180-B	Reilly	51+530, 52+200	Medium	Low	N/A
CC-SUB-S5-53600, CC-STA-S5-53660-B, CC-LC-S5-53820-B	Ashtown (+ Substation)	53+600, 53+650, 63+400	High	Low	High
CC-SET-S5-54750-B	Navan Road (Permanent)	54+750	Low	Low	Medium
CC-STR-S5-56060-B, CC-STR-S5-56130-B	OBG9	56+060, 56+130	Negligible	Negligible	Low
CC-STR-S5-56460-B, CC-SUB-S5-56500	Castleknock (+ Substation)	56+460, 56+500	Low	Low	Medium
CC-SUB-S5-57550-B, CC-STA-S5-57900-B, CC-LC-S5-58670-B	Coolmine (+ Substation)	57+550, 57+920, 67+900	Low	Negligible	Low
CC-PW-S5-59970-B, CC-LC-S5-60150-B	Clonsilla	59+970, 69+700	Low	Low	Medium
CC-LC-S5-58800-B	Porterstown	68+500	Low	Negligible	Low
CC-LC-S6-71100-B, CC-SET-S6-70700-B	Barberstown	71+000, 70+700	Low	Low	High

Compound Code	Location	Chainage	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
CC-PW-S6-72830-B	OBG13	72+830	Negligible	Negligible	Low
CC-SUB-S6-74680-B, CC-STR-S6-74660	Leixlip (Confey) (+ substation)	74+680, 74+660	Medium	Low	Medium
CC-STR-S6-76470-B, CC-STR-S6-76540-B	Leixlip (Louisa Bridge)	76+470, 76+540	Low	Negligible	Low
CC-SUB-S6-78180, CC-SET-S6-78200-B	Blakestown (+ substation)	78+180, 78+200	Negligible	Negligible	Low
CC-PW-S6-79950-B	OBG18	79+950	Negligible	Negligible	Low
CC-SUB-S6-82260	Maynooth (+ substation)	82+230	Low	Negligible	Low
CC-STR-S7-91880-B, CC-PW-S7-92340-B, CC-SET-S7-92100-B	Millfarm	91+880, 92+340, 92+180	Low	Low	N/A
CC-STR-S7-92850-U, CC-STR-S7-92900-B	OBG23A	92+850, 92+900	Low	Low	Medium
CC-DEP-S7-93060-D, CC-DEP-S7-UP-93370-U	Depot (+ substation)	92+980, 93+280	Low	Low	High
CC-SUB-S8-101070	Hansfield (+ substation)	101+060	Low	Negligible	N/A
CC-PW-S8-101660	OBCN286	101+660	Low	Low	N/A
CC-PW-S8-104970, CC-SUB-S8-105060	Dunboyne (+ substation)	104+970, 105+060	Low	Low	N/A
CC-PW-S8-106950-B, CC-SET-S8-106950-B, CC-SUB-S8-106950	M3 Parkway	106+950, 106+950, 106+950	Low	Low	N/A

Note: Summary of Risk defined as per IAQM Guidance (IAQM 2016)

Table 12-42 Summary of Construction Risk to Define Site-Specific Mitigation

Compound Code	Location	Chainage	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Rail line			High	Medium	High
CC-SET-S4-00000-B	Main Storage and Distribution Centre (MSDC)	-	Negligible	Negligible	N/A
CC-SUB-S2A-20280, CC-STA-S4-40230-B, CC-SET-S4-40280-B, CC-PW-S2A-20750-B, CC-STA-S4-40250-B, CC-PW-S4-40380-B	Spencer Dock (+ Station, Substation, Dock Road)	20+200, 40+230, 40+280, 40+380	High	Low	High
CC-PW-S1-10300-B, CC-STA-S1-7800-B	Connolly (+ North Strand Works)	10+300, -10+000	Low	Negligible	Low
CC-PW-S3-33340-B, CC-SUB-S3-33460, CC-PW-S4-43200-B	Glasnevin (+ Substation)	33+340, 33+460, 43+200	Low	Negligible	Low
CC-SET-S3-00000-B	Cabra Road	-	Low	Negligible	Low
CC-STR-S5-51480-B	OBG5	51+480	Medium	Low	Medium
CC-SET-S5-51530-B, CC-SET-S5-52180-B	Reilly	51+530, 52+200	Low	Negligible	Low
CC-SUB-S5-53600, CC-STA-S5-53660-B, CC-LC-S5-53820-B	Ashtown (+ Substation)	53+600, 53+650, 63+400	High	Low	High

Compound Code	Location	Chainage	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
CC-SET-S5-54750-B	Navan Road (Permanent)	54+750	Low	Negligible	Low
CC-STR-S5-56060-B, CC-STR-S5-56130-B	OBG9	56+060, 56+130	Low	Low	Medium
CC-STR-S5-56460-B, CC-SUB-S5-56500	Castleknock (+ Substation)	56+460, 56+500	Low	Low	Medium
CC-SUB-S5-57550-B, CC-STA-S5-57900-B, CC-LC-S5-58670-B	Coolmine (+ Substation)	57+550, 57+920, 67+900	Low	Negligible	Low
CC-PW-S5-59970-B, CC-LC-S5-60150-B	Clonsilla	59+970, 69+700	Low	Low	Medium
CC-LC-S5-58800-B	Porterstown	68+500	Medium	Low	Medium
CC-LC-S6-71100-B, CC-SET-S6-70700-B	Barberstown	71+000, 70+700	Low	Low	High
CC-PW-S6-72830-B	OBG13	72+830	Low	Low	Medium
CC-SUB-S6-74680-B, CC-STR-S6-74660	Leixlip (Confey) (+ substation)	74+680, 74+660	Medium	Low	Medium
CC-STR-S6-76470-B, CC-STR-S6-76540-B	Leixlip (Louisa Bridge)	76+470, 76+540	Low	Negligible	Low
CC-SUB-S6-78180, CC-SET-S6-78200-B	Blakestown (+ substation)	78+180, 78+200	Negligible	Negligible	Low
CC-PW-S6-79950-B	OBG18	79+950	Negligible	Negligible	Low
CC-SUB-S6-82260	Maynooth (+ substation)	82+230	Low	Negligible	Low
CC-STR-S7-91880-B, CC-PW-S7-92340-B, CC-SET-S7-92100-B	Millfarm	91+880, 92+340, 92+180	Low	Low	N/A
CC-STR-S7-92850-U, CC-STR-S7-92900-B	OBG23A	92+850, 92+900	Low	Low	Medium
CC-DEP-S7-93060-D, CC-DEP-S7-UP-93370-U	Depot (+ substation)	92+980, 93+280	Low	Low	High
CC-SUB-S8-101070	Hansfield (+ substation)	101+060	Low	Negligible	N/A
CC-PW-S8-101660	OBCN286	101+660	Negligible	Negligible	N/A
CC-PW-S8-104970, CC-SUB-S8-105060	Dunboyne (+ substation)	104+970, 105+060	Negligible	Negligible	N/A
CC-PW-S8-106950-B, CC-SET-S8-106950-B, CC-SUB-S8-106950	M3 Parkway	106+950, 106+950, 106+950	Low	Negligible	N/A

Note: Summary of Risk defined as per IAQM Guidance (IAQM 2016)

Table 12-43 Summary of Trackout Risk to Define Site-Specific Mitigation

Compound Code	Location	Chainage	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Rail line			Medium	Low	Medium
CC-SET-S4-00000-B	Main Storage and Distribution Centre (MSDC)	-	Low	Low	N/A

Compound Code	Location	Chainage	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
CC-SUB-S2A-20280, CC-STA-S4-40230-B, CC-SET-S4-40280-B, CC-PW-S2A-20750-B, CC-STA-S4-40250-B, CC-PW-S4-40380-B	Spencer Dock (+ Station, Substation, Dock Road)	20+200, 40+230, 40+280, 40+380	High	Low	High
CC-PW-S1-10300-B, CC-STA-S1-7800-B	Connolly (+ North Strand Works)	10+300, -10+000	Low	Low	Medium
CC-PW-S3-33340-B, CC-SUB-S3-33460, CC-PW-S4-43200-B	Glasnevin (+ Substation)	33+340, 33+460, 43+200	Low	Low	Medium
CC-SET-S3-00000-B	Cabra Road	-	Low	Low	Medium
CC-STR-S5-51480-B	OBG5	51+480	Low	Low	Medium
CC-SET-S5-51530-B, CC-SET-S5-52180-B	Reilly	51+530, 52+200	Medium	Low	High
CC-SUB-S5-53600, CC-STA-S5-53660-B, CC-LC-S5-53820-B	Ashtown (+ Substation)	53+600, 53+650, 63+400	Medium	Low	Medium
CC-SET-S5-54750-B	Navan Road (Permanent)	54+750	Low	Low	Medium
CC-STR-S5-56060-B, CC-STR-S5-56130-B	OBG9	56+060, 56+130	Low	Low	Medium
CC-STR-S5-56460-B, CC-SUB-S5-56500	Castleknock (+ Substation)	56+460, 56+500	Low	Low	Medium
CC-SUB-S5-57550-B, CC-STA-S5-57900-B, CC-LC-S5-58670-B	Coolmine (+ Substation)	57+550, 57+920, 67+900	Low	Low	Medium
CC-PW-S5-59970-B, CC-LC-S5-60150-B	Clonsilla	59+970, 69+700	Low	Low	Medium
CC-LC-S5-58800-B	Porterstown	68+500	Low	Low	Medium
CC-LC-S6-71100-B, CC-SET-S6-70700-B	Barberstown	71+000, 70+700	Low	Low	High
CC-PW-S6-72830-B	OBG13	72+830	Low	Low	Medium
CC-SUB-S6-74680-B, CC-STR-S6-74660	Leixlip (Confey) (+ substation)	74+680, 74+660	Medium	Low	Medium
CC-STR-S6-76470-B, CC-STR-S6-76540-B	Leixlip (Louisa Bridge)	76+470, 76+540	Medium	Low	Medium
CC-SUB-S6-78180, CC-SET-S6-78200-B	Blakestown (+ substation)	78+180, 78+200	Low	Low	High
CC-PW-S6-79950-B	OBG18	79+950	Low	Low	Medium
CC-SUB-S6-82260	Maynooth (+ substation)	82+230	Low	Low	Medium
CC-STR-S7-91880-B, CC-PW-S7-92340-B, CC-SET-S7-92100-B	Millfarm	91+880, 92+340, 92+180	Low	Low	N/A
CC-STR-S7-92850-U, CC-STR-S7-92900-B	OBG23A	92+850, 92+900	Low	Low	Medium
CC-DEP-S7-93060-D, CC-DEP-S7-UP-93370-U	Depot (+ substation)	92+980, 93+280	Low	Low	High
CC-SUB-S8-101070	Hansfield (+ substation)	101+060	Low	Low	N/A
CC-PW-S8-101660	OBCN286	101+660	Low	Low	N/A

Compound Code	Location	Chainage	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
CC-PW-S8-104970, CC-SUB-S8-105060	Dunboyne (+ substation)	104+970, 105+060	Low	Low	N/A
CC-PW-S8-106950-B, CC-SET-S8-106950-B, CC-SUB-S8-106950	M3 Parkway	106+950, 106+950, 106+950	Low	Low	N/A

Note: Summary of Risk defined as per IAQM Guidance (IAQM 2016)

Summary of Potential Dust Impacts

The risk of dust impacts because of the proposed development are summarised in Table 12-44. The magnitude of risk determined is used to prescribe the level of site-specific mitigation required for each activity to prevent significant impacts occurring.

In accordance with the EPA Guidelines (EPA 2022) the likely effects associated with the construction phase dust emissions mitigation are overall *negative*, *not significant*, and *short-term*.

Table 12-44 Summary Overall Dust Impact Risk to Define Site-Specific Mitigation

Compound Code	Location	Chainage	Worst Case Risk
Rail line			High
CC-SET-S4-00000-B	Main Storage and Distribution Centre (MSDC)	-	Low
CC-SUB-S2A-20280, CC-STA-S4-40230-B, CC-SET-S4-40280-B, CC-PW-S2A-20750-B, CC-STA-S4-40250-B, CC-PW-S4-40380-B	Spencer Dock (+ Station, Substation, Dock Road)	20+200, 40+230, 40+280, 40+380	High
CC-PW-S1-10300-B, CC-STA-S1-7800-B	Connolly (+ North Strand Works)	10+300, -10+000	Medium
CC-PW-S3-33340-B, CC-SUB-S3-33460, CC-PW-S4-43200-B	Glasnevin (+ Substation)	33+340, 33+460, 43+200	Medium
CC-SET-S3-00000-B	Cabra Road	-	Medium
CC-STR-S5-51480-B	OBG5	51+480	Medium
CC-SET-S5-51530-B, CC-SET-S5-52180-B	Reilly	51+530, 52+200	Medium
CC-SUB-S5-53600, CC-STA-S5-53660-B, CC-LC-S5-53820-B	Ashtown (+ Substation)	53+600, 53+650, 63+400	High
CC-SET-S5-54750-B	Navan Road (Permanent)	54+750	Medium
CC-STR-S5-56060-B, CC-STR-S5-56130-B	OBG9	56+060, 56+130	Medium
CC-STR-S5-56460-B, CC-SUB-S5-56500	Castleknock (+ Substation)	56+460, 56+500	Medium
CC-SUB-S5-57550-B, CC-STA-S5-57900-B, CC-LC-S5-58670-B	Coolmine (+ Substation)	57+550, 57+920, 67+900	Low
CC-PW-S5-59970-B, CC-LC-S5-60150-B	Clonsilla	59+970, 69+700	Medium
CC-LC-S5-58800-B	Porterstown	68+500	Medium
CC-LC-S6-71100-B, CC-SET-S6-70700-B	Barberstown	71+000, 70+700	High
CC-PW-S6-72830-B	OBG13	72+830	Medium
CC-SUB-S6-74680-B, CC-STR-S6-74660	Leixlip (Confey) (+ substation)	74+680, 74+660	Medium
CC-STR-S6-76470-B, CC-STR-S6-76540-B	Leixlip (Louisa Bridge)	76+470, 76+540	Low
CC-SUB-S6-78180, CC-SET-S6-78200-B	Blakestown (+ substation)	78+180, 78+200	Low

Compound Code	Location	Chainage	Worst Case Risk
CC-PW-S6-79950-B	OBG18	79+950	Low
CC-SUB-S6-82260	Maynooth (+ substation)	82+230	Low
CC-STR-S7-91880-B, CC-PW-S7-92340-B, CC-SET-S7-92100-B	Millfarm	91+880, 92+340, 92+180	Low
CC-STR-S7-92850-U, CC-STR-S7-92900-B	OBG23A	92+850, 92+900	Medium
CC-DEP-S7-93060-D, CC-DEP-S7-UP-93370-U	Depot (+ substation)	92+980, 93+280	High
CC-SUB-S8-101070	Hansfield (+ substation)	101+060	Low
CC-PW-S8-101660	OBCN286	101+660	Low
CC-PW-S8-104970, CC-SUB-S8-105060	Dunboyne (+ substation)	104+970, 105+060	Low
CC-PW-S8-106950-B, CC-SET-S8-106950-B, CC-SUB-S8-106950	M3 Parkway	106+950, 106+950, 106+950	Low

Note: Summary of Risk defined as per IAQM Guidance (IAQM 2016)

12.5.2 Potential Operational Impacts

12.5.1.5 Operational Rail Impacts

The proposed development's primary objective is to provide a higher frequency, higher capacity, electrified heavy rail service. The Do Nothing (DN) and Do Something (DS) regional emissions from the railway have been quantified using the assessment method detailed in Section 12.3.6.4 and 12.3.6.5. The DN is defined as the scenario where the current rail schedule continues. The DS is defined as the scenario where the rail schedule is updated as per the proposed development. able 12-45 shows the change to rail numbers on rail sections which are currently in operation using data provided by Iarnród Éireann. The rail traffic figures can be used in conjunction with the length of the section and the emission factors detailed in Section 12.3.6.4 and 12.3.6.5 to calculate the mass pollutant emission. A sizable increase in the number of carriages and trains daily are proposed as part of the proposed development. In addition to the sections compared to the DN in able 12-45, the rail numbers for the proposed Spencer Dock Station and depot west of Maynooth have also been included in the mass emission calculations.

For the DN, information has been provided on the number of carriages each locomotive has attached. This information has been utilised in calculating the total number of trains and carriages on a section of track. For the DS, all EMUs are assumed to have 10 carriages with DMUs remaining with 6 carriages. In addition, both passenger and technical movements have been included for the DN and DS.

able 12-45 Changes to Rail Numbers

Section of Track	DMU		Change Carriages Daily	EMU		Change Carriages Daily
	DN Carriages Daily	DS Carriages Daily	(% increase from DN)	DN Carriages Daily	DS Carriages Daily	(% increase from DN)
Connolly to East Wall Jct.	273	282	9 (3%)	712	1,072	360 (132%)
East Wall Jct. to Connolly	275	282	7 (3%)	710	968	258 (94%)
Connolly to North Strand Jct.	385	174	-211 (-55%)	-	784	784 (204%)
North Strand Jct. to Glasnevin	409	174	-235 (-57%)	-	1,312	1312 (321%)

Section of Track	DMU		Change Carriages Daily	EMU		Change Carriages Daily
	DN Carriages Daily	DS Carriages Daily	(% increase from DN)	DN Carriages Daily	DS Carriages Daily	(% increase from DN)
Glasnevin to Islandbridge Jct.	111	-	-111 (-100%)	-	880	880 (793%)
Islandbridge Jct. to Glasnevin	114	-	-114 (-100%)	-	872	872 (765%)
Glasnevin to North Strand Jct.	415	174	-241 (-58%)	-	1,256	1256 (303%)
North Strand Jct. to Connolly	373	174	-199 (-53%)	-	752	752 (202%)
Docklands to Glasnevin (Spencer Dock to Glasnevin in DS)	49	-	-49 (-100%)	-	872	872 (1780%)
Glasnevin to Clonsilla	339	174	-165 (-49%)	-	1,280	1280 (378%)
Clonsilla to Maynooth	291	174	-117 (-40%)	-	816	816 (280%)
Maynooth to Maynooth Depot	62	174	112 (181%)	-	-	0 (0%)
Maynooth Depot to Maynooth	54	174	120 (222%)	-	-	0 (0%)
Maynooth to Clonsilla	283	174	-109 (-39%)	-	760	760 (269%)
Clonsilla to Glasnevin	339	174	-165 (-49%)	-	1,224	1224 (361%)
Glasnevin to Docklands (Glasnevin to Spencer Dock in DS)	49	-	-49 (-100%)	-	872	872 (1780%)
Clonsilla to M3 Parkway	75	-	-75 (-100%)	-	448	448 (597%)
M3 Parkway to Clonsilla	83	-	-83 (-100%)	-	456	456 (549%)
Connolly to Pearse	364	6	-358 (-98%)	650	1,824	1174 (323%)
Pearse to Connolly	360	6	-354 (-98%)	650	1,832	1182 (328%)
Docklands to East Wall Jct.	-	-	-	-	-	-
East Wall Jct. to Spencer Dock	-	-	-	-	-	-
North wall to North Strand Jct. (Spencer Dock to North Strand Jct. in DS)	24	-	-24 (-100%)	-	536	536 (2233%)
North Wall to East Wall Jct. (Spencer Dock to East Wall Jct. in DS)	30	-	-30 (-100%)	-	-	0 (0%)
East Wall Jct. to North Wall	18	-	-18 (-100%)	-	-	0 (0%)
North Strand Jct. to North wall (North Strand Jct. to Spencer Dock in DS)	18	-	-18 (-100%)	-	504	504 (2800%)

Section of Track	DMU		Change Carriages Daily	EMU		Change Carriages Daily
	DN Carriages Daily	DS Carriages Daily	(% increase from DN)	DN Carriages Daily	DS Carriages Daily	(% increase from DN)
Total	**4,793**	**2,316**	-2477 (-52%)	**2,722**	**19,320**	16598 (346%)

Mass pollutant emissions produced in both the DN and DS scenarios during the operation phase are shown in Table 12-46 and Table 12-47 respectively.

Table 12-48 shows the change in mass emissions between the DN and DS. The proposed development is beneficial, with reductions in emissions of all pollutants modelled. PM_{10} is not a pollutant which is included in the National Air Emission Targets and therefore is not included in the comparison.

The majority of these reductions result from the shift from diesel units to electric rail units. The impact in emissions is significant enough that the increased frequency (6 trains presently to 12 trains in the future per hour) and capacity of the service does not result in an overall significant adverse impact. The emissions in the DS include emissions with respect to the generation of electricity to power the EMUs. As the national grid decarbonises in line with the 2021 CAP (up to 80% renewables by 2030) the improvements will become larger as less fossil fuels will be required to generate each kWh. Emissions calculations are based on this 80% target being reached by the national grid. IÉ have agreed to purchase of up to 80% of its operational demand from certified low or zero carbon electricity operations. This will ensure that should the CAP target of 80% renewables not be achieved, the proposed DART+ West project will however still achieve this percentage. The additional movements on the rail line at the depot west of Maynooth and the Spencer Dock area have also been included in the total DS emissions.

Table 12-46 Do-Nothing (DN) Rail Emissions

Stations	Kg NO_x	Kg PM_{10}	Kg $PM_{2.5}$	Kg SO_2	Carriage KM Travelled
DN - DMUs					
Connolly to East Wall Jct.	5.886	0.1733	0.1592	0.01	218.40
East Wall Jct. to Connolly	5.414	0.1581	0.1451	0.01	206.25
Connolly to North Strand Jct.	2.083	0.0623	0.0574	0.00	73.15
North Strand Jct. to Glasnevin	27.411	0.8200	0.7552	0.04	964.83
Glasnevin to Islandbridge Jct.	14.836	0.4509	0.4163	0.03	493.51
Islandbridge Jct. to Glasnevin	15.135	0.4591	0.4237	0.03	506.84
Glasnevin to North Strand Jct.	27.799	0.8315	0.7658	0.04	978.99
North Strand Jct. to Connolly	2.014	0.0603	0.0555	0.00	70.87
Docklands to Glasnevin (Spencer Dock to Glasnevin in DS)	4.722	0.1448	0.1338	0.01	151.90
Glasnevin to Clonsilla	111.479	3.3283	3.0643	0.17	3950.71
Clonsilla to Maynooth	101.401	3.0113	2.7702	0.14	3658.74
Maynooth to Depot	5.644	0.1686	0.1553	0.01	199.64
Depot to Maynooth	4.970	0.1489	0.1372	0.01	173.88
Maynooth to Clonsilla	98.384	2.9197	2.6856	0.14	3558.16
Clonsilla to Glasnevin	111.479	3.3283	3.0643	0.17	3950.71
Glasnevin to Docklands (Glasnevin to Spencer Dock in DS)	5.105	0.1557	0.1438	0.01	167.58
Clonsilla to M3 Parkway	0.000	0.0000	0.0000	0.00	0.00

Stations	Kg NO_x	Kg PM_{10}	Kg $PM_{2.5}$	Kg SO_2	Carriage KM Travelled
M3 Parkway to Clonsilla	0.000	0.0000	0.0000	0.00	0.00
Connolly to Pearse	15.233	0.4533	0.4171	0.02	546.00
Pearse to Connolly	15.190	0.4531	0.4171	0.02	540.00
Docklands to East Wall Jct.	0.000	0.0000	0.0000	0.00	0.00
East Wall Jct. to Spencer Dock	0.000	0.0000	0.0000	0.00	0.00
North wall to North Strand Jct. (Spencer Dock to North Strand Jct. in DS)	0.644	0.0191	0.0175	0.00	23.45
North Wall to East Wall Jct. (Spencer Dock to East Wall Jct. in DS)	0.775	0.0229	0.0211	0.00	28.23
East Wall Jct. to North Wall	0.465	0.0138	0.0127	0.00	16.94
North Strand Jct. to North wall (North Strand Jct. to Spencer Dock in DS)	0.483	0.0143	0.0131	0.00	17.59
Sum Daily (kg Pollutant)	576.55	17.20	15.83	1	20,496
Sum Annually (kg Pollutant)	210,441	6,277	5,778	317	7,481,168
DN - EMUs					
Connolly to East Wall Jct.	0.02638	0.00991	0.00104	0.010	569.6
East Wall Jct. to Connolly	0.02467	0.00926	0.00097	0.009	532.5
Connolly to North Strand Jct.	0.00000	0.00000	0.00000	0.000	-
North Strand Jct. to Glasnevin	0.00000	0.00000	0.00000	0.000	-
Glasnevin to Islandbridge Jct.	0.00000	0.00000	0.00000	0.000	-
Islandbridge Jct. to Glasnevin	0.00000	0.00000	0.00000	0.000	-
Glasnevin to North Strand Jct.	0.00000	0.00000	0.00000	0.000	-
North Strand Jct. to Connolly	0.00000	0.00000	0.00000	0.000	-
Docklands to Glasnevin (Spencer Dock to Glasnevin in DS)	0.00000	0.00000	0.00000	0.000	-
Glasnevin to Clonsilla	0.00000	0.00000	0.00000	0.000	-
Clonsilla to Maynooth	0.00000	0.00000	0.00000	0.000	-
Maynooth to Depot	0.00000	0.00000	0.00000	0.000	-
Depot to Maynooth	0.00000	0.00000	0.00000	0.000	-
Maynooth to Clonsilla	0.00000	0.00000	0.00000	0.000	-
Clonsilla to Glasnevin	0.00000	0.00000	0.00000	0.000	-
Glasnevin to Docklands (Glasnevin to Spencer Dock in DS)	0.00000	0.00000	0.00000	0.000	-
Clonsilla to M3 Parkway	0.00000	0.00000	0.00000	0.000	-
M3 Parkway to Clonsilla	0.00000	0.00000	0.00000	0.000	-
Connolly to Pearse	0.04516	0.01696	0.00178	0.017	975.0
Pearse to Connolly	0.04516	0.01696	0.00178	0.017	975.0
Docklands to East Wall Jct.	0.00000	0.00000	0.00000	0.000	-
East Wall Jct. to Spencer Dock	0.00000	0.00000	0.00000	0.000	-
North wall to North Strand Jct. (Spencer Dock to North Strand Jct. in DS)	0.00000	0.00000	0.00000	0.000	-
North Wall to East Wall Jct. (Spencer Dock to East Wall Jct. in DS)	0.00000	0.00000	0.00000	0.000	-
East Wall Jct. to North Wall	0.00000	0.00000	0.00000	0.000	-

Stations	Kg NO_x	Kg PM_{10}	Kg $PM_{2.5}$	Kg SO_2	Carriage KM Travelled
North Strand Jct. to North wall (North Strand Jct. to Spencer Dock in DS)	0.00000	0.00000	0.00000	0.000	-
Sum Daily (kg Pollutant)	0.14	0.05	0.01	0.053	3,052.1
Sum Annually (kg Pollutant)	52	19	2	19.383	1,114,016.5
DN - All Rail					
Sum Daily (kg Pollutant)	577	17	16	1	23,548
Sum Annually (kg Pollutant)	210,493	6,296	5,781	336	8,595,185

Table 12-47 Do-Something (DS) Rail Emissions

Stations	Kg NO_x	Kg PM_{10}	Kg $PM_{2.5}$	Kg SO_2	Carriage KM Travelled
DS - DMUs					
Connolly to East Wall Jct.	6.375	0.164	0.150	0.0084	226
East Wall Jct. to Connolly	5.976	0.154	0.140	0.0079	212
Connolly to North Strand Jct.	0.934	0.024	0.022	0.0012	33
North Strand Jct. to Glasnevin	11.598	0.299	0.272	0.0153	410
Glasnevin to Islandbridge Jct.	0.000	0.000	0.000	0.0000	0
Islandbridge Jct. to Glasnevin	0.000	0.000	0.000	0.0000	0
Glasnevin to North Strand Jct.	11.598	0.299	0.272	0.0153	410
North Strand Jct. to Connolly	0.934	0.024	0.022	0.0012	33
Docklands to Glasnevin (Spencer Dock to Glasnevin in DS)	0.000	0.000	0.000	0.0000	0
Glasnevin to Clonsilla	57.298	1.478	1.345	0.0758	2028
Clonsilla to Maynooth	61.816	1.594	1.451	0.0818	2188
Maynooth to Depot	15.831	0.408	0.372	0.0209	560
Depot to Maynooth	15.831	0.408	0.372	0.0209	560
Maynooth to Clonsilla	61.816	1.594	1.451	0.0818	2188
Clonsilla to Glasnevin	57.298	1.478	1.345	0.0758	2028
Glasnevin to Docklands (Glasnevin to Spencer Dock in DS)	0.000	0.000	0.000	0.0000	0
Clonsilla to M3 Parkway	0.000	0.000	0.000	0.0000	0
M3 Parkway to Clonsilla	0.000	0.000	0.000	0.0000	0
Connolly to Pearse	0.254	0.007	0.006	0.0003	9
Pearse to Connolly	0.254	0.007	0.006	0.0003	9
Docklands to East Wall Jct.	0.000	0.000	0.000	0.0000	0
East Wall Jct. to Spencer Dock	0.000	0.000	0.000	0.0000	0
North wall to North Strand Jct. (Spencer Dock to North Strand Jct. in DS)	0.000	0.000	0.000	0.0000	0
North Wall to East Wall Jct. (Spencer Dock to East Wall Jct. in DS)	0.000	0.000	0.000	0.0000	0
East Wall Jct. to North Wall	0.000	0.000	0.000	0.0000	0
North Strand Jct. to North wall (North Strand Jct. to Spencer Dock in DS)	0.000	0.000	0.000	0.0000	0
Sum Daily (kg Pollutant)	308	8	7	0.4072	10,894

Stations	Kg NO_x	Kg PM_{10}	Kg $PM_{2.5}$	Kg SO_2	Carriage KM Travelled
Sum Annually (kg Pollutant)	112,353	2,898	2,638	148.6151	3,976,203
DS - EMUs					
Connolly to East Wall Jct.	0.040	0.015	0.002	0.0149	857.6
East Wall Jct. to Connolly	0.034	0.013	0.001	0.0126	726
Connolly to North Strand Jct.	0.007	0.003	0.000	0.0026	148.96
North Strand Jct. to Glasnevin	0.143	0.054	0.006	0.0538	3095.008
Glasnevin to Islandbridge Jct.	0.181	0.068	0.007	0.0681	3912.48
Islandbridge Jct. to Glasnevin	0.180	0.067	0.007	0.0675	3876.912
Glasnevin to North Strand Jct.	0.137	0.052	0.005	0.0516	2962.904
North Strand Jct. to Connolly	0.007	0.002	0.000	0.0025	142.88
Docklands to Glasnevin (Spencer Dock to Glasnevin in DS)	0.148	0.056	0.006	0.0556	3195.008
Glasnevin to Clonsilla	0.691	0.260	0.027	0.2595	14917.12
Clonsilla to Maynooth	0.475	0.179	0.019	0.1785	10259.568
Maynooth to Depot	0.000	0.000	0.000	0.0000	0
Depot to Maynooth	0.000	0.000	0.000	0.0000	0
Maynooth to Clonsilla	0.443	0.166	0.017	0.1663	9555.48
Clonsilla to Glasnevin	0.661	0.248	0.026	0.2482	14264.496
Glasnevin to Docklands (Glasnevin to Spencer Dock in DS)	0.148	0.056	0.006	0.0556	3195.008
Clonsilla to M3 Parkway	0.000	0.000	0.000	0.0000	0
M3 Parkway to Clonsilla	0.000	0.000	0.000	0.0000	0
Connolly to Pearse	0.127	0.048	0.005	0.0476	2736
Pearse to Connolly	0.127	0.048	0.005	0.0478	2748
Docklands to East Wall Jct.	0.000	0.000	0.000	0.0000	0
East Wall Jct. to Spencer Dock	0.000	0.000	0.000	0.0000	0
North wall to North Strand Jct. (Spencer Dock to North Strand Jct. in DS)	0.021	0.008	0.001	0.0080	460.96
North Wall to East Wall Jct. (Spencer Dock to East Wall Jct. in DS)	0.000	0.000	0.000	0.0000	0
East Wall Jct. to North Wall	0.000	0.000	0.000	0.0000	0
North Strand Jct. to North wall (North Strand Jct. to Spencer Dock in DS)	0.020	0.008	0.001	0.0075	433.44
Sum Daily (kg Pollutant)	3.59	1.35	0.14	1.3	77,488
Sum Annually (kg Pollutant)	1,310	492	52	492	28,283,056
DS - All Rail					
Sum Daily (kg Pollutant)	311	9	7	2	88,382
Sum Annually (kg Pollutant)	113,663	3,390	2,690	641	32,259,259

Table 12-48 Change in Rail Emissions

Stations	Kg NO_x	Kg PM_{10}	Kg $PM_{2.5}$	Kg SO_2
DS - DM - All Rail				
Change Daily (kg Pollutant)	-265	-8	-8	0.8

Stations	Kg NO_x	Kg PM_{10}	Kg $PM_{2.5}$	Kg SO_2
Change Annually (kg Pollutant)	-96,830	-2,906	-3,091	304
DS as Percentage of DM	-46%	-46%	-53%	91%
Change as % of the 2030 National Target (Article 4(1) of Directive 2016/2284)	-0.2381%	N/A	-0.0275%	0.0000278

There are some imperceptible increases in SO_2, this is due to the ultra-low sulphur diesel fuel already in use in the DN. Given the low DN, the change in fuel type was not sufficient to offset the significant increases in rail journeys. This increase is a reflection of the low emissions in the DN. Ireland complied with the SO_2 emission ceilings for all years from 2010 to 2019, emitting only 26% of the emission coiling in 2019. However, Ireland has exceeded its emission ceilings for NO_x by 50% in 2019 and has exceeded the ceiling for all years since 2010. Therefore, the reduction in NO_x emissions is considered more beneficial compared to the imperceptible increase in SO_2.

In accordance with the EPA Guidelines (EPA 2022) the likely effects associated with the operation phase rail traffic emissions pre-mitigation are overall *positive, significant and long-term*.

12.5.1.6 Operational Road Traffic Impacts

For the operation phase, two areas which the traffic consultant has deemed to have the potential for impact due to traffic redistribution associated with the proposed development operation phase have been assessed. Impact scenarios have been modelled representing the worst-case traffic impacts, as advised by the proposed development traffic consultants. The two areas of potential impact are:

- Traffic Related Air Quality Impact Study Area 1 (hereafter known as 'Area 1'): operation phase impacts in proximity to the Ashtown level crossing area.
- Traffic Related Air Quality Impact Study Area 2 (hereafter known as 'Area 2'): operation phase impacts in proximity to the Coolmine and Clonsilla level crossing area.

The road links (a road link is a segment of road between two junctions) modelled are shown in Table 12-50 and Table 12-56 for Ashtown and Coolmine/Clonsilla respectively, with figures shown in Drawing no. MAY-MDC-ENV-ROUT-DR-V-120013-D and MAY-MDC-ENV-ROUT-DR-V-120016-D in Volume 3A of the EIAR. Further details on the proposed development traffic redistribution are contained within Appendix A6.3 Construction Traffic Management Plan in Volume 4 of this EIAR.

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 Something traffic (with the proposed development) compared to the Do Nothing traffic (without the proposed development):

- Annual average daily traffic (AADT) changes by 1,000 or more.
- Heavy duty vehicle (HDV) AADT changes by 200 or more.
- A change in speed band.
- A change in carriageway alignment by 5m or greater.

The above scoping criteria has been used in the current assessment to determine the road links required for inclusion in the modelling assessment. The proposed development's traffic consultant has been advised of these scoping criteria in order to ensure that additional roads, other than those included in the current assessment, do not increase above the scoping criteria as a result of traffic redistribution during the operation phase. Sensitive receptors within 200 m of impacted road links were included within the modelling assessment as detailed in LA 105 - Air Quality (UKHA 2019). In addition to this criterion, professional judgement may be used to scope in additional areas to increase the robustness of the assessment.

As noted in Section 12.3.5.1.2, LA 105 Air Quality (UKHA 2019) 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. Due to the nature of the impact on traffic due to the proposed development, for example, the closure of level crossings, the operation phase traffic is classified as low risk. The level crossing closure falls under this low-risk category as it can be classed as junction congestion relief project i.e. small junction improvements, signalling changes (UKHA 2019). The high-risk category is reserved for large smart motorway projects, bypass and major motorway junction improvements.

LA 105 Air Quality states that a low sensitivity environment includes areas that have annual mean NO_2 concentrations of less than 36 µg/m^3 combined with a low number of sensitive receptors near the impacted roads. The traffic consultant deemed that the two areas (Area 1: Ashtown and Area 2: Coolmine/Clonsilla) which have been modelled were impacted by the proposed development. These areas have background concentrations significantly lower than 36 µg/m^3. Project specific monitoring (Section 12.3.3.2) in these areas included location 6, 7, 8, 9 and 10 (Table 12-19, which show a maximum annualised concentration of 15.5 µg/m^3. A review of long-term EPA air quality in representative areas such as Ballyfermot, Rathmines or Swords (Table 12-15) also indicates that concentrations are significantly lower than 36 µg/m^3 on the road links impacted. The closest EPA monitoring station to both these areas is the roadside Blanchardstown Station which is located on the M3 just after the turn off from the M50. The Blanchardstown station location is considered a significantly heavier traffic environment compared to the areas of proposed impact due to the proposed development. Despite this, concentrations monitored both by the long-term EPA monitoring station and the project specific monitoring are significantly lower than 36 µg/m^3.

Although operation phase traffic emissions pass through some residential areas, the DMRB assessment is considered conservative with respect to air pollutant emissions whilst background concentrations are significantly lower than the 36 µg/m^3 criteria for advancement to a detailed air dispersion modelling assessment. Thus, in line with appropriate guidance such as LA 105 Air Quality Guidance, it is not deemed necessary to undertake detailed air modelling. The screening DMRB model will be appropriate for this assessment. In circumstances where the screening assessment indicates the potential for exceedances of the ambient air quality limit value, a detailed assessment, as per Section 12.3.5.1.2, will be undertaken.

12.5.1.7 Operational Traffic Impacts on Human Receptors

12.5.1.7.1 Area 1: Ashtown

As part of the proposed development, the Ashtown level crossing will be permanently closed to accommodate the increase in rail service associated with the increased frequency and improved operation of the line. A pedestrian footbridge and a new vehicular underpass along Mill Lane will replace the Ashtown level crossing. Altogether these structures will maintain vehicular, pedestrian and bicycle access through the railway line and the Royal Canal.

The degree of impact is determined based on both the absolute and relative impact of the proposed development. Results are compared against the 'Do-Nothing' scenario, which assumes that the proposed development is not in place in future years, to determine the degree of impact. The traffic data modelled is included in Table 12-50. Impacts were assessed at 28 no. worst-case sensitive receptors (Table 12-49 and Drawing MAY-MDC-ENV-ROUT-DR-V-120014-D in Volume 3A of this EIAR), within 200 m of the road links impacted by the proposed development (see Drawing MAY-MDC-ENV-ROUT-DR-V-120013-D in Volume 3A of this EIAR). These sensitive receptors include residential receptors and schools which are representative samples of sensitive receptors on the impacted roads. When choosing receptors consideration was given to choosing the worst-case location on a particular road link i.e. closest to the impacted roads. An impacted road is one which meets the scoping criteria detailed in Section 12.3.5.1.1. All road links provided by the traffic consultant are shown Drawing MAY-MDC-ENV-ROUT-DR-V-120013-D in Volume 3A of this EIAR and Table 12-50 however not all meet the scoping criteria and therefore some do not have sensitive receptors modelled.

Table 12-49 Air Quality Receptors Area 1: Ashtown

Site	East (ITM)	North (ITM)	Site	East (ITM)	North (ITM)
Area1_R1	710916	737498	Area1_R15	711056	737669

Site	East (ITM)	North (ITM)	Site	East (ITM)	North (ITM)
Area1_R2	710978	737188	Area1_R16	712406	737691
Area1_R3	711098	736977	Area1_R17	709025	737064
Area1_R4	710996	737298	Area1_R18	708872	737328
Area1_R5	710135	737934	Area1_R19	708775	737517
Area1_R6	709493	738242	Area1_R20	708934	737185
Area1_R7	712762	736800	Area1_R21	711421	736613
Area1_R8	712693	736923	Area1_R22	711307	736688
Area1_R9	712747	737011	Area1_R23	711590	736405
Area1_R10	712727	737275	Area1_R24	712649	737852
Area1_R11	712672	737183	Area1_R25	712223	737950
Area1_R12	712155	737686	Area1_R26	713196	737843
Area1_R13	711725	737843	Area1_R27	711143	736844
Area1_R14	711369	737782	Area1_R28	710867	737496

Table 12-50 Traffic Data Area 1: Ashtown

Link Number	Base Year	Do-Nothing		Do-Something	
	2019	2028	2043	2028	2043
1	2188 (2.9%)	3213 (0.9%)	3519 (1.4%)	6272 (0.6%)	6542 (0.8%)
2	2792 (1.3%)	4555 (0.1%)	5064 (0%)	4315 (0.7%)	4518 (0.5%)
4	4980 (2%)	7768 (0.4%)	8583 (0.6%)	10587 (0.6%)	11059 (0.7%)
5	26919 (1.3%)	26180 (1.7%)	26249 (2.8%)	26635 (1.9%)	26356 (3%)
6	31970 (1.1%)	26138 (2%)	25065 (2.8%)	26366 (2.1%)	25678 (3.1%)
7	11352 (1.7%)	17339 (1%)	17648 (1.5%)	17608 (1%)	17176 (1.3%)
8	12167 (1.7%)	11465 (3%)	12783 (3.4%)	11844 (2.5%)	12412 (2.6%)
9	11522 (0%)	8149 (2.9%)	8446 (3.3%)	8816 (2.2%)	9464 (2.4%)
10	17133 (0.5%)	15590 (1.6%)	17319 (2.1%)	16020 (1.3%)	16891 (1.5%)
11	9609 (1%)	8509 (0.7%)	9202 (0.4%)	8595 (0.7%)	9555 (0.8%)
12	12236 (0.4%)	12015 (2.3%)	13100 (2.9%)	11402 (2.1%)	11369 (2.5%)
13	9430 (2.1%)	10813 (1.6%)	10980 (1.3%)	10776 (1.7%)	11362 (1.7%)
14	8070 (0.5%)	9052 (1.3%)	9223 (1.9%)	7942 (0.8%)	7979 (1%)
15	3860 (0%)	7079 (0%)	6367 (0%)	8553 (0%)	7593 (0%)
16	18960 (0.4%)	16196 (0.3%)	16955 (0.4%)	14967 (0.2%)	15209 (0.3%)
17	13547 (1.7%)	15040 (1.3%)	14718 (1.1%)	14781 (1.4%)	12333 (1.3%)
18	22148 (1.3%)	21158 (1.4%)	22301 (1.2%)	21242 (1.5%)	22035 (1.6%)
19	21341 (1.3%)	19220 (1.5%)	19124 (1.4%)	18209 (1.8%)	17558 (2%)
20	16006 (1.7%)	16986 (1.7%)	17347 (2.4%)	17233 (1.7%)	17268 (2.1%)
21	5835 (0.5%)	5943 (0.9%)	7236 (2.9%)	6306 (0.8%)	9050 (1.5%)

Note: Percentage HGV in Brackets

Note: Link 3 removed by traffic consultant – no data available

The results of the assessment of the impact of the proposed development on NO_2 in the opening year 2028 and design year 2043 are shown in Table 12-51. The annual average concentration is in compliance with the limit value at all worst-case receptors in 2028 and 2043. Concentrations of NO_2 are at most 54% of the annual limit value of 40 µg/m^3 in 2028 or 2043. There are some redistribution and changes to traffic levels between the opening and design years, which is reflected in modelled results. The hourly limit value for NO_2 is 200 µg/m^3 and is expressed as a 99.8th percentile (i.e. it must not be exceeded more than 18 times per year). The maximum 1-hour NO_2 concentration is not predicted to be exceeded in any modelled year (Table 12-52).

The impact of the proposed development on annual mean NO_2 concentrations can be assessed relative to the 'Do Nothing' (DN) levels. Relative to baseline levels, there are predicted to be some imperceptible increases in NO_2 concentrations at the worst-case receptors assessed. Concentrations will increase by at most 3.2% of the annual EU NO_2 limit value (which is the same as the WHO guidance value) at receptor Area1_R28 which is located in close proximity to the road link leading to the new underpass at Ashtown. Changes in annual mean NO_2 concentrations are similarly low for the design year 2043, annual mean NO_2 concentrations at receptor Area1_R28 will increase by 3.2%. Large concentration decreases in annual mean NO_2 concentrations are also predicted due to the proposed development. Decreases of up to 2.0% of the annual NO_2 limit value are predicted at receptor Area1_R4 in 2028 and of up to 2.3% of the annual NO_2 limit value at receptor Area1_R4 in 2043. This is due to the road alignment moving further from the sensitive receptor when the road is realigned for the underpass.

Concentrations of PM_{10} were modelled for the baseline year of 2019. The modelling showed that concentrations were in compliance with the annual limit value of 40 µg/m^3 at all receptors assessed, therefore, further modelling for the opening and design years was not required as per UK HA LA105 Guidance. The base year modelled contribution reached at most 1.0 µg/m^3. When a background concentration of 13 µg/m^3 is included, the overall concentration is 35% of the annual limit value at the worst-case receptor in the base year. Although not required in Guidance, a sensitivity study of the PM_{10} (Table 12-53) and $PM_{2.5}$ (Table 12-54) concentration was conducted for the opening and design year given Dublin City Council's aim to achieve WHO standards. Annual mean concentrations of PM_{10} reached at most 71% of the WHO standard of 20 µg/m^3 or 35% of the EU limit value of 40µg/m^3. With respect to $PM_{2.5}$, annual mean concentrations of $PM_{2.5}$ reached at most 87% of the WHO standard of 10 µg/m^3 (background for $PM_{2.5}$ was 8 µg/m^3) or 35% of the EU limit value of 25 µg/m^3. Concentrations will increase by at most 0.8% of the annual PM_{10} EU limit value at receptor Area1_R28. Changes in annual mean PM_{10} concentrations are similarly low for the design year 2043 with the annual mean PM_{10} concentration at receptor Area1_R28 increasing by 0.9%. Large decreases in annual mean PM_{10} concentrations are also predicted due to the proposed development. Decreases of up to 0.6% of the annual PM_{10} limit value at receptor Area1_R4 in 2028 and of up to 0.7% of the annual EU PM_{10} limit value at receptor Area1_R4 in 2043 are predicted.

Using the assessment criteria outlined in Table 12-9 to Table 12-11, the impact of the proposed development in terms of NO_2, PM_{10} and $PM_{2.5}$ is considered negligible. Therefore, the overall impact of NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of the proposed development is *long-term, negative and imperceptible*.

In accordance with TII guidance (TII 2011), the impact of the proposed development on ambient air quality in the operation phase is considered *long-term, localised, negative* and *imperceptible*. In accordance with the EPA Guidelines (EPA 2022) the likely effects associated with the operation phase traffic emissions pre-mitigation are both *negative* and *positive* but *not significant* and *long-term*.

Table 12-51 Predicted Annual Mean NO_2 Concentrations for Area 1: Ashtown

Receptor	Impact Opening Year 2028				Impact Design Year 2043			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area1_R1	18.7	19.6	0.95	Small Increase	18.6	19.5	0.92	Small Increase
Area1_R2	20.1	20.9	0.76	Small Increase	20.1	20.8	0.66	Small Increase
Area1_R3	20.5	20.6	0.09	Negligible	20.5	20.5	0.05	Negligible
Area1_R4	19.0	19.6	0.60	Small Increase	18.9	19.5	0.53	Small Increase
Area1_R5	19.7	19.3	-0.42	Small Decrease	19.6	19.1	-0.56	Small Decrease

Receptor	Impact Opening Year 2028				Impact Design Year 2043			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area1_R6	20.3	19.7	-0.53	Small Decrease	20.2	19.5	-0.69	Small Decrease
Area1_R7	20.6	20.5	-0.15	Negligible	20.4	20.2	-0.21	Negligible
Area1_R8	20.4	20.3	-0.13	Negligible	20.2	20.0	-0.18	Negligible
Area1_R9	20.4	20.3	-0.13	Negligible	20.2	20.0	-0.18	Negligible
Area1_R10	19.6	19.5	-0.10	Negligible	19.4	19.2	-0.14	Negligible
Area1_R11	19.2	19.2	-0.09	Negligible	19.0	18.9	-0.11	Negligible
Area1_R12	18.6	18.8	0.19	Negligible	18.2	18.4	0.15	Negligible
Area1_R13	19.4	19.8	0.39	Negligible	18.9	19.2	0.33	Negligible
Area1_R14	19.6	20.1	0.45	Small Increase	19.1	19.5	0.38	Negligible
Area1_R15	20.8	21.3	0.47	Small Increase	20.4	20.7	0.30	Negligible
Area1_R16	20.9	21.0	0.11	Negligible	20.4	20.6	0.12	Negligible
Area1_R17	20.9	20.7	-0.21	Negligible	21.0	20.5	-0.56	Small Decrease
Area1_R18	20.7	20.5	-0.24	Negligible	20.9	20.2	-0.69	Small Decrease
Area1_R19	23.0	22.7	-0.26	Negligible	20.7	20.1	-0.64	Small Decrease
Area1_R20	21.8	21.5	-0.28	Negligible	22.0	21.3	-0.73	Small Decrease
Area1_R21	19.6	19.7	0.04	Negligible	19.5	19.6	0.11	Negligible
Area1_R22	19.9	19.9	0.04	Negligible	19.7	19.8	0.12	Negligible
Area1_R23	20.2	20.2	0.05	Negligible	20.1	20.2	0.16	Negligible
Area1_R24	18.9	18.9	0.07	Negligible	19.2	19.4	0.25	Negligible
Area1_R25	19.3	19.4	0.10	Negligible	19.8	20.2	0.32	Negligible
Area1_R26	18.9	18.9	0.07	Negligible	19.2	19.4	0.25	Negligible
Area1_R27	19.6	19.6	0.04	Negligible	19.4	19.5	0.11	Negligible
Area1_R28	18.0	19.3	1.27	Small Increase	17.8	19.1	1.30	Small Increase

Table 12-52 Predicted 99.8th percentile of Daily Maximum 1-hour NO_2 Concentrations (µg/m^3) for Area 1: Ashtown

Receptor	Opening Year 2028		Design Year 2043	
	DN	DS	DN	DS
Area1_R1	65.4	68.8	65	68.2
Area1_R2	70.4	73.1	70.4	72.7
Area1_R3	71.7	72	71.6	71.8
Area1_R4	66.6	68.7	66.2	68.1
Area1_R5	69.1	67.6	68.7	66.8
Area1_R6	70.9	69.1	70.7	68.3
Area1_R7	72.2	71.7	71.4	70.7
Area1_R8	71.4	70.9	70.6	69.9
Area1_R9	71.4	70.9	70.6	69.9
Area1_R10	68.6	68.3	67.8	67.4
Area1_R11	67.4	67.1	66.5	66.1
Area1_R12	65	65.7	63.7	64.2

Receptor	Opening Year 2028		Design Year 2043	
	DN	DS	DN	DS
Area1_R13	67.9	69.2	66.2	67.4
Area1_R14	68.7	70.3	66.9	68.2
Area1_R15	72.8	74.4	71.4	72.4
Area1_R16	73.1	73.5	71.5	71.9
Area1_R17	73.1	72.4	73.7	71.7
Area1_R18	72.5	71.7	73.3	70.9
Area1_R19	80.4	79.4	72.6	70.4
Area1_R20	76.3	75.3	77.2	74.6
Area1_R21	68.7	68.8	68.1	68.5
Area1_R22	69.5	69.6	69	69.5
Area1_R23	70.6	70.8	70.2	70.8
Area1_R24	66	66.3	67.2	68.1
Area1_R25	67.7	68	69.4	70.5
Area1_R26	66	66.3	67.2	68.1
Area1_R27	68.6	68.7	68	68.4
Area1_R28	63.1	67.6	62.2	66.8

Table 12-53 Annual Mean PM_{10} Concentrations (µg/m^3) for Area 1: Ashtown

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area1_R1	13.2	13.4	0.19	Negligible	13.2	13.4	0.18	Negligible
Area1_R2	13.6	13.8	0.16	Negligible	13.7	13.8	0.14	Negligible
Area1_R3	13.7	13.7	0.01	Negligible	13.7	13.7	0.01	Negligible
Area1_R4	13.3	13.5	0.13	Negligible	13.4	13.5	0.11	Negligible
Area1_R5	13.5	13.4	-0.07	Negligible	13.5	13.4	-0.08	Negligible
Area1_R6	13.6	13.5	-0.09	Negligible	13.6	13.5	-0.10	Negligible
Area1_R7	13.9	13.8	-0.03	Negligible	13.9	13.9	-0.04	Negligible
Area1_R8	13.8	13.8	-0.03	Negligible	13.8	13.8	-0.04	Negligible
Area1_R9	13.8	13.8	-0.03	Negligible	13.8	13.8	-0.04	Negligible
Area1_R10	13.6	13.5	-0.02	Negligible	13.6	13.6	-0.03	Negligible
Area1_R11	13.5	13.4	-0.02	Negligible	13.5	13.4	-0.02	Negligible
Area1_R12	13.3	13.3	0.05	Negligible	13.2	13.3	0.04	Negligible
Area1_R13	13.5	13.6	0.10	Negligible	13.4	13.5	0.08	Negligible
Area1_R14	13.6	13.7	0.12	Negligible	13.5	13.6	0.10	Negligible
Area1_R15	13.9	14.0	0.11	Negligible	13.9	13.9	0.07	Negligible
Area1_R16	13.9	13.9	0.02	Negligible	13.9	13.9	0.00	Negligible
Area1_R17	13.8	13.8	-0.04	Negligible	13.9	13.8	-0.10	Negligible
Area1_R18	13.8	13.7	-0.04	Negligible	13.8	13.7	-0.12	Negligible
Area1_R19	13.7	13.7	-0.04	Negligible	13.8	13.7	-0.11	Negligible
Area1_R20	14.0	14.0	-0.05	Negligible	14.1	14.0	-0.13	Negligible

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area1_R21	13.5	13.5	0.03	Negligible	13.5	13.6	0.05	Negligible
Area1_R22	13.6	13.6	0.03	Negligible	13.6	13.7	0.06	Negligible
Area1_R23	13.7	13.7	0.04	Negligible	13.7	13.8	0.07	Negligible
Area1_R24	13.3	13.3	0.02	Negligible	13.4	13.5	0.09	Negligible
Area1_R25	13.4	13.5	0.02	Negligible	13.6	13.7	0.11	Negligible
Area1_R26	13.3	13.3	0.02	Negligible	13.4	13.5	0.09	Negligible
Area1_R27	13.5	13.5	0.03	Negligible	13.5	13.6	0.05	Negligible
Area1_R28	13.1	13.4	0.34	Negligible	13.1	13.4	0.35	Negligible

Table 12-54 Annual Mean $PM_{2.5}$ Concentrations (μg/m^3) for Area 1: Ashtown

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area1_R1	8.14	8.08	-0.06	Negligible	8.15	8.08	-0.07	Negligible
Area1_R2	8.39	8.51	0.12	Negligible	8.42	8.53	0.11	Negligible
Area1_R3	8.41	8.42	0.01	Negligible	8.43	8.43	0.00	Negligible
Area1_R4	8.21	8.06	-0.15	Negligible	8.24	8.06	-0.17	Negligible
Area1_R5	8.30	8.26	-0.04	Negligible	8.31	8.26	-0.05	Negligible
Area1_R6	8.38	8.33	-0.05	Negligible	8.40	8.33	-0.06	Negligible
Area1_R7	8.54	8.52	-0.02	Negligible	8.55	8.53	-0.02	Negligible
Area1_R8	8.49	8.48	-0.02	Negligible	8.51	8.48	-0.02	Negligible
Area1_R9	8.49	8.48	-0.02	Negligible	8.51	8.48	-0.02	Negligible
Area1_R10	8.35	8.34	-0.01	Negligible	8.36	8.34	-0.02	Negligible
Area1_R11	8.28	8.27	-0.01	Negligible	8.29	8.27	-0.01	Negligible
Area1_R12	8.16	8.19	0.03	Negligible	8.15	8.17	0.02	Negligible
Area1_R13	8.30	8.36	0.06	Negligible	8.27	8.32	0.05	Negligible
Area1_R14	8.34	8.41	0.07	Negligible	8.31	8.37	0.06	Negligible
Area1_R15	8.54	8.61	0.07	Negligible	8.53	8.57	0.04	Negligible
Area1_R16	8.54	8.55	0.01	Negligible	8.53	8.53	0.00	Negligible
Area1_R17	8.50	8.47	-0.02	Negligible	8.54	8.48	-0.06	Negligible
Area1_R18	8.46	8.44	-0.03	Negligible	8.51	8.44	-0.07	Negligible
Area1_R19	8.44	8.41	-0.02	Negligible	8.49	8.42	-0.07	Negligible
Area1_R20	8.64	8.61	-0.03	Negligible	8.70	8.62	-0.08	Negligible
Area1_R21	8.32	8.33	0.02	Negligible	8.33	8.36	0.03	Negligible
Area1_R22	8.35	8.38	0.02	Negligible	8.37	8.41	0.03	Negligible
Area1_R23	8.41	8.44	0.03	Negligible	8.43	8.47	0.04	Negligible
Area1_R24	8.19	8.20	0.01	Negligible	8.25	8.30	0.05	Negligible
Area1_R25	8.27	8.29	0.01	Negligible	8.34	8.41	0.07	Negligible
Area1_R26	8.19	8.20	0.01	Negligible	8.25	8.30	0.05	Negligible
Area1_R27	8.31	8.32	0.02	Negligible	8.32	8.35	0.03	Negligible

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area1_R28	8.04	8.25	0.21	Negligible	8.05	8.26	0.21	Negligible

12.5.1.7.2 Area 2: Coolmine/Clonsilla

The level crossings at Coolmine, Barberstown, Porterstown and Clonsilla shall be permanently closed to accommodate the increase in rail service associated with the increased frequency and improved operation of the rail line. At Coolmine Station, a new pedestrian and cyclist bridge will be constructed over the railway. A series of junction improvements will be undertaken to accommodate the redistributed road traffic. Porterstown and Clonsilla level crossings will be replaced by corresponding dedicated pedestrian and cyclist bridges over the railway line and the Royal Canal. The traffic consultant has provided road links which are predicted to have significant traffic redistribution due to this work.

The degree of impact is determined based on both the absolute and relative impact of the proposed development. Results are compared against the 'Do-Nothing scenario', which assumes that the proposed development is not in place in future years, in order to determine the degree of impact. The traffic data modelled is included in Table 12-56. Impacts were assessed at 52 no. worst-case sensitive receptors (Table 12-55 and Drawing no. MAY-MDC-ENV-ROUT-DR-V-120016-D in Volume 3A of the EIAR) within 200 m of the road links impacted by the proposed development (see Drawing no. MAY-MDC-ENV-ROUT-DR-V-120015-D in Volume 3A of the EIAR). These sensitive receptors include residential receptors and schools which are representative samples of sensitive receptors on the impacted roads. When choosing receptors consideration was given to choosing the worst-case location i.e., closest to the impacted roads. An impacted road is one which meets the scoping criteria detailed in Section 12.3.5.1.1. All road links provided by the traffic consultant are shown, however not all meet the scoping criteria and therefore some do not have sensitive receptors modelled.

Table 12-55 Air Quality Receptors Area 2: Coolmine / Clonsilla

Site	East (ITM)	North (ITM)	Site	East (ITM)	North (ITM)
Area2_R1	706264	737893	Area2_R27	704954	738018
Area2_R2	706187	737453	Area2_R28	705821	738576
Area2_R3	705996	737172	Area2_R29	706219	738518
Area2_R4	706005	737351	Area2_R30	704910	738841
Area2_R5	705944	737155	Area2_R31	707887	738703
Area2_R6	706229	737981	Area2_R32	708084	738556
Area2_R7	706253	738118	Area2_R33	707772	738764
Area2_R8	706286	738032	Area2_R34	706150	738108
Area2_R9	704735	738284	Area2_R35	703372	738077
Area2_R10	704478	738610	Area2_R36	706413	737117
Area2_R11	704416	738765	Area2_R37	706691	736920
Area2_R12	705102	738190	Area2_R38	706821	736823
Area2_R13	704943	738166	Area2_R39	706127	737393
Area2_R14	706587	738127	Area2_R40	706967	737554
Area2_R15	706762	738159	Area2_R41	707004	737433
Area2_R16	706373	738117	Area2_R42	706986	737723
Area2_R17	706001	737212	Area2_R43	706957	737951
Area2_R18	708451	737871	Area2_R44	706854	738172

Site	East (ITM)	North (ITM)	Site	East (ITM)	North (ITM)
Area2_R19	708489	738010	Area2_R45	707176	737344
Area2_R20	708401	738200	Area2_R46	706889	737398
Area2_R21	708384	738132	Area2_R47	704930	737925
Area2_R22	703375	739069	Area2_R48	704540	737786
Area2_R23	703328	738935	Area2_R49	707142	737179
Area2_R24	703842	738125	Area2_R50	707092	737264
Area2_R25	703838	737778	Area2_R51	708516	737942
Area2_R26	704956	737745	Area2_R52	706314	738875

Table 12-56 Traffic Data Area 2: Coolmine / Clonsilla

Link Number	Base Year	Do-Nothing		Do-Something	
	2019	2028	2043	2028	2043
1	6517 (3.1%)	5652 (1.5%)	5214 (1.2%)	0 (0%)	0 (0%)
2	6630 (0.3%)	9283 (0.8%)	11066 (1.3%)	8562 (1.1%)	8867 (0.6%)
3	10484 (2.3%)	10642 (2.3%)	11303 (2.1%)	8784 (2.5%)	9842 (2.4%)
4	7060 (2.6%)	7726 (3.5%)	10050 (3.4%)	7225 (3.1%)	8707 (3%)
5	9551 (1.7%)	8852 (3.2%)	11145 (3.5%)	8143 (3.1%)	8826 (3.7%)
6	13168 (0.5%)	10518 (0.3%)	12094 (0.6%)	10598 (0.2%)	11865 (0.4%)
7	11777 (0.5%)	10935 (0.4%)	12401 (0.6%)	10536 (0.2%)	11796 (0.4%)
8	4274 (0.5%)	3882 (0.2%)	4461 (0.1%)	0 (0%)	0 (0%)
9	5669 (0.5%)	6028 (0.7%)	7494 (1%)	8145 (0.8%)	9476 (0.9%)
10	7812 (0.6%)	7252 (0.6%)	9249 (0.9%)	9574 (0.8%)	10817 (0.9%)
11	12479 (0.5%)	9624 (0.3%)	10731 (0.7%)	8915 (0.2%)	9363 (0.4%)
12	13168 (0.5%)	10518 (0.3%)	12094 (0.6%)	10598 (0.2%)	11865 (0.4%)
13	556 (0.7%)	1041 (0%)	1524 (0.3%)	1910 (0.1%)	2836 (0.2%)
14	1283 (0.3%)	1388 (0%)	1870 (0.2%)	2192 (0.1%)	3122 (0.1%)
15	990 (0%)	1039 (0%)	1107 (0%)	1026 (0%)	1102 (0%)
16	21449 (2%)	20251 (2.4%)	22665 (2.3%)	26105 (2%)	28652 (2.3%)
17	8375 (0.5%)	8149 (0.2%)	8862 (0.2%)	9277 (0.8%)	9949 (0.5%)
18	7455 (0.3%)	10829 (0.4%)	10757 (0.3%)	11584 (0.5%)	12267 (0.7%)
19	13206 (0.5%)	12852 (0.5%)	13828 (0.7%)	15077 (0.5%)	15947 (0.4%)
20	2621 (4.8%)	869 (0.3%)	2223 (0.1%)	921 (0.3%)	2210 (0.1%)
21	2621 (4.8%)	869 (0.3%)	1400 (0.1%)	879 (0.3%)	1564 (0.1%)
22	17020 (0.8%)	18359 (1.1%)	18419 (1.2%)	18191 (1.2%)	18390 (1.2%)
23	19252 (2.2%)	16566 (1.5%)	16818 (1.5%)	15833 (1.5%)	18681 (1.4%)
24	13556 (0.4%)	12210 (0.3%)	11355 (0.6%)	10973 (0.2%)	10442 (0.4%)
25	19252 (2.2%)	16566 (1.5%)	16818 (1.5%)	15833 (1.5%)	18681 (1.4%)
26	16904 (0.7%)	18550 (1.1%)	18049 (1.3%)	18544 (1.2%)	19155 (1.3%)
27	20109 (0.7%)	20565 (1.1%)	20660 (1.2%)	19379 (1.2%)	19671 (1.2%)
28	6709 (3.9%)	7397 (3.7%)	8513 (2.5%)	7461 (5.1%)	9531 (2.4%)
29	16211 (4%)	17338 (2.1%)	17458 (3.9%)	19851 (1.8%)	17544 (2.6%)
30	12787 (3.4%)	11429 (1.2%)	12131 (1.5%)	13881 (0.9%)	13016 (1.1%)

Link Number	Base Year	Do-Nothing		Do-Something	
	2019	2028	2043	2028	2043
31	16893 (5%)	18324 (2.7%)	18582 (4.5%)	19108 (2.4%)	16316 (3.5%)
32	9942 (1.8%)	9460 (0.6%)	10217 (0.6%)	9147 (0.7%)	10286 (0.9%)

Note: Percentage HGV in Brackets

The results of the assessment of the impact of the proposed development on NO_2 in the opening year 2028 and design year 2043 are shown in Table 12-57 . The annual average concentration is in compliance with the limit value at all worst-case receptors in 2028 and 2043. Concentrations of NO_2 are at most 61% of the annual limit value of 40 µg/m^3 in 2028 or 2043. There are some redistribution and changes to traffic levels between the opening and design years, which is reflected in modelled results. The hourly limit value for NO_2 is 200 µg/m^3 and is expressed as a 99.8th percentile (i.e., it must not be exceeded more than 18 times per year). The maximum 1-hour NO_2 concentration is not predicted to be exceeded in any modelled year (Table 12-58).

The impact of the proposed development on annual mean NO_2 concentrations can be assessed relative to; Do Nothing' (DN) levels. Relative to DN levels, there are predicted to be some imperceptible increases in NO_2 concentrations at the worst-case receptors assessed. Concentrations will increase by at most 1.4% of the annual EU NO_2 limit value (which is the same as the WHO guidance value) in 2028 at receptor Area2_R7 which is located in close proximity to the road link 16 (Diswellstown Road) which will receive additional traffic when the level crossings in the area is closed. Changes in annual mean NO_2 concentrations are similarly low for the design year 2043 with annual mean NO_2 concentrations at receptor Area2_R7 increasing by 1.6%. Large annual mean NO_2 concentrations decreases are also predicted due to the proposed development. Decreases of up to 3.4% of the annual NO_2 limit value are predicted at receptor Area2_R41 in 2028 and of up to 3.1% of the annual NO_2 limit value at receptor Area2_R41 in 2043 This is due to the closing of the Coolmine level crossing reducing traffic in proximity to this receptor.

Concentrations of PM_{10} were modelled for the baseline year of 2019. The modelling showed that concentrations were in compliance with the annual limit value of 40 µg/m^3 at all receptors assessed, therefore, further modelling for the opening and design years was not required as per UK HA LA105 Guidance. The base year modelled contribution reached at most 1.8 µg/m^3. When a background concentration of 13 µg/m^3 is included the overall concentration is 37% of the annual limit value at the worst case receptor in the base year. Although not required in Guidance, a sensitivity study of the PM_{10} (Table 12-59) and $PM_{2.5}$ (Table 12-60) concentrations was conducted for the opening and design year. In the opening and design years annual mean concentrations of PM_{10} reached at most 37% of the EU limit value of 40 µg/m^3. With respect to $PM_{2.5}$, annual mean concentrations of $PM_{2.5}$ reached at most 36% of the EU limit value of 25 µg/m^3. Concentrations will increase by at most 0.43% of the annual PM_{10} EU limit value at receptor Area1_R51. Changes in annual mean PM_{10} concentrations are similarly low for the design year 2043 with annual mean PM_{10} concentrations at receptor Area2_R7 increasing by 0.41%. Large annual mean PM_{10} concentration decreases are also predicted due to the proposed development. Decreases of up to 0.81% of the annual PM_{10} limit value at receptor Area2_R40 in 2028 and of up to 0.88% of the annual EU PM_{10} limit value at receptor Area2_R40 in 2043 are predicted.

Using the assessment criteria outlined in Table 12-9 to Table 12-11 the impact of the proposed development in terms of NO_2, PM_{10} and $PM_{2.5}$ is considered negligible. Therefore, the overall impact of NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of the proposed development is *long-term, negative and imperceptible*.

In accordance with TII guidance (TII 2011), the impact of the proposed development on ambient air quality in the operation phase is considered long-term, localised, negative and imperceptible. In accordance with the EPA Guidelines (EPA 2022) the likely effects associated with the operation phase traffic emissions pre-mitigation are both *positive* and *negative* but *not significant and long-term*.

Table 12-57 Predicted Annual Mean NO_2 Concentrations for Area 2: Coolmine/Clonsilla

Receptor	Impact Opening Year 2028				Impact Design Year 2043			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area2_R1	20.56	20.75	0.19	Negligible	20.32	20.6	0.28	Negligible
Area2_R2	19.78	19.92	0.14	Negligible	19.53	19.75	0.21	Negligible
Area2_R3	19.24	19.47	0.23	Negligible	19.06	19.18	0.12	Negligible
Area2_R4	22.2	22.75	0.54	Small Increase	22.05	22.56	0.52	Small Increase
Area2_R5	20.15	20.54	0.38	Negligible	20.06	20.25	0.19	Negligible
Area2_R6	20.28	20.46	0.18	Negligible	20.05	20.3	0.25	Negligible
Area2_R7	23.56	24.12	0.56	Small Increase	23.44	24.08	0.64	Small Increase
Area2_R8	19.74	19.89	0.15	Negligible	19.5	19.7	0.2	Negligible
Area2_R9	18.36	18.57	0.22	Negligible	18.22	18.41	0.19	Negligible
Area2_R10	18.95	19.38	0.43	Small Increase	18.96	19.34	0.38	Negligible
Area2_R11	18.97	19.47	0.5	Small Increase	19.03	19.46	0.43	Small Increase
Area2_R12	19.02	19.42	0.4	Small Increase	19.07	19.32	0.25	Negligible
Area2_R13	19.61	19.23	-0.38	Negligible	19.73	19.13	-0.6	Small Decrease
Area2_R14	19.37	19.67	0.3	Negligible	19.2	19.45	0.25	Negligible
Area2_R15	19.32	19.61	0.29	Negligible	19.15	19.39	0.24	Negligible
Area2_R16	18.77	18.95	0.18	Negligible	18.56	18.71	0.15	Negligible
Area2_R17	19.14	19.37	0.22	Negligible	18.96	19.08	0.12	Negligible
Area2_R18	20.57	20.97	0.4	Small Increase	20.51	20.55	0.04	Negligible
Area2_R19	21.2	21.38	0.18	Negligible	21.29	21.06	-0.22	Negligible
Area2_R20	21.07	21.17	0.09	Negligible	21.17	20.87	-0.3	Negligible
Area2_R21	20.81	20.9	0.08	Negligible	20.88	20.61	-0.28	Negligible
Area2_R22	20.03	20.12	0.08	Negligible	19.85	19.93	0.07	Negligible
Area2_R23	20.1	20.18	0.08	Negligible	19.92	19.99	0.07	Negligible
Area2_R24	18.17	18.36	0.19	Negligible	18.02	18.29	0.28	Negligible
Area2_R25	19.83	19.66	-0.17	Negligible	19.82	19.48	-0.34	Negligible
Area2_R26	20.93	20.27	-0.67	Small Decrease	21.13	20.27	-0.86	Small Decrease
Area2_R27	18.64	17.84	-0.8	Small Decrease	18.47	17.57	-0.89	Small Decrease
Area2_R28	20.97	20.99	0.03	Negligible	20.65	20.71	0.06	Negligible
Area2_R29	20.32	20.31	-0.01	Negligible	20.01	20.09	0.08	Negligible
Area2_R30	21.27	21.22	-0.06	Negligible	20.97	20.92	-0.05	Negligible
Area2_R31	19.49	19.66	0.17	Negligible	19.26	19.45	0.19	Negligible
Area2_R32	19.86	20.07	0.21	Negligible	19.63	19.87	0.24	Negligible
Area2_R33	19.35	19.5	0.15	Negligible	19.11	19.29	0.18	Negligible
Area2_R34	20.79	20.79	0	Negligible	20.49	20.52	0.03	Negligible
Area2_R35	17.87	17.98	0.1	Negligible	17.65	17.8	0.16	Negligible
Area2_R36	19.75	19.9	0.15	Negligible	19.4	19.74	0.33	Negligible
Area2_R37	19.98	20.15	0.18	Negligible	19.63	20	0.38	Negligible
Area2_R38	19.98	20.15	0.18	Negligible	19.63	20	0.38	Negligible
Area2_R39	21.06	21.29	0.23	Negligible	20.76	21.18	0.43	Small Increase

Receptor	Impact Opening Year 2028				Impact Design Year 2043			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area2_R40	19.25	17.87	-1.38	Small Decrease	18.84	17.6	-1.24	Small Decrease
Area2_R41	19.25	18.05	-1.19	Small Decrease	18.84	17.81	-1.03	Small Decrease
Area2_R42	19.28	19.2	-0.07	Negligible	19.31	18.88	-0.43	Small Decrease
Area2_R43	19.55	19.47	-0.07	Negligible	19.65	19.13	-0.53	Small Decrease
Area2_R44	19.83	20	0.17	Negligible	19.82	19.74	-0.08	Negligible
Area2_R45	20.19	19.98	-0.21	Negligible	20.51	19.96	-0.55	Small Decrease
Area2_R46	19.74	19.56	-0.18	Negligible	19.97	19.59	-0.38	Negligible
Area2_R47	18.42	17.84	-0.58	Small Decrease	18.22	17.56	-0.65	Small Decrease
Area2_R48	20.26	20.25	-0.01	Negligible	20.39	20.26	-0.14	Negligible
Area2_R49	20.31	19.92	-0.39	Negligible	20.11	19.82	-0.3	Negligible
Area2_R50	20.5	20.09	-0.41	Small Decrease	20.35	20.03	-0.32	Negligible
Area2_R51	23.87	24.36	0.48	Small Increase	24.19	23.92	-0.26	Negligible
Area2_R52	18.81	18.79	-0.02	Negligible	18.52	18.56	0.04	Negligible

Table 12-58 Predicted 99.8th percentile of Daily Maximum 1-hour NO_2 Concentrations (µg/m^3) for Area 2: Coolmine/Clonsilla

Receptor	Opening Year 2028		Design Year 2043	
	DN	DS	DN	DS
Area2_R1	72	72.6	71.1	72.1
Area2_R2	69.2	69.7	68.4	69.1
Area2_R3	67.3	68.1	66.7	67.1
Area2_R4	77.7	79.6	77.2	79
Area2_R5	70.5	71.9	70.2	70.9
Area2_R6	71	71.6	70.2	71
Area2_R7	82.5	84.4	82	84.3
Area2_R8	69.1	69.6	68.2	68.9
Area2_R9	64.3	65	63.8	64.4
Area2_R10	66.3	67.8	66.4	67.7
Area2_R11	66.4	68.1	66.6	68.1
Area2_R12	66.6	68	66.8	67.6
Area2_R13	68.6	67.3	69	66.9
Area2_R14	67.8	68.8	67.2	68.1
Area2_R15	67.6	68.6	67	67.9
Area2_R16	65.7	66.3	65	65.5
Area2_R17	67	67.8	66.4	66.8
Area2_R18	72	73.4	71.8	71.9
Area2_R19	74.2	74.8	74.5	73.7
Area2_R20	73.8	74.1	74.1	73.1
Area2_R21	72.8	73.1	73.1	72.1
Area2_R22	70.1	70.4	69.5	69.7

Receptor	Opening Year 2028		Design Year 2043	
	DN	DS	DN	DS
Area2_R23	70.3	70.6	69.7	70
Area2_R24	63.6	64.3	63.1	64
Area2_R25	69.4	68.8	69.4	68.2
Area2_R26	73.3	70.9	74	70.9
Area2_R27	65.2	62.5	64.6	61.5
Area2_R28	73.4	73.5	72.3	72.5
Area2_R29	71.1	71.1	70	70.3
Area2_R30	74.5	74.3	73.4	73.2
Area2_R31	68.2	68.8	67.4	68.1
Area2_R32	69.5	70.2	68.7	69.6
Area2_R33	67.7	68.2	66.9	67.5
Area2_R34	72.8	72.8	71.7	71.8
Area2_R35	62.6	62.9	61.8	62.3
Area2_R36	69.1	69.7	67.9	69.1
Area2_R37	69.9	70.5	68.7	70
Area2_R38	69.9	70.5	68.7	70
Area2_R39	73.7	74.5	72.7	74.1
Area2_R40	67.4	62.6	65.9	61.6
Area2_R41	67.4	63.2	65.9	62.3
Area2_R42	67.5	67.2	67.6	66.1
Area2_R43	68.4	68.2	68.8	67
Area2_R44	69.4	70	69.4	69.1
Area2_R45	70.7	69.9	71.8	69.8
Area2_R46	69.1	68.5	69.9	68.6
Area2_R47	64.5	62.4	63.8	61.5
Area2_R48	70.9	70.9	71.4	70.9
Area2_R49	71.1	69.7	70.4	69.4
Area2_R50	71.7	70.3	71.2	70.1
Area2_R51	83.6	85.2	84.6	83.7
Area2_R52	65.8	65.8	64.8	65
Area2_R1	72	72.6	71.1	72.1
Area2_R2	69.2	69.7	68.4	69.1
Area2_R3	67.3	68.1	66.7	67.1

Table 12-59 Annual Mean PM_{10} Concentrations (µg/m^3) for Area 2: Coolmine/Clonsilla

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area2_R1	13.66	13.72	0.06	Negligible	13.69	13.69	13.75	Negligible
Area2_R2	13.48	13.52	0.04	Negligible	13.5	13.5	13.55	Negligible
Area2_R3	13.39	13.46	0.07	Negligible	13.42	13.42	13.47	Negligible

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area2_R4	14.15	14.3	0.15	Negligible	14.2	14.2	14.35	Negligible
Area2_R5	13.63	13.74	0.11	Negligible	13.69	13.69	13.76	Negligible
Area2_R6	13.6	13.65	0.06	Negligible	13.62	13.62	13.68	Negligible
Area2_R7	14.43	14.59	0.16	Negligible	14.51	14.51	14.67	Negligible
Area2_R8	13.47	13.52	0.05	Negligible	13.49	13.49	13.54	Negligible
Area2_R9	13.16	13.21	0.06	Negligible	13.2	13.2	13.25	Negligible
Area2_R10	13.31	13.42	0.11	Negligible	13.39	13.39	13.49	Negligible
Area2_R11	13.37	13.5	0.13	Negligible	13.46	13.46	13.58	Negligible
Area2_R12	13.33	13.44	0.11	Negligible	13.42	13.42	13.49	Negligible
Area2_R13	13.49	13.38	-0.11	Negligible	13.6	13.6	13.43	Negligible
Area2_R14	13.43	13.5	0.07	Negligible	13.47	13.47	13.53	Negligible
Area2_R15	13.42	13.48	0.06	Negligible	13.46	13.46	13.52	Negligible
Area2_R16	13.27	13.31	0.04	Negligible	13.29	13.29	13.33	Negligible
Area2_R17	13.37	13.43	0.06	Negligible	13.39	13.39	13.43	Negligible
Area2_R18	13.76	13.89	0.13	Negligible	13.81	13.81	13.84	Negligible
Area2_R19	13.9	13.98	0.07	Negligible	13.95	13.95	13.94	Negligible
Area2_R20	13.86	13.9	0.04	Negligible	13.9	13.9	13.88	Negligible
Area2_R21	13.79	13.83	0.04	Negligible	13.83	13.83	13.81	Negligible
Area2_R22	13.59	13.69	0.1	Negligible	13.63	13.63	13.74	Negligible
Area2_R23	13.6	13.71	0.11	Negligible	13.65	13.65	13.76	Negligible
Area2_R24	13.12	13.17	0.05	Negligible	13.16	13.16	13.23	Negligible
Area2_R25	13.56	13.52	-0.05	Negligible	13.64	13.64	13.55	Negligible
Area2_R26	13.86	13.69	-0.18	Negligible	14.01	14.01	13.77	Negligible
Area2_R27	13.23	13.02	-0.21	Negligible	13.27	13.27	13.02	Negligible
Area2_R28	13.76	13.76	0	Negligible	13.75	13.75	13.77	Negligible
Area2_R29	13.59	13.59	-0.01	Negligible	13.59	13.59	13.61	Negligible
Area2_R30	13.83	13.81	-0.02	Negligible	13.83	13.83	13.82	Negligible
Area2_R31	13.42	13.43	0.02	Negligible	13.47	13.47	13.52	Negligible
Area2_R32	13.51	13.53	0.02	Negligible	13.57	13.57	13.63	Negligible
Area2_R33	13.38	13.4	0.01	Negligible	13.43	13.43	13.48	Negligible
Area2_R34	13.71	13.7	0	Negligible	13.71	13.71	13.72	Negligible
Area2_R35	13.04	13.07	0.03	Negligible	13.05	13.05	13.1	Negligible
Area2_R36	13.49	13.53	0.04	Negligible	13.49	13.49	13.56	Negligible
Area2_R37	13.55	13.59	0.04	Negligible	13.55	13.55	13.63	Negligible
Area2_R38	13.55	13.59	0.04	Negligible	13.55	13.55	13.63	Negligible
Area2_R39	13.8	13.86	0.07	Negligible	13.81	13.81	13.91	Negligible
Area2_R40	13.36	13.01	-0.35	Negligible	13.34	13.34	13.01	Negligible
Area2_R41	13.37	13.06	-0.3	Negligible	13.35	13.35	13.07	Negligible
Area2_R42	13.4	13.37	-0.03	Negligible	13.48	13.48	13.38	Negligible
Area2_R43	13.47	13.44	-0.03	Negligible	13.57	13.57	13.45	Negligible

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area2_R44	13.55	13.58	0.03	Negligible	13.62	13.62	13.61	Negligible
Area2_R45	13.61	13.56	-0.05	Negligible	13.77	13.77	13.61	Negligible
Area2_R46	13.45	13.41	-0.03	Negligible	13.57	13.57	13.49	Negligible
Area2_R47	13.17	13.02	-0.16	Negligible	13.2	13.2	13.02	Negligible
Area2_R48	13.68	13.69	0	Negligible	13.81	13.81	13.77	Negligible
Area2_R49	13.67	13.55	-0.11	Negligible	13.71	13.71	13.62	Negligible
Area2_R50	13.71	13.59	-0.12	Negligible	13.76	13.76	13.67	Negligible
Area2_R51	14.64	14.81	0.17	Negligible	14.73	14.73	14.74	Negligible
Area2_R52	13.24	13.24	0.00	Negligible	13.24	13.24	13.25	Negligible

Table 12-60 Annual Mean $PM_{2.5}$ Concentrations (μg/m^3) for Area 2: Coolmine/ Clonsilla

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area2_R1	8.41	8.44	0.04	Negligible	8.42	8.46	0.04	Negligible
Area2_R2	8.29	8.32	0.03	Negligible	8.3	8.34	0.03	Negligible
Area2_R3	8.24	8.28	0.04	Negligible	8.26	8.29	0.03	Negligible
Area2_R4	8.71	8.8	0.09	Negligible	8.74	8.83	0.09	Negligible
Area2_R5	8.39	8.45	0.07	Negligible	8.42	8.46	0.04	Negligible
Area2_R6	8.37	8.4	0.04	Negligible	8.38	8.42	0.04	Negligible
Area2_R7	8.88	8.98	0.1	Negligible	8.93	9.03	0.1	Negligible
Area2_R8	8.29	8.32	0.03	Negligible	8.3	8.33	0.03	Negligible
Area2_R9	8.1	8.13	0.03	Negligible	8.12	8.15	0.03	Negligible
Area2_R10	8.19	8.26	0.07	Negligible	8.24	8.3	0.06	Negligible
Area2_R11	8.23	8.31	0.08	Negligible	8.28	8.36	0.07	Negligible
Area2_R12	8.2	8.27	0.06	Negligible	8.26	8.3	0.04	Negligible
Area2_R13	8.3	8.23	-0.07	Negligible	8.37	8.26	-0.1	Negligible
Area2_R14	8.27	8.31	0.04	Negligible	8.29	8.33	0.04	Negligible
Area2_R15	8.26	8.3	0.04	Negligible	8.28	8.32	0.04	Negligible
Area2_R16	8.16	8.19	0.02	Negligible	8.18	8.2	0.02	Negligible
Area2_R17	8.22	8.26	0.04	Negligible	8.24	8.27	0.03	Negligible
Area2_R18	8.47	8.55	0.08	Negligible	8.5	8.52	0.02	Negligible
Area2_R19	8.56	8.6	0.04	Negligible	8.58	8.58	0	Negligible
Area2_R20	8.53	8.56	0.03	Negligible	8.55	8.54	-0.01	Negligible
Area2_R21	8.49	8.51	0.02	Negligible	8.51	8.5	-0.01	Negligible
Area2_R22	8.36	8.43	0.06	Negligible	8.39	8.46	0.07	Negligible
Area2_R23	8.37	8.44	0.07	Negligible	8.4	8.47	0.07	Negligible
Area2_R24	8.07	8.1	0.03	Negligible	8.1	8.14	0.05	Negligible
Area2_R25	8.35	8.32	-0.03	Negligible	8.4	8.34	-0.06	Negligible
Area2_R26	8.53	8.42	-0.11	Negligible	8.62	8.48	-0.15	Negligible

Receptor	Impact Opening Year				Impact Design Year			
	DN	DS	DS-DN	Description (TII Criteria)	DN	DS	DS-DN	Description (TII Criteria)
Area2_R27	8.14	8.01	-0.13	Negligible	8.16	8.01	-0.15	Negligible
Area2_R28	8.46	8.47	0	Negligible	8.46	8.47	0.01	Negligible
Area2_R29	8.36	8.36	0	Negligible	8.36	8.38	0.01	Negligible
Area2_R30	8.51	8.5	-0.01	Negligible	8.51	8.5	-0.01	Negligible
Area2_R31	8.26	8.27	0.01	Negligible	8.29	8.32	0.03	Negligible
Area2_R32	8.31	8.32	0.01	Negligible	8.35	8.39	0.04	Negligible
Area2_R33	8.24	8.25	0.01	Negligible	8.26	8.3	0.03	Negligible
Area2_R34	8.44	8.43	0	Negligible	8.44	8.44	0	Negligible
Area2_R35	8.02	8.04	0.02	Negligible	8.03	8.06	0.03	Negligible
Area2_R36	8.3	8.33	0.02	Negligible	8.3	8.35	0.05	Negligible
Area2_R37	8.34	8.36	0.02	Negligible	8.34	8.39	0.05	Negligible
Area2_R38	8.34	8.36	0.02	Negligible	8.34	8.39	0.05	Negligible
Area2_R39	8.49	8.53	0.04	Negligible	8.5	8.56	0.06	Negligible
Area2_R40	8.22	8.01	-0.22	Negligible	8.21	8.01	-0.2	Negligible
Area2_R41	8.23	8.04	-0.19	Negligible	8.21	8.04	-0.17	Negligible
Area2_R42	8.24	8.23	-0.02	Negligible	8.3	8.23	-0.06	Negligible
Area2_R43	8.29	8.27	-0.02	Negligible	8.35	8.28	-0.07	Negligible
Area2_R44	8.34	8.36	0.02	Negligible	8.38	8.37	-0.01	Negligible
Area2_R45	8.37	8.34	-0.03	Negligible	8.47	8.38	-0.09	Negligible
Area2_R46	8.27	8.25	-0.02	Negligible	8.35	8.3	-0.05	Negligible
Area2_R47	8.11	8.01	-0.1	Negligible	8.12	8.01	-0.11	Negligible
Area2_R48	8.42	8.42	0	Negligible	8.5	8.48	-0.02	Negligible
Area2_R49	8.41	8.34	-0.07	Negligible	8.43	8.38	-0.05	Negligible
Area2_R50	8.44	8.37	-0.07	Negligible	8.47	8.41	-0.06	Negligible

12.5.1.8 Operational Traffic Impacts – Ecological Receptors

12.5.1.8.1 Area 1: Ashtown

An operation phase assessment of the impact of traffic on the nearby ecologically sensitive areas has been conducted for the Ashtown area. The designated ecology within 200 m of impacted roads in this area is the Royal Canal pNHA (Site Code: 002103). There are no other designated ecological areas within 200 m of impacted roads.

An assessment of the operational impact of the proposed development has been undertaken using the approach outlined in the IAQM guidance document A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1) (IAQM, 2020). The guidance 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. 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 development on the nearby ecologically sensitive areas within 200 m of roads impacted by the proposed development, as defined in Section 12.3.6.2, is outlined in Table 12-61 for 2028 and Table 12-62 for 2043. The annual mean NO_X concentration has been compared to the critical level of 30µg/m^3 (including a background of 26.5 µg/m^3) at each of the designated habitat sites. The Royal Canal at

Rathoath Road is found to exceed the critical value of 30 µg/m^3 up to a distance of 42 m in 2028 and 22 m in 2043 from the road. However, NO_x concentrations decrease at this location due to the proposed development. The other two modelled locations were found to be below the critical level of 30 µg/m^3. There are increases in NO_x concentrations due to the proposed development at Ashtown however the NO_x concentration remains under the critical load and consultation with the project ecologist confirmed that the impacts are not significant.

Nitrogen deposition levels have been compared to the lower and higher critical loads for the designated habitat sites in Table 12-63 for 2028 and Table 12-64 for 2043. 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 likely effects associated with the operation phase traffic emissions are overall *negative, slight and long-term*.

Table 12-61 Significance of Impacts at Key Ecological Receptors (NO_X Annual Mean Concentration In 2028)

Receptor	Receptor Location (ITM)	Do Minimum (mg/m^3)	Distance from road beyond which concentration is below critical level (30 mg/m^3) (m)	Do Something (mg/m^3)	Distance from road beyond which concentration is below critical level (30 mg/m^3) (m)	Impact (DS – DM) (mg/m^3)	Change as a percentage of critical level (30mg/m^3) (%)
Royal Canal - Ashtown	712644, 737379	28.2	0 m	29.6	0 m	1.5	4.9%
Royal Canal - Ratoath Road	710933, 737440	33.9	42 m	33.6	42 m	-0.3	-1.0%
Royal Canal - Proximity to River Road	709704, 737980	27.6	0 m	27.4	0 m	-0.2	-0.7%

Table 12-62 Significance of Impacts at Key Ecological Receptors (NO_X Annual Mean Concentration In 2043)

Receptor	Receptor Location (ITM)	Do Minimum (mg/m^3)	Distance from road beyond which concentration is below critical level (30 mg/m^3) (m)	Do Something (mg/m^3)	Distance from road beyond which concentration is below critical level (30 mg/m^3) (m)	Impact (DS – DM) (mg/m^3)	Change as a percentage of critical level (30mg/m^3) (%)
Royal Canal - Ashtown	712644, 737379	27.8	0m	28.7	0m	0.9	3.0%
Royal Canal - Ratoath Road	710933, 737440	34.2	22m	33.8	22m	-0.4	-1.3%
Royal Canal - Proximity to River Road	709704, 737980	27.4	0m	27.3	0m	-0.2	-0.5%

Table 12-63 Significance of Impacts at Key Ecological Receptors (NO_2 Deposition In 2028)

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
Royal Canal - Ashtown	712644, 737379	5	2.0	0m	2.1	0m	1.5%	22m	0.08
Royal Canal - Ratoath Road	710933, 737440	5	2.3	0m	2.3	0m	-0.3%	0m	-0.01
Royal Canal - Proximity to River Road	709704, 737980	5	2.0	0m	2.0	0m	-0.2%	0m	-0.01

Table 12-64 Significance of Impacts at Key Ecological Receptors (NO_2 Deposition In 2043)

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
Royal Canal - Ashtown	712644, 737379	5	2.0	0m	2.0	0m	0.94%	0m	0.05
Royal Canal - Ratoath Road	710933, 737440	5	2.3	0m	2.3	0m	-0.40%	0m	-0.02
Royal Canal - Proximity to River Road	709704, 737980	5	2.0	0m	1.9	0m	-0.18%	0m	-0.01

12.5.1.8.2 Area 2: Coolmine/Clonsilla

An operation phase assessment of the impact of traffic on the nearby ecologically sensitive areas has been conducted for the Coolmine/Clonsilla area. The designated ecology within 200m of impacted roads in this area is the Royal Canal pNHA (Site Code: 002103). There are no other designated ecological areas within 200m of impacted roads.

An assessment of the operational impact of the proposed development has been undertaken using the approach outlined in the IAQM guidance document A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1) (IAQM, 2020). The guidance 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. 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 development on the nearby ecologically sensitive areas within 200 m of roads impacted by the proposed development, as defined in Section 12.3.6.2, is outlined in Table 12-65 for 2028 and Table 12-66 for 2043. The annual mean NO_X concentration has been compared to the critical level of 30µg/m^3 (including a background of 26.5 µg/m^3) at each of the designated habitat sites. The Royal Canal at Diswellstown Road, Clonsilla and Castleknock are found to exceed the critical value of 30 µg/m^3 in the DM scenario at distances of up to 42 m in 2028 and 52m in 2043 from the road. In the DS scenario, the only site to see an increase in the distance from the road at which concentrations are above the critical level is Castleknock Road in 2028. However, NO_x concentrations decrease at this location due to the proposed development in 2043 due to a decrease in HGVs. The other two modelled locations at Coolmine Road and Barberstown were found to be below the critical level of 30 µg/m^3. A 9.9% decrease in NO_x concentrations has been modelled in 2028 and 9% decrease in 2043 because of the Coolmine Road closure.

Nitrogen deposition levels have been compared to the lower and higher critical loads for the designated habitat sites in Table 12-67 for 2028 and Table 12-68 for 2043. 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 likely effects associated with the operation phase traffic emissions are overall *negative, slight and long-term*.

Table 12-65 Significance of Impacts at Key Ecological Receptors (NO_X Annual Mean Concentration In 2028)

Receptor	Receptor Location (ITM)	Do Minimum (mg/m^3)	Distance from road beyond which concentration is below critical level (30 mg/m^3) (m)	Do Something (mg/m^3)	Distance from road beyond which concentration is below critical level (30 mg/m^3) (m)	Impact (DS – DM) (mg/m^3)	Change as a percentage of critical level (30mg/m^3) (%)
Royal Canal - Coolmine Road	706971, 737602	29.4	0m	26.5	0m	-3.0	-9.9%
Royal Canal - Diswellstown Road	706295, 737727	36.0	42m	36.7	42m	0.7	2.2%
Royal Canal - Clonsilla	704928, 738167	31.3	32m	30.5	12m	-0.8	-2.6%
Royal Canal - Barberstown	703760, 738230	27.7	0m	28.0	0m	0.4	1.3%
Royal Canal - Castleknock Road	708413, 738108	35.5	42m	35.7	52 m	0.3	0.9%

Table 12-66 Significance of Impacts at Key Ecological Receptors (NO_X Annual Mean Concentration In 2043)

Receptor	Receptor Location (ITM)	Do Minimum (mg/m^3)	Distance from road beyond which concentration is below critical level (30 mg/m^3) (m)	Do Something (mg/m^3)	Distance from road beyond which concentration is below critical level (30 mg/m^3) (m)	Impact (DS – DM) (mg/m3)	Change as a percentage of critical level (30mg/m^3) (%)
Royal Canal - Coolmine Road	706971, 737602	29.1	0m	26.5	0m	-2.7	-9.0%
Royal Canal - Diswellstown Road	706295, 737727	36.4	52m	37.4	52m	1.0	3.3%
Royal Canal - Clonsilla	704928, 738167	32.4	52m	31.2	22m	-1.2	-3.9%

Receptor	Receptor Location (ITM)	Do Minimum (mg/m^3)	Distance from road beyond which concentration is below critical level (30 mg/m^3) (m)	Do Something (mg/m^3)	Distance from road beyond which concentration is below critical level (30 mg/m^3) (m)	Impact (DS – DM) (mg/m3)	Change as a percentage of critical level (30mg/m^3) (%)
Royal Canal - Barberstown	703760, 738230	27.9	0.0	28.5	0m	0.6	2.0%
Royal Canal - Castleknock Road	708413, 738108	36.7	52m	35.9	52m	-0.9	-3.0%

Table 12-67 Significance of Impacts at Key Ecological Receptors (NO_2 Deposition In 2028)

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
Royal Canal - Coolmine Road	706971, 737602	5	2.1	0m	1.9	0m	0.7%	22m	-0.155
Royal Canal - Diswellstown Road	706295, 737727	5	2.4	0m	2.4	0m	-3.1%	0m	0.033
Royal Canal - Clonsilla	704928, 738167	5	2.2	0m	2.1	0m	-1.7%	0m	-0.040
Royal Canal - Barberstown	703760, 738230	6	2.0	0m	2.0	0m	-1.5%	0m	0.020
Royal Canal - Castleknock Road	708413, 738108	7	2.4	0m	2.4	0m	-1.3%	0m	0.013

Table 12-68 Significance of Impacts at Key Ecological Receptors (NO_2 Deposition In 2043)

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
Royal Canal - Coolmine Road	706971, 737602	5	2.0	0m	1.9	0m	1.0%	0m	-0.139
Royal Canal - Diswellstown Road	706295, 737727	5	2.4	0m	2.5	0m	-2.8%	0m	0.050
Royal Canal - Clonsilla	704928, 738167	5	2.2	0m	2.1	0m	-2.0%	0m	-0.060
Royal Canal - Barberstown	703760, 738230	6	2.0	0m	2.0	0m	-1.7%	0m	0.030
Royal Canal - Castleknock Road	708413, 738108	7	2.4	0m	2.4	0m	-1.5%	0m	-0.044

12.5.1.9 Operational Dust

To support the existing maintenance compounds along the proposed development, three new operational maintenance compounds are required:

- An additional facility is proposed at the Navan Road Parkway station.
- The proposed depot will also host a maintenance facility.
- The existing maintenance facility at Docklands will be relocated within the area of the Docklands lands within the ownership of CIÉ.

Should any of the maintenance compounds require storage of materials or other activities that have the potential to generate dust, the dust mitigation measures set out in Section 12.6.1.1 and Appendix A12.4 Dust Mitigation in Volume 4 of the EIAR will be utilised. These will ensure operation phase impacts with respect to dust nuisance, health impacts and sensitive ecology are not significant in the long term. In addition, any maintenance activities on the rail line will also implement the dust mitigation measures set out in Section 12.6.1.1 and Appendix A12.4 Dust Mitigation in Volume 4 of the EIAR.

In accordance with the EPA Guidelines (EPA 2022) and considering the potential likely effects of emissions from the operational dust, the impacts are considered overall *neutral, not significant and long-term*.

12.5.1.10 Other Minor Emissions

In addition to the above potential emissions from the proposed development, there is the potential for some other minor emissions. These emissions have been reviewed and considered to not be significant sources of air pollutants requiring a full modelling assessment, the rational for scoping these emissions out is detailed below.

There will be some use of natural gas at the proposed depot west of Maynooth. These emissions have been considered with respect to the Directive (EU) 2015/219 which is commonly known as Medium Combustion Directive (MCD).

The combined total output of natural gas at the depot is 188.12 KW, the MCD states that individual combustion plants with a rated thermal input less than 1 MW (1,000 KW) should not be considered for the purpose of calculating the total rated thermal input of a combination of combustion plants. Therefore, the impact due to combustion emissions from the depot can be considered *not significant*.

In addition to the depot, there is a single 80 KVA diesel generator in the proposed substations. There are considered a minor emission point and are put in place as an emergency backup in the unlikely event that power is cut to the substation. The substations have looped connection with the ESB (redundant connection) and therefore already has a backup which will be used prior to the generator being required. The six substations each have an electrical power requirement of 43.6 KW.

In accordance with the EPA Guidelines (EPA 2022) and considering the potential likely effects of emissions from the operational minor emissions, the impacts are considered overall *neutral, not significant and long-term*.

12.6 Mitigation Measures

To sufficiently ameliorate the likely air quality impact, a schedule of air control measures has been formulated for both construction and operation phases associated with the proposed development.

12.6.1 Construction Phase

12.6.1.1 Construction Phase Dust Mitigation Measures

The potential risk from dust emissions has been reviewed in Appendix A12.2 Potential Dust Generating Activities in Volume 4 of the EIAR for the most important activities. Further details on construction methods can be found in Chapter 5 of the EIAR which contains an overview of the typical activities and methods that are anticipated to be used during construction and commissioning of the proposed development. In addition, the mitigation measures documented in this section and Appendix A12.4 Dust Mitigation in Volume 4 of the EIAR will be implemented in parallel with the preliminary Construction Environmental Management Plan (CEMP). Before commencing relevant works, an air quality management plan shall be prepared by the contractor and submitted for approval to the relevant planning authority. The plan must include all appropriate dust and emissions mitigation measures, applicable to the circumstances of the relevant site, based on the local authority requirements and industry best practices. Dublin City Council (DCC) guidance document titled Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition (DCC 2018) will be taken into consideration with respect to mitigation dust measures.

The plan will be developed by the contractor and for each worksite shall include:

- An inventory and timetable of activities which may give rise to emissions or dust.
- Alert levels.
- Alert system to be used (including notification process).
- Details of control measures.
- Details of dust monitoring arrangements, including the location of sensitive receptors, monitoring locations, and monitoring equipment to be used.
- Details of the air quality reporting requirements.

A pre-construction dilapidation survey of all buildings will be required prior to commencement of the construction phase. There are no buildings which have shown potential for asbestos containing material, however, a fully intrusive asbestos-containing materials survey, will be completed if asbestos potential is indicated in the pre-construction dilapidation survey. Prior to commencement of the demolition works, all asbestos containing materials identified by the Management Asbestos Survey and Refurbishment and Demolition Survey will be removed by a suitably trained and competent person. Asbestos-containing materials will only be removed from site by a suitably permitted/licensed waste contractor and will be brought to a suitably licensed facility. The Health and Safety Authority will be contacted where needed in relation to the handling of asbestos and material will be dealt with in accordance with the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006, as amended and associated approved Codes of Practice.

The mitigation measures put in place to control construction dust will be implemented as mitigation measures with respect to aspergillus as they will minimise the potential for spread of the fungal spores.

To ensure that no dust nuisance occurs, a series of measures will be implemented, these have been detailed in Appendix A12.4 Dust Mitigation in Volume 4 of the EIAR. In summary, the measures which will be implemented will include:

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- Liaison with local authorities and community groups.
- Hoarding will be provided around the construction compounds.
- It is anticipated that methods of collecting rainwater and recycling for general site use, will be adopted where practical.

Strict dust prevention will always be in place, to minimise any potential emissions and these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Monitoring of construction dust deposition at nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2 m above ground level. The TA Luft limit value is 350 mg/(m^2*day) during the monitoring period between 28 - 32 days.

Consistent implementation of good dust minimisation practices will ensure that the likely effects from construction dust is short-term, localised, reversible and not significant when considered with respect to the EPA description of effects (EPA 2022).

12.6.1.2 Construction Phase Traffic Mitigation Measures

The modelling of road traffic for impacts on human and ecological receptors has found no significant impacts that require mitigation measures with respect to the modelling of emissions. However, some mitigation measures can be put in place to minimise emissions:

- Implement a policy which prevents idling of vehicles both on and off-site including HGV holding sites.
- Construction phase traffic should be monitored to ensure construction vehicles are using the designated haul routes.
- The contractor must adhere to defined traffic routes as noted in the Construction Traffic Management Plan.
- Efficient scheduling of deliveries to minimise number of truck movements.
- Construction vehicles should conform to the current EU emissions standards and where reasonably practicable, their emissions should meet upcoming standards prior to the legal requirement date for the new standard. This will ensure emissions on haul routes are minimised.

Mitigation measures are required for the control of dust with respect to HGV movements onsite with the site and deliveries to/from the site:

- HGV traffic leaving site will pass through a wheel wash.
- Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary. If public roads are deemed to require additional cleaning where possible a suction device for road cleaning will be utilised to access spaces around cars and other street furniture more effectively.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

12.6.2 Operation Phase

As all ambient air pollutants will remain in compliance with the ambient air quality standards and the proposed development has negligible impacts at all modelled receptors with respect to TII Guidance (TII 2011), no specific operation phase mitigation measures are required.

12.7 Residual effects

12.7.1 Construction Phase

When the dust minimisation measures detailed in the mitigation section of this chapter are implemented, fugitive emissions of dust from the site are not predicted to be significant and pose no nuisance, human health or ecological risk to nearby receptors. Thus, there will be no residual construction phase dust impacts.

The air dispersion modelling assessment of construction phase traffic emissions has found negligible results at all modelled locations.

The construction phase of the assessment identifies a negligible impact on air quality in the vicinity of the proposed development. Therefore, overall it is considered that the residual effects with the EPA Guidelines (EPA 2022) and considering the potential likely effects of emissions from the proposed development construction, the impacts are considered overall *short-term* and *not significant*.

12.7.2 Operation Phase

The air dispersion modelling assessment has found that in 2028 and 2043 all receptors will have ambient air quality in compliance with the ambient air quality standards for the Do Something (and Do Nothing) scenario. There are no slight, moderate or substantial adverse effects expected as a result of the operation phase of the proposed development.

The regional mass emissions modelling for the rail line found that for the proposed future operational scenario the emissions are decreased compared to the DN emissions which are currently exceeding emission limit ceilings. Ireland has exceeded its emission ceilings for NO_x by 50% in 2019 and has exceeded the ceiling for all years since 2010. The impact in emissions due to the change in energy source is significant enough that the increased frequency (6 trains presently to 12 trains in the future per hour) and capacity of the service does not result in an overall significant adverse impact. Impacts are also likely to reduce in future years due to additional renewable proportions in the electricity utilised for the rail and the improvements in technology that allow some of the remaining DMUs to change to EMUs or improve their efficiency.

Additional benefits will also be seen in concentrations of NO_2. NO_2, a secondary pollutant of NO_x, and NO_2 has exceeded its EU air quality limit values in Dublin. As a consequence the Dublin Region Air Quality Management Plan - Air Quality Plan to improve Nitrogen Dioxide levels in Dublin Region (DCC 2021) with an aim to remediate exceedances in the air quality limit values. A reduction in mass NO_x emissions will contribute to a reduction in NO_2 concentrations at key locations such as Glasnevin where baseline monitoring recorded exceedances in NO_2 concentrations. As well as the direct impact of change of fuel, the provision of a more frequent rail service will reduce the reliance on the private car which is one of the most significant emitters of NO_2 in urban areas.

Therefore, overall it is considered that the residual effects with the EPA Guidelines (EPA 20122) and considering the potential impact of emissions from the operation phase of the proposed development, the likely effects are considered overall to be *positive, significant and long-term*.

12.8 Monitoring

Monitoring is not proposed for the operation phase.

12.9 Cumulative effects

There is the potential for cumulative impacts of construction activities pre-mitigation. In order to ensure that no impacts occur on dust nuisance, human health or ecological receptors, a series of mitigation measures that are applicable to the construction of the proposed development will be implemented and are set out within the Construction Environmental Management Plan (CEMP) and Appendix A12.4 Dust Mitigation in Volume 4 of the EIAR for the proposed development. Mitigation measures to reduce construction dust are best practice for all developments located within 350 m of sensitive receptors. Therefore, it is assumed that no significant cumulative impacts will arise with from the cumulative elements being constructed concurrently.

In the context of other air quality impacts the construction and operation phases are considered separately and there will be no cumulative long-term air quality effect on the environment.

During construction cumulative effects will not be any greater than the residual impacts described in Section 12.7.

The potential air quality effects as a result of the proposed DART+ West project and other plans and projects are assessed in Chapter 26 Cumulative Effects.

12.10 References

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Directives and Legislation

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

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

Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants

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

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