

The background is a vibrant yellow. It is decorated with several abstract shapes: a dark blue shape in the top left with a white circle; a dark blue shape in the top right with a white circle; a teal shape in the top right; a dark blue shape in the middle right with a white circle; a teal shape in the bottom right with a white circle; a dark blue shape in the bottom left with a white circle; and a teal shape in the bottom left with a white circle.

Chapter 21

Cumulative Impacts & Environmental Interactions

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21. Cumulative Impacts & Environmental Interactions

21.1 Introduction

This Chapter reports the assessment of cumulative impacts of the Ballymun / Finglas to City Centre Core Bus Corridor Scheme (hereafter referred to the Proposed Scheme) in combination with other existing and / or approved projects, and projects which, at the time of assessment, were yet to be approved, but for which a decision on such project is reasonably foreseeable over the likely consenting and construction period anticipated for the Proposed Scheme.

In addition, this Chapter addresses the potential for interactions between impacts on different environmental factors of the Proposed Scheme itself on the receiving environment.

21.1.1 Cumulative Impacts

Annex IV of Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (hereafter referred to as the EIA Directive) requires that an Environmental Impact Assessment Report (EIAR) provides a '*description of the likely significant effects of the project on the environment resulting from...the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.*'

The Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as EPA Guidelines) (EPA 2022) define cumulative effects as:

'The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.'

It should be noted that the EPA Guidelines use the terms impacts and effects interchangeably. A relatively minor effect on a particular receptor caused by the Proposed Scheme could result in a significant effect if it is added to by impacts from other nearby projects. This Chapter identifies and provides an assessment of likely significant cumulative effects caused by the Proposed Scheme in combination with other planned projects. This includes consideration of the potential effects of the other BusConnects Core Bus Corridor Schemes as well as other projects (e.g. MetroLink, DART+). Section 21.2 sets out the process for deciding which other planned projects were included in the assessment.

21.1.2 Environmental Interactions

Environmental interactions are the reactions between impacts, whether between the impacts of just one project (i.e. the Proposed Scheme), or between the impacts of multiple projects. For each environmental topic there will be certain interactions or interdependencies with other environmental topics, whereby impacts may interact to create a greater effect or different type of effect. An assessment of these interactions has been undertaken as required by Article 3 of the EIA Directive, which states the following:

'The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

- (a) *Population and human health;*
- (b) *Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;*
- (c) *Land, soil, water, air and climate;*
- (d) *Material assets, cultural heritage and the landscape;*
- (e) ***The interaction between the factors referred to in points (a) to (d).***

Some of the topic assessments within this EIAR already address environmental interactions. For example, Chapter 10 (Population) provides an assessment of effects on community amenity, which relates to the interaction of impacts on air quality, visual amenity, traffic and transport, and noise and vibration. Furthermore, Chapter 11 (Human Health) describes and assesses how a combination of impacts on health determinants (air quality, noise and vibration, community amenity, traffic and transport) can interact and influence health outcomes. Section 21.4 of this Chapter sets out the main environmental interactions identified from the Proposed Scheme, sign-posting chapters which already address environmental interactions and providing a description and assessment of environmental interactions which are not addressed elsewhere in this EIAR.

21.1.3 Guidance

This assessment has been completed with reference to the following guidance documents:

- EPA Guidelines (EPA 2022);
- Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission 2017); and
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission 1999).

21.2 Methodology for Cumulative Impacts Assessment

21.2.1 Introduction

Broadly speaking, the potential cumulative effects of the Proposed Scheme can be classed as traffic related or non-traffic related. The traffic related effects such as potential air emissions or noise resulting from the cumulation of traffic distribution from multiple projects are predicted through the results of traffic scenario modelling. The traffic modelling scenarios for the cumulative assessment are described in Section 21.2.6.

For non-traffic related cumulative effects, it is necessary to consider the scale, nature and likely impacts of other projects which could combine with the Proposed Scheme to cause cumulative effects. It was therefore necessary to identify which other projects should be included for analysis as part of the cumulative impacts assessment. A staged approach to identify such other projects was applied, as illustrated below, with each stage described in subsequent chapter sections.

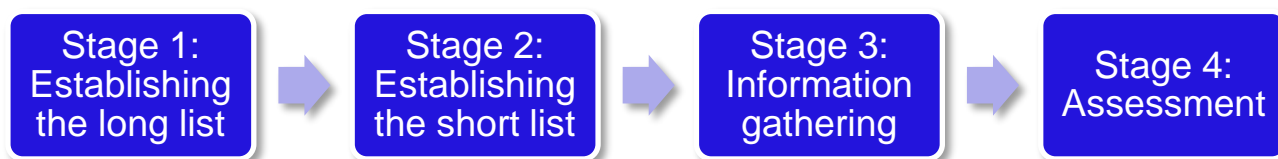


Image 21.1: Staged Approach to Identifying Which Other Project Should be Included for Analysis and Part of the Cumulative Impacts Assessment

21.2.2 Stage 1: Establishing the Long List of ‘Other Projects’

The first stage of the cumulative impacts assessment was to identify other projects deemed potentially relevant to be included in the long list. While the EIA Directive only requires the consideration of other existing and / or approved projects, this assessment has gone further in that it is assumed that the BusConnects Dublin - Core Bus Corridors Infrastructure Works (i.e. the 12 BusConnects Core Bus Corridor schemes) (hereafter referred to as the CBC Infrastructure Works) will be undertaken over a circa six year period (with construction commencing in 2023 subject to approval being granted). There is also potential for a number of other projects to receive approval and be progressed within that time period which may give rise to cumulative effects in combination with the Proposed Scheme. It was, therefore, considered appropriate to identify projects which, at the time of assessment, were yet to be approved, but for which a decision and potentially approval is reasonably foreseeable over the likely consenting and construction period anticipated for the Proposed Scheme.

21.2.2.1 Sources for the Identification of Other Projects

Potentially relevant other projects include those from various sectors, such as residential and commercial projects, utilities, and other transport projects. The identification of projects for the long list considered the following sources:

- An Bord Pleanála website (<http://www.pleanala.ie/index.htm>) – for details of strategic infrastructure projects and Strategic Housing Developments;
- Local authority websites and the development plans for Dublin City, South Dublin, Dún Laoghaire-Rathdown, Fingal and Wicklow – for details of allocations and areas for regeneration;
- National Planning Application Database (<https://data.gov.ie/dataset/national-planning-applications>) – for downloadable list of planning applications sent from local authorities;
- Projects being planned by the National Transport Authority (NTA) (the NTA website, (<https://www.nationaltransport.ie/planning-and-investment/transport-investment/projects/>, provides detail) as part of other major transport projects and programmes in accordance with the Transport Strategy for the Greater Dublin Area 2016 – 2035 (hereafter referred to as the GDA Transport Strategy) (NTA 2016);
- Project Ireland 2040, which combines the National Development Plan (Government of Ireland 2021) and National Planning Framework (Government of Ireland 2019). (gov.ie - Project Ireland 2040 (www.gov.ie) and its interactive mapper (<https://geohive.maps.arcgis.com/apps/MapSeries/index.html?appid=f05a07c5a0324b1a887cd9d5d7103e22>);
- The Transport Infrastructure Ireland (TII) website (<https://www.tii.ie/public-transport/projects-and-improvements/>) – to identify major transport projects and programmes;
- Discussion between the BusConnects Infrastructure team / TII / Iarnród Éireann to gain an understanding of each organisation's relevant projects and programmes;
- The EIA Portal (<https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal>) maintained by the Department of Housing, Planning and Local Government – for applications for development consent accompanied by an EIAR; and
- Irish Water's website, which includes a page on its projects (<https://www.water.ie/projects/>).

All planning application data provided by each local authority is fed into the national Data.Gov.ie database (<https://data.gov.ie/dataset/national-planning-applications>). This dataset was used to identify planning applications within a search area of the Proposed Scheme. The dataset included planning applications of various scales, most of which were for small-scale applications such as domestic / residential modifications. The planning application lists were searched to identify and exclude very minor applications from the long list on the basis that, given their minor nature, these were not likely to have a cumulative effect noticeable over the effects of the Proposed Scheme in isolation. Examples of planning applications which were excluded from the preliminary long list were applications to construct or demolish conservatories, house extensions, loft conversions, change of uses for single or small numbers of buildings, construction of outbuildings, modifications to driveways and retention applications. Granted and pending applications older than 10 years were also excluded from the preliminary long list on the basis that they would likely already have been built (and so would form part of the existing baseline) or are now unlikely to be progressed. Applications which have been refused or annulled were discounted from the preliminary long list on the basis that they are unlikely to progress, unless through successful appeal. The exercise to identify relevant planning applications was initially undertaken in November 2020 with subsequent updates in May 2021, October 2021 and March 2022.

In addition to this process and to capture other potentially relevant foreseeable projects, major projects as part of transport and other infrastructure programmes were added to the preliminary long list. As noted earlier, this included the identification of major transport projects from the GDA Transport Strategy (NTA 2016). It also included other known major projects or programmes or schemes that are currently undergoing some form of formal environmental appraisal, for example, MetroLink and the DART+ programme.

As noted previously, the other 11 BusConnects Core Bus Corridor schemes were also included for assessment. While each of the other BusConnects Core Bus Corridor schemes will be subject to an application for approval, they have a similar likelihood of going ahead as this Proposed Scheme and therefore, the potential cumulative effects of the other BusConnects Core Bus Corridor schemes are of relevance to the potential cumulative effects

of this Proposed Scheme so they were included on the preliminary long list. Types of projects that were identified for consideration on the long list have been classed as follows:

- Local Planning Applications – those projects for which planning permission is applied for through the local planning authorities themselves and were identified from local authority planning application lists;
- Strategic Housing Developments – housing developments of a certain type and scale (e.g., 100 or more houses or student accommodation units) for which applications are lodged directly with An Bord Pleanála;
- Strategic Infrastructure Developments - major infrastructure developments by local authorities and others for which applications are lodged directly with An Bord Pleanála;
- Greater Dublin Area Park & Ride Projects – strategic rail and bus-based Park & Ride projects identified in the GDA Transport Strategy (NTA 2016);
- Irish Water projects – projects under the programmes of work listed on Irish Water’s website;
- Other Major Projects – projects which were at a pre-application stage at the time of identification, but which are anticipated to be developed over the time period for the CBC Infrastructure Works. These include projects from various sectors including energy, utilities and transport; and
- Other Core Bus Corridor schemes: the other 11 Core Bus Corridor schemes proposed by the NTA.

21.2.2.2 Search Areas to Guide the Inclusion of Projects for the Long List

In the absence of specific guidance on cumulative impacts assessment study areas, consideration was given as to the distance over which impact pathways from other projects could potentially combine with the impact pathways of the Proposed Scheme to have likely significant effects on relevant receptors for each environmental topic. The starting point was taken to be impact pathways relating to biodiversity as this was deemed likely to be the most extensive. The Natura Impact Statement (NIS) which has been prepared and is included as a standalone document in the planning application complies with the requirements of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (hereafter referred to as the Habitats Directive), and contains all of the information, data and analysis to inform the Appropriate Assessment to be conducted by the competent authority in order for the competent authority to establish whether the Proposed Scheme individually or in combination with other plans or projects, will have a significant effect on a European site.

The Guidance for Planning Authorities on Appropriate Assessments (Department of Environment, Heritage and Local Government 2009) recommends a study area of 15km is applied. However, any Appropriate Assessment to be conducted by the competent authority needs to consider all potential pathways to impacts on European nature conservation sites, and therefore, the application of an arbitrary distance may not be suitable. For example, this may be the case where highly mobile species are concerned, or where there is a credible impact pathway which extends over some distance, such as a watercourse. Consideration was therefore given to the distance and scales of projects that should be included on the long list for consideration that would be considered for the biodiversity cumulative assessment in this EIAR. This has meant that some major projects added to the long list were more than 15km from the Proposed Scheme itself. All major and strategic projects that have been (or would be) lodged with An Bord Pleanála within a 15km search area, or otherwise identified by the biodiversity assessors as discussed above, were included on the preliminary long list.

Waste management is undertaken on a regional basis, and therefore, for the waste and resources assessment, consideration has been given to projects within the Eastern Midlands Waste Region (EMWR) (see also Section 21.2.3.3).

The climate assessment has been considered on a national basis and not confined to a specific study area, as the drivers and impacts of climate change operate on a wider scale.

It was considered that a smaller search area could be applied to guide the identification of the majority of planning applications. A buffer of 500m from the Proposed Scheme was applied for this purpose, with flexibility retained so that particularly large-scale planning applications were included on the preliminary long list where they were considered to have potential significant cumulative impacts.

This 500m buffer was deemed appropriate since guidance from the Chartered Institution of Highways and Transportation (CIHT) (CIHT 2018) indicates that the preferred walking distance to a bus stop is 400m. A buffer of 500m is therefore sufficient to capture the population that is most likely to interact with the Proposed Scheme, and which could reasonably be exposed to cumulative effects in combination with other projects. The 500m buffer is greater than the study areas for all the other environmental topics with the exception of biodiversity, and waste and resources. For biodiversity, it was considered that the scale and nature of most projects that seek planning permission through local authorities (rather than through An Bord Pleanála) are unlikely to give rise to impacts that would be noticeable above the baseline trends of Dublin’s urban environment on biodiversity interests. However, as noted above, some flexibility was retained to allow some particularly large further afield planning applications lodged with local authorities to be included on the preliminary long list, as per the major and strategic projects identified.

21.2.2.3 Zones of Influence

The long listing process next involved establishing the topic Zones of Influence (Zol). This was done by establishing whether each of the other projects identified would fall within the study areas for the topics considered for the Proposed Scheme in isolation, as assessed in the topic chapters of this EIAR. The Zol provides a guide as to the likelihood that another project may contribute to potentially significant cumulative effects with the Proposed Scheme. All local planning applications were included on the finalised long list to be considered further during Stage 2 as described above being a shortlisting process stage, while some of the major projects, Strategic Infrastructure Developments and Strategic Housing Developments, some of which were outside of any Zol, would not be taken through to the shortlisting stage.

Table 21.1 sets out the pre-defined Zol to guide the long-listing process.

Table 21.1: Pre-Defined Zol for Cumulative Impacts Assessment

Topic	Zol*
Air quality (construction)	350m
Climate	N/A (Informed by traffic modelling scenario and the area of influence the Proposed Scheme has on changing traffic volumes and on long-term trends of climate change)
Noise and vibration (construction)	300m
Population	Community areas
Human health	500m
Biodiversity	15km (not including watercourses linked to estuarine habitats and highly mobile species)
Water	500m
Land and soils	250m
Archaeology	50m
Architectural heritage	50m
Landscape and visual impacts	50m
Waste	N/A waste assessment is informed by regional data on waste. Study area of EMWR is applied to waste assessment.
Material assets	50m (used as proxy for footprint of Proposed Scheme & affected utilities)
Traffic and transport	N/A Informed by traffic modelling scenario and the area of influence the Proposed Scheme has on changing traffic volumes
*Note: Zol = Zones of Influence. These were used as a guide only. Where appropriate, other projects which were outside the pre-defined Zol for the topic were considered on the basis that potentially likely significant effects of a cumulative nature could extend beyond the pre-defined Zol for the Proposed Scheme in isolation.	

The outcome of Stage 1 was a long list of projects for review (and amendment if required) and consideration at Stage 2 of the assessment being the establishment of the shortlist of projects. The long list of other projects is provided in Appendix A21.1 Summary of Stages 1 and 2 Shortlisting Outcomes in Volume 4 of the EIAR.

The review step of the Stage 1 long list was more applicable to the biodiversity and waste and resources topics. In the case of biodiversity, any major or strategic project within 15km of the Proposed Scheme was included in the long list to be reviewed at Stage 2. For the major and strategic projects outside of the 15km buffer, considering issues such as connectivity to sensitive habitats via watercourses has helped inform whether further afield projects could contribute to likely significant cumulative impacts with the Proposed Scheme. In relation to the waste and resources assessment, consideration was given to the potential for likely significant cumulative impacts within the EMWR.

21.2.3 Stage 2: Establishing the Shortlist of ‘Other Projects’

The aim of Stage 2 was to narrow down the Stage 1 long list to include only those other projects where there was potential for significant cumulative effects arising in combination with the Proposed Scheme. To do this, the following was considered:

- Whether the project has been completed, or the planning applications have been refused (where not identified at Stage 1), annulled or expired (if so, they were not shortlisted). If a project was identified as completed, it has been considered as part of the baseline as appropriate;
- Whether there is a likelihood of temporal overlap (including overlap for construction periods) between the Proposed Scheme and the other project; and
- Whether the scale and nature of the other project is likely to significantly contribute to the effects of the Proposed Scheme, taking account of the aspects of the environment for which the Zol is relevant.

21.2.3.1 Scale and Nature of Other Projects

In considering the scale and nature of the other projects, regard was had for the screening thresholds set out in Schedule 5 of S.I. No. 600/2001 - Planning and Development Regulations, 2001 (as amended). For example, the threshold for screening a housing project for Environmental Impact Assessment (EIA) is where there are more than 500 dwelling units. The use of EIA screening thresholds was only a guide however, and some projects which are below thresholds yet relatively close in proximity to the Proposed Scheme and still of a scale to be noticeable in the local context were shortlisted. Ultimately, the judgement as to whether a project should be shortlisted depended on whether the scale, location and / or nature could be sufficient to generate impacts which would be noticeable against typical baseline trends in the same Zol as the Proposed Scheme.

21.2.3.2 Shortlisting

The shortlisting was informed by input from the environmental topic specialists involved in the preparation of this EIAR, which allowed for consideration as to whether a particular type of project could result in impacts to receptors of interest for the Proposed Scheme assessment. In most cases, the Zol for the topic has informed whether or not another project is likely to have a cumulative effect. However, in some instances the environmental topic specialists have considered that there is potential for a likely significant cumulative effect beyond the Zol applied for the Proposed Scheme in isolation, and therefore, a project could be scoped into Stages 3 and 4 for an individual topic even though it was outside of the pre-defined Zol identified at Stage 1. The rationale for whether a project should be scoped out or not is recorded where relevant in Appendix A21.1 Summary of Stages 1 and 2 Shortlisting Outcomes in Volume 4 of the EIAR, which provides a record of key decisions made when shortlisting projects for Stages 3 and 4 of the cumulative impacts assessment. This includes a note of reasons where a specialist has scoped out a project that falls within the Zol for their topic. The shortlisted projects are indicated on Figure 21.1 and Figure 21.2 in Volume 3 of the EIAR.

21.2.3.3 Biodiversity, Climate, Waste and Resources

For some topics, a slightly different approach has been deemed appropriate. The biodiversity assessment has primarily considered individual Strategic Infrastructure Developments, Strategic Housing Developments and other Major Projects for shortlisting within the cumulative impacts assessment. For other projects, such as those covered by local planning applications, the scale of each project was not deemed sufficient to warrant a specific assessment of cumulative impacts on biodiversity. Instead, the biodiversity cumulative assessment assesses how the general trend of development across Dublin cumulatively impacts on the biodiversity resource. This is set out as part of the assessment reported in Section 21.4.1.7.

The climate assessment has considered the cumulative influence of the Proposed Scheme with other developments on a national basis.

The waste and resources assessment has focused on key projects that were considered to have potential for likely significant effects on a regional basis. Specifically, it has focused on those projects likely to generate a similar waste profile to the Proposed Scheme such as soil and stones and bitumen containing material, which may lead to cumulative effects associated with the off-site treatment of solid waste that will be generated by the Construction and Operational Phases of the Proposed Scheme, and other projects in the EMWR that will have simultaneous requirements for landfill and treatment capacity of any construction and demolition (C&D) waste generated during the construction timeframe. The approach to the cumulative impacts assessment for waste is set out in more detail along with the assessment in Section 21.4.1.12.

21.2.4 Stage 3: Information Gathering for the Shortlist of ‘Other Projects’

The cumulative impacts assessment has relied primarily on the gathering of environmental information from a range of sources published as part of planning application submissions or planning documentation for the shortlisted projects. In addition, where environmental assessments have not yet been undertaken or published, then any published Strategic Environmental Assessments (SEA) have been relied on for additional supporting information, where available. Specific information has been obtained from the following sources:

- Planning application documentation and supporting environmental assessments obtained via the National Planning Application Database and the EIA Portal;
- Local authority websites and the development plans for Dublin City, South Dublin, Dún Laoghaire-Rathdown, Fingal and Wicklow local authorities for details of SEAs; and
- Developer websites, for example for Irish Water and other utilities companies.

The information sought focused on:

- Proposed design and location of the project;
- Proposed programme of construction, operation and decommissioning (if relevant); and
- Environmental assessments, if available, that set out baseline data and effects arising from the project.

In many cases there is limited information on the above available with which to inform the cumulative impacts assessment; for example, for many of the projects in a pre-application stage.

21.2.5 Stage 4: Assessment

The cumulative impacts assessment has been undertaken with the findings recorded in Appendix A21.2 Stage 4 Specialist Assessments in Volume 4 of the EIAR. The assessment has been made for construction effects and operation effects based on the scenarios outlined below.

For Construction Phase cumulative impacts, it has been generally assumed that other projects (including the other 11 Core Bus Corridor schemes), would be under construction concurrently with the Proposed Scheme, to present a worst-case scenario. In some cases, a worst-case was considered to be likely where other projects are constructed sequentially, with the effect of lengthening the time that certain receptors may be exposed to similar impacts. For example, this has been the case with the landscape (townscape) and visual impact assessment. Individual topics have set out any such assumptions in the assessments provided in Appendix A21.2 Stage 4 Specialist Assessments in Volume 4 of the EIAR.

For the assessment of Operational Phase cumulative impacts, an assumption has been made that all 12 Core Bus Corridor schemes and any other shortlisted projects, would be complete and in operation, to present a worst-case scenario.

The level of assessment is commensurate with the level of information available for each shortlisted other project.

21.2.6 Traffic Related Cumulative Effects: Construction Scenarios for Assessment

For the purposes of the cumulative impacts assessment, it is assumed that the other 11 Core Bus Corridor schemes will be approved. However, as with any proposed project, there is a risk of delay in grant of approval or indeed a risk of refusal, or delay in starting construction due to unforeseen circumstances. As noted in the EPA Guidelines (EPA 2022), where uncertainty arises then an EIAR needs to describe the 'worst-case' of the accumulation of effects that could arise from these other projects. For this reason, a 'Combined Worst-Case' scenario, where all 12 Core Bus Corridor schemes and other major schemes would be constructed at the same time, was developed and modelled within the Local Area Model (LAM) to inform the assessment of the potential traffic effects. The scenario includes for background traffic and heavy goods vehicle (HGV) growth for a common Construction Year of 2024, to ensure increased travel demand activity during the Construction Phase period was captured which is expected to incorporate all additional construction traffic relating to new development in the study area.

21.2.6.1 Combined Worst-Case Traffic Scenario

In order to assess the impacts of the 'Combined Worst-Case Traffic Scenario', the Construction Traffic Management Plans (CTMPs) associated with the worst-case stage of construction for each of the 12 Core Bus Corridor schemes and other major schemes in combination was modelled on top of a 2024 Do Minimum model year scenario in the LAM. The year 2024 was selected as representative of the likely receiving traffic network environment during the construction timeframe of the 12 Core Bus Corridor schemes. The 2024 modelled scenario also includes for background traffic growth from reasonably foreseeable projects in line with regional growth projections and local development plans, therefore taking account of the effects of traffic generated by a mix of construction projects and general traffic across the city when the CTMPs are applied. It was envisaged that the results of the Combined Worst-Case construction scenario modelling would allow the identification of the more significant locations of traffic displacement and associated environmental impacts to help inform mitigation proposals.

The results from modelling the traffic effects of the combined worst-case scenario in the LAM revealed that there would be significant traffic displacement across the Dublin area.

These significant increases would occur on both main traffic arteries (national, regional roads) as well as local and residential roads. The increases on the main traffic arteries were not deemed to generate a significant adverse impact on the road network due to the function of these roads to accommodate high volumes of traffic. However, the large cumulative increase on local roads had the potential to generate a significant adverse impact. The implications of the increases in traffic were assessed in terms of traffic flows and highway network performance. The modelling indicated that there would be a significant increase in total travel time and delay, with associated increases in queuing and decreases in average speed when compared to the 2024 Do Minimum scenario. The most notable issues were the 'Over Capacity Queues' (an indicator of traffic congestion) across the network which would increase by approximately 59% in the morning (AM) peak and by 82% in the evening (PM) peak.

Due to the modelled impacts based on traffic congestion from the combined worst-case scenario and the risk of generating associated significant air quality and noise impacts, a revised construction scenario was developed, which is outlined below in Section 21.2.6.2.

21.2.6.2 Revised Construction Traffic Scenario

Based on the outputs from the assessment of the combined worst-case scenario, it is proposed that the following schemes will not be constructed concurrently with adjacent BusConnects Core Bus Corridor schemes so as to avoid potential traffic and associated environmental impacts:

- The Proposed Scheme will not be constructed concurrently with the Swords to City Centre Core Bus Corridor Scheme and the Blanchardstown to City Centre Core Bus Corridor Scheme;
- Lucan to City Centre Core Bus Corridor Scheme will not be constructed concurrently with the Liffey Valley to City Centre Core Bus Corridor Scheme and the Blanchardstown to City Centre Core Bus Corridor Scheme;
- Templeogue / Rathfarnham to City Centre Core Bus Corridor Scheme will not be constructed concurrently with the Kimmage to City Centre and Bray to City Centre Core Bus Corridor Schemes; and,

- Bray to City Centre Core Bus Corridor Scheme will not be constructed concurrently with the Blackrock / Belfield to City Centre and Templeogue / Rathfarnham to City Centre Core Bus Corridor Schemes.

For example, no section of the Bray to City Centre Core Bus Corridor Scheme will be constructed at the same time as Templeogue / Rathfarnham to City Centre and Belfield / Blackrock to City Centre Core Bus Corridor Schemes. Also, no section of the Proposed Scheme will be constructed at the same time as the Blanchardstown to City Centre Core Bus Corridor Scheme or the Swords to City Centre Core Bus Corridor Schemes. The remaining eight schemes can be constructed concurrently or with a combination of other schemes incorporating the limitations outlined above.

As the Proposed Scheme is expected to generate significant adverse environmental impacts at receptor locations if constructed concurrently with other adjacent Core Bus Corridor schemes (i.e. Swords to City Centre Core Bus Corridor Scheme and the Blanchardstown to City Centre Core Bus Corridor Scheme), over and above those identified as part of the standalone scheme assessment, the localised assessments such as traffic, air (non-regional) and noise are based on the Proposed Scheme under construction concurrently with adjacent Core Bus Corridor schemes. Therefore limiting the schemes under construction concurrently with the Proposed Scheme will minimise potential additional congestion and associated significant impacts over and above the standalone schemes.

This Proposed Construction Traffic Scenario (i.e. the worst-case stage of construction of the Proposed Scheme without adjacent Core Bus Corridor schemes) has formed the basis of the air quality and noise and vibration Construction Phase cumulative impact assessments in Section 21.3.1.2 and Section 21.3.1.4 respectively, where the Proposed Scheme is assessed by comparing the 2024 Do Minimum construction scenario to the Do Something cumulative construction scenario.

The climate and regional air assessment considers all schemes as the impacts are considered on a regional (not local) basis and again compares the 2024 Do Minimum construction scenario to the Do Something cumulative construction scenario. As above, the Do Minimum and Do Something scenarios are expected to account for traffic associated with the development of other schemes. In addition, both the Do Minimum and Do Something scenarios include for background traffic and HGV growth for a common Construction Year of 2024, which accounts for the construction of other projects such as those provided in Appendix A21.1 Summary of Stages 1 and 2 Shortlisting Outcomes in Volume 4 of the EIAR.

21.2.7 Operational Scenario for Assessment

For operational cumulative effects including the Proposed Scheme, the assessment has been undertaken based on a scenario where all the other 11 Core Bus Corridor schemes are also operational. This has been adopted for the following reasons:

- It is the NTA's intention that all BusConnects Core Bus Corridor schemes would be completed by 2028, therefore the scenario is considered to be reasonable; and
- It is the largest scale option and therefore represents a reasonable worst case for operational effects in terms of redistribution of traffic and traffic related effects.

The Do Minimum scenarios (in both 2028 and 2043) include all other elements of the BusConnects Programme (apart from the CBC Infrastructure Works elements) (i.e. the new BusConnects routes and services (as part of the revised Dublin Area bus network), new bus fleet, the Next Generation Ticketing and integrated fare structure proposals are included in the Do Minimum scenarios).

In 2028, other notable Do Minimum transport schemes include; the roll out of the DART+ Programme, LUAS Green Line capacity enhancement and the Greater Dublin Area Cycle Network Plan implementation (excluding BusConnects Core Bus Corridor elements). The 2043 Do Minimum scenario assumes the full implementation of the GDA Transport Strategy schemes (NTA 2016) and so assumes that proposed major transport schemes such as MetroLink, DART+ Tunnel, LUAS Green Line extensions to Lucan, Finglas and Bray are all fully operational. The level crossing closures associated with DART+ West scheme have also been included within the modelling.

Appendix A6.2 Transport Modelling Report in Volume 4 of the EIAR, contains further information on the modelling assumptions contained within the Do Minimum scenario including the full list of transport schemes included.

For non-traffic modelling related cumulative impacts assessment, the assessment is on the basis that the other shortlisted projects would all be in an operational state for the assessment. For traffic modelling related cumulative impacts assessment, the Operational Phase scenario has been modelled including for background growth from reasonably foreseeable projects in line with regional growth projections and local development plans to capture the wider traffic effects expected from projected development in Dublin.

21.2.8 Summary of Assessment Methodology for Cumulative Impacts Assessment

In summary, a four-stage process has been adopted for assessing cumulative effects for all environmental topics. Stage 1 involved developing and reviewing a long list of other existing and / or approved projects as well as reasonably foreseeable projects and planning applications and identifying whether or not they fall within a ZoI for any of the assessment topics. Stage 2 involved the review of the long list of projects and deciding whether the distance, location, scale and nature of the proposed projects have the potential to result in significant impacts in cumulation with the Proposed Scheme. At the end of Stage 2, a shortlist was established for further assessment of potential cumulative effects. Stages 3 and 4 involved the gathering of available information on the projects in the shortlist and carrying out the assessment. The results of these assessments are summarised in Section 21.3, with supporting detail contained in Appendix A21.2 Stage 4 Specialist Assessments in Volume 4 of this EIAR.

For the Operational Phase cumulative impacts assessment, it was assumed that all 12 Core Bus Corridor schemes are operational, and all shortlisted projects are operational as they form part of general traffic growth. For the Construction Phase cumulative impacts assessment, it was generally assumed that all 12 Core Bus Corridor schemes and other projects on the shortlist would be under construction at the same time as a worst-case, unless, for a particular environmental topic, it was considered that sequential construction of projects would represent a worst-case.

In addition to the process summarised here, for assessment topics which depend on traffic modelling (i.e., air quality, noise and vibration, and traffic and transport) traffic modelling scenarios for construction and operation were prepared. For the Construction Phase, a proposed worst-case scenario was modelled whereby the eight schemes outlined earlier would be under construction concurrently and have their CTMPs implemented at the same time (see Section 21.2.6). For Operational Phase cumulative traffic related effects, it was assumed that all 12 Core Bus Corridor schemes are operational, in addition to other transport schemes, in line with the progressive roll out of the GDA Transport Strategy (NTA 2016). These schemes were applied, along with the forecasted increased travel demand from general development, within the model to capture projected traffic growth from reasonably foreseeable development across the city in both 2028 and 2043.

21.3 Assessment of Cumulative Impacts and Environmental Interactions

This Section provides a topic-by-topic assessment of likely significant cumulative effects of the Proposed Scheme in combination with other projects, before moving on to a description of the main environmental interactions identified for the Proposed Scheme.

In total, 246 other projects, including all 11 other Core Bus Corridor schemes, were shortlisted for further cumulative assessment. Appendix A21.1 of Volume 4 of this EIAR sets out a record of which projects were shortlisted for assessment against the relevant topics for which they were shortlisted. Reference should be made to Figure 21.1 and Figure 21.2 in Volume 3 of the EIAR, for the locations of the shortlisted projects.

21.3.1 Construction Impacts

21.3.1.1 Traffic and Transport

As described in Section 21.2.6, it is proposed to limit the number of Core Bus Corridor schemes which would be under construction concurrently as part of the proposed realistic worst-case scenario to manage overall construction impacts across the city region. The following schemes will not, therefore, be constructed concurrently with adjacent schemes to limit potential for significant adverse traffic, air quality and noise issues during the Construction Phase:

- Ballymun / Finglas to City Centre Core Bus Corridor Scheme (The Proposed Scheme);
- Lucan to City Centre Core Bus Corridor Scheme;

- Templeogue / Rathfarnham to City Centre Core Bus Corridor Scheme; and
- Bray to City Centre Core Bus Corridor Scheme.

The effect of limiting the concurrent Construction Phases of certain Core Bus Corridor schemes is that the traffic redistribution impacts, of each of the Core Bus Corridor schemes will be limited to the adjacent areas of the direct study area of each scheme. This will ensure limited overlap of traffic dispersion into the direct study areas of other Core Bus Corridor schemes, which has the potential to cause cumulative traffic impacts above the levels of the schemes in isolation.

In terms of the Proposed Scheme in isolation, significant impacts due to general traffic redistribution away from the direct study area are not anticipated during the Construction Phase. This is based on the intended scheduling of the works progressively along the corridor, whereby traffic flows are to be maintained in both directions (refer to Chapter 6 (Traffic & Transport) for further information on the Proposed Scheme assessment). There may be a requirement for some localised temporary lane closures for short durations of the day or night, which will involve consultation between the appointed contractor and relevant authorities. Access for general traffic to existing residential and commercial units immediately adjacent to the Proposed Scheme will be accommodated throughout the Construction Phase as well as access for emergency vehicles.

A CTMP has been prepared and is included in the CEMP (Appendix A5.1 in Volume 4 of the EIAR). The appointed contractor will develop the CTMP further to ensure that it gives due consideration to the provision of local access requirements and designates appropriate diversion routes in the cases where localised temporary closures are required. It will be a condition of the Employer's Requirements that the successful contractor, immediately following appointment, must detail in the CTMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála, should they grant approval.

The MetroLink, DART+ West and DART+ Southwest (the DART+ Southwest scheme merges with the DART+ West scheme via the Phoenix Park Tunnel at Glasnevin) major transport infrastructure projects are planned within the Proposed Scheme study area. MetroLink is a proposed high-capacity metro system that will run between Dublin City Centre and Dublin Airport, before continuing to Swords. It will run predominantly underground for most of the length parallel to the Ballymun Section of the Proposed Scheme between Phibsborough at the southern end and Northwood at the northern end. There will be interfaces between the two schemes at five locations (Northwood, Ballymun, Collins Avenue, Griffith Park and Glasnevin (Phibsborough) MetroLink stations), where underground stations will be located beside the Ballymun Section of the Proposed Scheme.

The DART+ West (a proposed railway corridor upgrade along the Dublin to Sligo line) and the DART+ Southwest (a proposed railway corridor upgrade along the Dublin to Cork line) projects converge and cross under the Ballymun Section of the Proposed Scheme at Phibsborough / Glasnevin. A new railway station will be constructed to the west of R108 Prospect Road as part of the development of a MetroLink station at a lower level where the north / south metro tunnel will pass beneath the east / west railway line that is in cutting just below ground level. The new Glasnevin Station will provide an interchange point between the four major transport schemes - DART+ West, DART+ Southwest, MetroLink and the Proposed Scheme.

The BusConnects Infrastructure team has considered the potential for spatial and temporal overlap with these major transport projects and they have been considered in the traffic modelling undertaken. However, in the case of the Proposed Scheme there is not considered to be a temporal or spatial overlap that will give rise to significant cumulative impacts. It is envisaged that the Proposed Scheme will be constructed in advance of significant construction works on MetroLink. The Proposed Scheme construction works will not be undertaken within the road footprint outside of MetroLink stations if construction at the station is taking place at the same time. Any overlapping worksites at stations, for example, will be delivered in tandem with station works to reduce disruption.

Interface liaison has taken place between the BusConnects Infrastructure team and the design teams for both MetroLink and DART+ West during the development of the schemes. The NTA and the appointed contractor will continue this during the Construction Phase of the Proposed Scheme to ensure that there is coordination between projects so as to avoid significant cumulative impacts.

As specified in Section 5.9 in Chapter 5 (Construction) of this EIAR, interface liaison with other projects will take place on a case-by-case basis, as will be set out in the Construction Contract, to ensure that there is coordination

between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

Based on the aim to coordinate between the Proposed Scheme works and other major infrastructure projects and major projects which are proposed along the route, or in the vicinity of the Proposed Scheme, no likely significant cumulative effects are predicted on traffic and transport over and above the effects of the Proposed Scheme in isolation which are reported in Chapter 5 (Construction) and Chapter 6 (Traffic & Transport).

21.3.1.2 Air Quality

21.3.1.2.1 Construction Dust Assessment

An appraisal has been carried out to assess the cumulative risk to sensitive receptors as a result of dust soiling, health impacts and ecology impacts due to the Construction Phase of the Proposed Scheme, and other projects listed in Appendix A21.1 and Appendix A21.2 in Volume 4 of this EIAR, in accordance with the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (IAQM 2014). The assessment methodology is described in full in Section 7.2.4.4 in Chapter 7 (Air Quality). There were 44 other projects identified and shortlisted for the construction dust assessment within the 350m ZoI of the Proposed Scheme and sensitive receptors identified within this ZoI.

Without mitigation, there is the potential for significant cumulative impacts near these other projects. However, in order to ensure that no dust nuisance impacts occur on human health or ecological receptors, a series of mitigation measures have been identified that will be implemented during construction of the Proposed Scheme. These are set out in Chapter 7 (Air Quality). Mitigation measures to reduce construction dust are standard practice for moderate / major scale developments likely to generate dust. Therefore, it is predicted that no significant cumulative impacts will arise from the concurrent construction of the other Core Bus Corridor schemes and those other projects (see Appendix A21.2 in Volume 4 of the EIAR and the Proposed Scheme).

21.3.1.2.2 Construction Traffic Assessment

Local Air Quality

As outlined in Section 21.2.6.22, limitations on the construction of four Core Bus Corridor schemes concurrently with other Core Bus Corridor schemes are proposed to minimise the potential impact on air quality. The Proposed Scheme will not be constructed concurrently with the Blanchardstown or Swords to City Centre Core Bus Corridor Scheme.

Eight new additional significant adverse impacts on the R108 Botanic Road / Phibsborough Road and the R135 Finglas Road are identified when comparing the Do Minimum to the Do Something cumulative construction scenario compared with the standalone scenario assessed in Section 7.4.2.2.2 in Chapter 7 (Air Quality) (refer to Appendix A.21.3 for the full set of air quality results). A worst-case scenario has been modelled, where in reality, the construction works will be short-term and temporary in nature.

In accordance with the EPA Guidelines (EPA 2022), the impacts associated with the cumulative Construction Phase traffic emissions arising from the Proposed Scheme in combination with the adjacent Core Bus Corridor schemes are overall Neutral and Short-Term.

As outlined in Section 21.3.1.2.1, a number of other local projects could directly interface with the construction of the Proposed Scheme. However, as outlined in Section 5.9 in Chapter 5 (Construction) of this EIAR, liaison with third-party developers will take place on a case-by-case basis, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

Based on the aim to coordinate between the Proposed Scheme works and other major infrastructure projects and major projects which are proposed along the route, or in the vicinity, of the Proposed Scheme, no likely significant

cumulative effects are predicted on air quality over and above the effects of the Proposed Scheme in isolation which are reported in Chapter 7 (Air Quality).

21.3.1.2.3 Ecological Receptors Assessment

An assessment of the cumulative impact of the Proposed Scheme and the other 11 Core Bus Corridor schemes on ecological receptors has been undertaken using the approach outlined in Section 7.2.4.3 in Chapter 7 (Air Quality).

The cumulative impact of the Proposed Scheme and the other 11 Core Bus Corridor schemes on the nearby ecologically sensitive areas within 200m of roads impacted by the Proposed Scheme, as defined in Section 7.2.4.3 in Chapter 7 (Air Quality), is outlined in Table 21.2. The annual mean NO_x (nitrogen oxide) concentration has been compared to the critical level of 30µg/m³ (micrograms per metre cubed) at each of the designated habitat sites. All sites exceed the critical level for NO_x in both the Do Minimum and the cumulative construction Do Something scenarios, within 200m of the nearest impacted road.

Nitrogen deposition levels have been compared to the lower and higher critical loads for the designated habitat sites. All sites are below the lower critical load for the designated habitat site in both the Do Minimum and the Do Something cumulative operational scenarios, with the exception of the Royal Canal proposed Natural Heritage Area (pNHA) (Binn's Bridge).

Table 21.2: Significance of Construction Cumulative Impacts at Key Ecological Receptors (NO_x Annual Mean Concentration In 2024)

Annual Mean NO _x in 2024 At Closest Point Within Ecological Site To Road							
Receptor	Receptor Location (ITM)	Do Minimum (µg/m ³)	Distance from Road Beyond which Concentration is Below Critical Level (30µg/m ³) (m)	Do Something (□g/m ³)	Distance from Road Beyond which Concentration is Below Critical Level (30µg/m ³) (m)	Impact (DS – DM) (µg/m ³)	Change as a Percentage of Critical Level (30µg/m ³) (%)
Royal Canal pNHA (Binn's Bridge, western side)	715830, 736004	148.1	>200m	125.7	>200m	-22.4	-75%
Royal Canal pNHA (Binn's Bridge, eastern side)	715846, 735998	170.5	>200m	143.0	>200m	-27.5	-92%
Royal Canal pNHA (Cross Guns Bridge, western side)	715015, 736301	98.9	>200m	101.9	>200m	3.0	10%
Royal Canal pNHA (Cross Guns Bridge, eastern side)	715027, 736292	118.7	>200m	122.6	>200m	3.8	13%
Royal Canal pNHA (Whitworth Road)	715183, 736244	33.5	>200m	33.7	>200m	0.1	0%

Table 21.3: Significance of Cumulative Construction Impacts at Key Ecological Receptors (Nitrogen (N) Deposition In 2024)

Annual Mean N Deposition In 2024 At Closest Point Within Ecological Site To Road									
Receptor	Receptor Location (ITM)	Lower Critical Load for Most Sensitive feature (kgN/ha/yr*)	Do Minimum (kgN/ha/yr)	Distance from Road Beyond which Deposition is Below Critical Load (m)	Do Something (kgN/ha/yr)	Distance from Road Beyond which Deposition is Below Critical Load (m)	Change Relative to Lower Critical Load (%)	Distance from Road Beyond which the Change is <1% (m)	Change in Deposition kgN/ha/yr
Royal Canal pNHA (Binn's Bridge, western side)	715830, 736004	5	7.09	40m	6.29	40m	-16%	0m	-0.81
Royal Canal pNHA (Binn's Bridge, eastern side)	715846, 735998	5	2.73	0m	2.74	0m	0%	0m	0.01
Royal Canal pNHA (Cross Guns Bridge, western side)	715015, 736301	5	2.47	0m	2.43	0m	-1%	0m	-0.04
Royal Canal pNHA (Cross Guns Bridge, eastern side)	715027, 736292	5	2.45	0m	2.47	0m	0%	0m	0.02
Royal Canal pNHA (Whitworth Road)	715183, 736244	5	2.66	0m	2.67	0m	0%	0m	0.01

* kilograms of Nitrogen per hectare per year

In accordance with the EPA Guidelines (EPA 2022), the ecological impacts associated with the cumulative Construction Phase traffic emissions arising from the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes are overall Negative, Slight and Short-Term.

21.3.1.2.4 Regional Air Quality Assessment

The potential changes in regional air emissions due to the cumulative Construction Phase traffic impacts have been assessed using the ENEVAL tool (methodology set out in Section 7.2.4.2 in Chapter 7 (Air Quality)). This assessment considers all 12 Core Bus Corridor schemes on a regional basis to account for the total emissions, although, as outlined in Section 21.2.6.2, all 12 schemes will not be constructed concurrently.

Pollutant emissions (in tonnes) produced in both the Do Minimum and Do Something scenarios for the 2024 cumulative Construction Phase are shown in Table 21.4. The Proposed Scheme cumulatively with the other 11 Core Bus Corridor schemes is predicted to increase emissions of all pollutants modelled. The majority of these increases will result from the redistribution of vehicles onto other longer routes, while construction of the schemes takes place. To produce these emissions estimates, the traffic model utilising the ENEVAL tool has applied the peak construction day in 2024 across the whole year. Emissions are therefore based on a worst-case scenario and are likely to be lower in reality.

Table 21.4: Cumulative Construction Phase Regional Pollutant Emissions (Tonnes) – Construction Year (2024)

	Vehicle Class	NO _x (tonnes)	NO ₂ (tonnes)	PM ₁₀ (tonnes)	PM _{2.5} (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)	Butadiene (tonnes)
DM	Car	1625	489	18.4	17.5	86	1952	1.5	1.2
DS		1659	499	18.8	17.9	89	2007	1.5	1.2
Change		34	10.4	0.4	0.4	2.1	55	0.04	0.02
% Change		2.1%	2.1%	2.1%	2.1%	2.5%	2.8%	2.6%	1.6%
DM	Goods	1437	408	11.3	10.7	43	223	0.4	0.5
DS		1468	416	11.5	10.9	44	231	0.4	0.5
Change		30.7	7.5	0.2	0.2	0.8	7.9	0.02	0.01
% Change		2.1%	1.8%	1.7%	1.7%	1.8%	3.5%	5.8%	1.6%
DM	Urban Bus	44	4.5	0.7	0.7	2.0	8.9	0	0.05
DS		52	5.2	0.8	0.8	2.2	10.2	0	0.05
Change		7.6	0.8	0.09	0.08	0.24	1.3	0	0.004
% Change		17.2%	17.2%	11.5%	11.5%	12.3%	15.0%	0%	9.6%
DM	Total	3106	902	30	29	132	2184	1.8	1.72
DS		3179	920	31	30	135	2249	1.9	1.75
Change		73	19	0.7	0.6	3.1	64	0.06	0.03
% Change		2.3%	2.1%	2.2%	2.2%	2.4%	3.0%	3.2%	1.8%

In accordance with the EPA Guidelines (EPA 2022) the regional impacts associated with the cumulative Construction Phase traffic emissions from the Proposed Scheme and the other 11 Core Bus Corridor schemes are considered overall Negative, Not Significant and Short-Term.

21.3.1.2.5 Summary of Predicted Cumulative Construction Phase Impacts

Table 21.5 summarises the predicted impacts associated with the construction of the Proposed Scheme cumulatively with the other Core Bus Corridor Schemes concurrently.

Table 21.5: Summary of Predicted Cumulative Construction Phase Impacts

Assessment Topic	Predicted Impact – Cumulative Construction
Construction dust	Neutral, Short-Term
Road traffic impacts on local human receptors	Neutral, Short-Term
Road traffic impacts on local ecological receptors	Negative, Slight, Short-Term
Regional air quality	Negative, Not Significant, Short-Term

With the implementation of the dust minimisation and mitigation measures detailed in the CEMP (Appendix 5.1 in Volume 4 of the EIAR), fugitive emissions of dust will be insignificant and pose no nuisance at nearby receptors. Thus, there will be no residual cumulative Construction Phase dust impacts.

The air dispersion modelling assessment of cumulative 2024 Construction Phase traffic emissions has found that the Proposed Scheme will be Neutral overall in the study area, as with the standalone scenario described in Section 7.4.2.2.2 of Chapter 7 (Air Quality). No specific Construction Phase mitigation measures are required.

Overall, therefore, it is considered that the cumulative residual impacts as a result of the Proposed Scheme's construction will be Neutral and Short-Term, whilst meeting the scheme objectives set out in Chapter 1 (Introduction). Eight additional significant localised negative impacts are predicted over and above the standalone assessment for the Proposed Scheme as outlined in Chapter 7 (Air Quality).

21.3.1.3 Climate

21.3.1.3.1 Construction Embodied Carbon Assessment

As outlined in Section 21.2.2.3, the Zol for the embodied carbon climate assessment is not limited to the study area and is considered on a national basis. The construction of a wide range of projects in Ireland over the construction period of the CBC Infrastructure Works will result in the generation of embodied carbon. These projects include local planning applications, major projects and strategic developments with a varying extent of embodied carbon generation. The Institute for Environmental Management and Assessment (IEMA) EIA Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA 2017) (hereafter referred to as the IEMA Guidance 2017), advises that all carbon emissions contribute to climate change and, in the absence of a defined threshold (e.g. national sector-specific targets and trajectories), any increase (or decrease) in carbon emissions may be considered as significant. Therefore, any developments which result in the generation of embodied carbon during their construction phases, can be considered as Negative and Significant.

However, notwithstanding that carbon emissions are to be considered on a national basis, an appraisal has been carried out to assess the embodied carbon associated with the Construction Phase of the Proposed Scheme cumulatively with the other 11 Core Bus Corridor schemes using the 'TII Carbon Assessment Tool' (Version 2) (TII 2020). The methodology to assess embodied carbon is described in full in Section 8.3.4.1 in Chapter 8 (Climate). As has been previously outlined in Section 21.2.6.2, four Core Bus Corridor schemes will not be constructed concurrently with adjacent Core Bus Corridor schemes. However, for the purpose of the embodied carbon assessment, the timing of the construction of the schemes is not considered a determining factor for the assessment. It is assumed that all 12 Core Bus Corridor schemes will ultimately be constructed, and therefore, the carbon impacts associated with the schemes would materialise.

Based on the TII Carbon Tool (TII 2020), the breakdown of the activities between the different phases of the Proposed Scheme cumulatively with all other Core Bus Corridor schemes has been assessed. Table 21.6 provides the key phases of the cumulative greenhouse gas (GHG) generation which are the embodied carbon of the construction materials and construction activities, which when combined account for 91% of all carbon emissions. Pre-construction together with construction waste is expected to account for 10% of all cumulative emissions.

Table 21.6: Construction GHG Emissions

Activity	Kilotonnes (kt) CO _{2eq} / Total	% Of Total
Pre-Construction	0.8	1%
Embodied Carbon	84.7	77%
Construction Activities	15.6	14%
Construction Waste	9.4	9%
All	110.5	100%

The Proposed Scheme, cumulatively with all other Core Bus Corridor schemes, is estimated to result in total Construction Phase GHG emissions of 110.5 kt (kilotonnes) embedded CO_{2eq} for materials (refer to Table 21.6) equivalent to an annualised total of 0.14% of Ireland’s non-ETS (Emissions Trading Scheme) 2020 target or 0.16% of Ireland’s non-ETS 2030 target. Over the predicted operational 60-year lifespan of the Proposed Scheme, the annualised emissions due to the Construction Phase of the Proposed Scheme, cumulatively with all other Core Bus Corridor schemes, is projected to reach, at most, 0.006% of Ireland’s non-ETS 2030 emissions target. The operational lifespan of 60 years is the default used in the TII Carbon Tool and is the default in the United Kingdom Highway Agency (UKHA) Design Manual for Roads and Bridges (DMRB) - LA 114 Climate (hereafter referred to as LA 114 Climate) (UKHA 2019). Sixty years is also the timeline for the appraisal of the CBC Infrastructure Works business case. The predicted impact to climate due to embodied carbon emissions during the cumulative Construction Phase, prior to mitigation, will therefore be Negative, Significant and Short-Term.

As outlined in Section 21.3.1.3.1, and in line with IEMA Guidance 2017 (IEMA 2017), the combined impact of the Proposed Scheme with other schemes under construction concurrently is considered to result in a cumulative Negative, Significant and Short-Term impact. In general, the carbon emissions associated with embodied carbon and energy to construct schemes on a national basis is accounted for cumulatively as part of the ETS.

21.3.1.3.2 Construction Traffic Assessment

As outlined in Section 21.2.6.1, the traffic data used for both the 2024 Do Minimum and Do Something cumulative construction scenarios includes background traffic growth accounting for wider construction activity. Therefore, it is assumed that potential emissions associated with the concurrent construction traffic related to other projects alongside the construction of the Proposed Scheme are included in the carbon emission forecasts in both the Do Minimum and Do Something scenarios.

The climate impact assessment of road traffic emissions from the Construction Phase of the Proposed Scheme cumulatively with all other Core Bus Corridor schemes has been carried out according to methodology outlined in Section 8.3.4.2 in Chapter 8 (Climate).

Specifically, the predicted GHG emissions from the Do Minimum scenario were compared with the GHG emissions from the Do Something cumulative construction scenario. The cumulative construction scenario assumed construction of the Proposed Scheme in addition to all other Core Bus Corridor schemes concurrently, as a worst-case, as the greatest level of traffic redistribution would occur with all Core Bus Corridor schemes under construction at the same time.

A comparison of the construction traffic associated with the Proposed Scheme cumulatively with all other Core Bus Corridor schemes and the Do Minimum GHG emissions in the Construction Year (2024) indicates that there is predicted to be an overall temporary increase of 40.4kt in CO_{2eq} (carbon dioxide equivalent) (refer to Table 21.7). This is equivalent to a 2.6% temporary increase in CO_{2eq} relative to the construction year Do Minimum estimates. To put these figures in context, approximately 11,000kt CO_{2eq} are projected to be emitted in Ireland by the transport sector in 2024 (EPA 2021). The majority of these increases will result from the redistribution of vehicles onto other longer routes, while construction of the Proposed Scheme takes place. To produce these emissions estimates, the traffic model and therefore the ENEVAL tool have applied the peak construction day in 2024 across the whole year. Emission predictions are therefore a highly conservative worst-case and are likely to be conservatively 50% lower in reality.

Carbon emissions are accounted for on an annual basis by the EPA. The predicted cumulative GHG emissions included in Table 21.7 are totalled across all schemes which are expected to be constructed over a six year period. Therefore, an average annual GHG emission value is also provided on a per annum basis.

Table 21.7: Cumulative Construction Phase Traffic CO_{2eq} Emissions Total Over a Six Year Period and Per Annum

Scenario	Vehicle Class	CO _{2eq} (kt CO _{2eq})	CO _{2eq} (kt CO _{2eq}) Per Annum
DM	Car	875.0	145.8
DS		899.2	149.9
Change		24.2	4.0
% Change		2.8	2.8
DM	Goods	648.0	108.0
DS		660.0	110.0
Change		12.0	2.0
% Change		1.9	1.9
DM	Bus	30.4	5.1
DS		34.4	5.7
Change		4.1	0.7
% Change		13.4	13.4
DM	Total	1553.3	258.9
DS		1593.6	265.6
Change		40.4	6.7
% Change		2.6	2.6

The potential impact to climate due to cumulative construction traffic, prior to mitigation, will be Negative, Significant and Short-Term.

A series of embedded mitigation measures have been incorporated into the design of the Core Bus Corridor schemes with the goal of reducing the embodied carbon and traffic emissions associated with the Construction Phase of all Core Bus Corridor schemes. It is proposed that, where feasible, concrete containing Portland cement will be replaced with concrete containing ground granulated blast furnace slag (GGBFS). This measure will lead to a cumulative saving of approximately 11.1kt of CO_{2eq} across all 12 Core Bus Corridor schemes. In addition, the Core Bus Corridor schemes will minimise wastage of materials due to poor timing or over ordering on-site, thus helping to minimise the embodied carbon footprint of the Proposed Scheme, and where practicable, opportunities for materials reuse will be considered within the extent of the Core Bus Corridor schemes. In addition, where practicable, materials will be sourced locally to reduce the embodied emissions associated with transport.

Notwithstanding the implementation of mitigation measures, the predicted impact to climate due to the Construction Phase of the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes, after mitigation, will be Negative, Significant and Short-Term.

21.3.1.3.3 Overall Cumulative Construction Climate Assessment

Table 21.8 summarises the potential impacts on climate associated with the Proposed Scheme cumulatively with the construction of all other Core Bus Corridor schemes.

Table 21.8: Summary of Potential Cumulative Construction Phase Climate Impacts

Assessment Topic	Potential Impact – Cumulative Construction
Embodied Carbon	Negative, Significant and Short-Term
Construction Traffic	Negative, Significant and Short-Term
Combined Construction Phase	Negative, Significant and Short-Term

21.3.1.4 Noise and Vibration

21.3.1.4.1 Construction Noise Assessment

An appraisal was carried out to assess the cumulative impact to noise sensitive locations (NSLs) as a result of construction noise due to the Construction Phase of the Proposed Scheme, the other Core Bus Corridor schemes and the other projects listed in Appendix A21.1 in Volume 4 of the EIAR. There were 33 projects identified with the 300m Zol of the Proposed Scheme (refer to Section 21.2.2.3) and NSLs within this Zol were identified. This included 13 Dublin City Council (DCC) local planning applications, four Fingal County Council (FCC) local planning applications, eight Strategic Housing Developments, seven other Major Projects and the Blanchardstown to City Centre Core Bus Corridor Scheme (see Appendix A21.2 in Volume 4 of this EIAR).

In addition, eight other projects were located within the 300m Zol of the Proposed Scheme, but these were considered sufficiently set back and screened from any major works associated with the Proposed Scheme to result in any potential significant cumulative effects.

The highest noise impacts associated with the Proposed Scheme are calculated at NSLs along the immediate boundary of the proposed construction works (typically within 50m of a specific working area). Due to the linear nature of works associated with the Proposed Scheme, construction noise impacts will occur over temporary periods at any one location. Construction activities associated with the Proposed Scheme will therefore dominate noise levels at the closest NSLs to the Proposed Scheme when occurring in their proximity. Due to the further distance of the other Core Bus Corridor schemes and the other projects to these NSLs, the cumulative construction noise levels will remain dominated by the Proposed Scheme and the magnitude of impacts described in Section 9.4.3.2 of Chapter 9 (Noise & Vibration) remain valid.

In order to ensure that construction activities associated with the Proposed Scheme are controlled at the closest NSLs, a series of mitigation measures will be implemented throughout the Construction Phase. These measures are set out in Section 9.5.1.1 of Chapter 9 (Noise & Vibration). With the implementation of the mitigation measures to reduce construction noise levels associated with the Proposed Scheme, and due to the separation from the nearest other Core Bus Corridor scheme, there are no predicted significant cumulative impacts from concurrent construction of the Proposed Scheme in combination with the other Core Bus Corridor schemes and other projects identified.

21.3.1.4.2 Construction Traffic Assessment

Potential noise impacts associated with Construction Phase traffic during the construction of the Proposed Scheme has been assessed in Section 9.4.3.4 of Chapter 9 (Noise & Vibration). The assessment methodologies and significance criteria used for the assessment is set out in Section 9.2.4.1 of Chapter 9 (Noise & Vibration).

The assessment of potential cumulative construction traffic noise impacts has been undertaken using the following approach:

- Traffic noise levels have been calculated along the modelled roads within a 1km study area of the Proposed Scheme;
- Noise levels have been calculated for the Do Minimum scenario for the assessed Construction Year (2024);
- Noise levels have been calculated for the cumulative Do Something scenario for the assessed Construction Year (2024) which includes the adjacent Core Bus Corridor schemes with the exception of those set out in Section 21.2.6.2;
- The change in traffic noise levels between the Do Minimum and cumulative Do Something scenarios for the Construction Year (2024) has been calculated, and the associated magnitude of change and noise level ranges using the same methodology as the Proposed Scheme, as set out in Section 9.2.4.1 of Chapter 9 (Noise & Vibration); and
- It is assumed that other schemes that may be under construction concurrently are captured in the 2024 Do Minimum and Do Something traffic volumes which accounts for traffic and HGV growth.

For the majority of the 1km study area relative to the standalone Proposed Scheme and assessed for the cumulative Construction Phase scenario, traffic noise impacts are determined to be Positive, Imperceptible and

Temporary to Negative, Slight to Moderate and Temporary due to the negligible to low volume of additional traffic along the road network during the cumulative Construction Phase scenario.

There are a small number of roads in the overall study area where there is the potential for significant impacts because of traffic redistribution onto the surrounding road network due to temporary traffic management measures during the Construction Phase. These are defined as roads with a traffic noise level above a daytime noise level of 55dB L_{Aeq,16hr} (the daytime ambient noise level between 07:00hrs and 23:00hrs, refer to Section 9.2.4 of Chapter 9 (Noise & Vibration)) and an increase in noise level greater than 3dB. The results are provided for both the standalone Proposed Scheme and the cumulative scenarios in Table 21.9.

Table 21.9: Summary of Potential Construction Traffic Noise Impacts Due to Standalone Proposed Scheme and Cumulative Construction (Other Core Bus Corridor Schemes Under Construction)

Road	Potential Impact – Standalone Proposed Scheme	Potential Impact – Cumulative Construction
Glendalough Road	Negative, Moderate to Significant and Temporary	Negative, Moderate and Temporary
Crawford Avenue	Negative, Moderate to Significant and Temporary	Negative, Slight and Temporary
Hollybank Road	Negative, Moderate to Significant and Temporary	Negative, Moderate and Temporary
Botanic Road	Negative, Moderate and Temporary	Negative, Not Significant and Temporary
Jamestown Road	Negative, Slight to Moderate and Temporary	Negative, Not Significant and Temporary
Oxmantown Road	Positive and Imperceptible	Moderate to Significant
Manor Place	Positive and Imperceptible	Moderate to Significant
St. Joseph's Road	Positive and Imperceptible	Moderate to Significant
Home Farm Road	Not Significant	Moderate to Significant
Clare Road	Slight	Moderate

Under the cumulative construction traffic scenario, the magnitude of impacts are reduced along roads impacted as a result of the Proposed Scheme in isolation, and impacts are increased along a small number of additional roads as result of the cumulative construction scenario. This is due to alternative traffic management measures in place during the cumulative schemes' construction scenario compared to the standalone Proposed Scheme. Under the cumulative schemes' scenario, five roads are calculated to experience increased traffic noise impacts compared to the standalone Proposed Scheme scenario. Impacts are calculated as Negative, Moderate to Significant and Temporary along these identified roads under the cumulative construction scenario. All traffic noise impacts are temporary in nature.

Based on the aim to coordinate between the Proposed Scheme works and other major infrastructure projects and major projects which are proposed along the route, or in the vicinity of the Proposed Scheme, a small number of roads will experience cumulative effects on noise and vibration over and above the effects of the Proposed Scheme in isolation which are reported in Chapter 9 (Noise & Vibration).

21.3.1.5 Population

The population assessment has considered potential cumulative effects on land take, amenity and accessibility during construction. Eight projects were shortlisted as having potential interfaces with population receptors affected by the Proposed Scheme, as assessed in Chapter 10 (Population). These were:

- DCC planning reference 2628/17: extension to the existing Phibsborough Shopping Centre;
- DCC planning reference 3361/22: construction of 52 residential units within three apartments blocks ranging from three to eight storeys fronting both Church Street and Brunswick Street North;
- DCC planning reference 308905: 101 Apartments, Glasnevin Hill;
- DCC planning reference 309345: An application for Strategic Housing Development at Old Bakery Site, 113 Phibsborough Road;

- DCC planning reference 310722: An application for Strategic Housing Development on Finglas Road;
- Major Project (ID MP08) - DART+ Programme West;
- Major Project (ID MP14) - Finglas LUAS (Green Line extension Broombridge to Finglas); and
- Major Project (ID MP32) - MetroLink.

For those developments that are not already completed, and where there is the potential for a temporal overlap with the Proposed Scheme, the assessment of cumulative effects has identified potential for significant impacts on amenity in the immediate vicinity of works during a temporary period, given the scale and type of works envisaged / proposed.

In regard to DCC planning reference 2628/17, Finglas LUAS (Green Line extension Broombridge to Finglas) and MetroLink, the assessment of cumulative effects has identified potential for cumulative impact on land take (and accessibility) on population receptors. However, given the limited interface in respect to the overall length of the Proposed Scheme and the wider community, such impacts are not anticipated to be significant.

21.3.1.6 Human Health

The Human Health assessment identified 39 other projects with the potential for likely significant cumulative effects with the Proposed Scheme and were taken into assessment Stages 3 and 4 (see Appendix A21.1 in Volume 4 of this EIAR).

The identified impacts are related to construction related noise, dust and general disruption from construction traffic. However health effects were judged to be either Negative and Slight or Negative and Moderate on a Temporary basis. No significant cumulative health effects are anticipated from the Construction Phase of the Proposed Scheme in combination with the construction phases of the other projects identified.

As outlined in Section 5.9 in Chapter 5 (Construction) of this EIAR, liaison with third-party developers will take place on a case-by-case basis, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

21.3.1.7 Biodiversity

This cumulative impact assessment examined whether the Proposed Scheme, along with any other projects could cumulatively result in a likely significant effect on biodiversity. Projects either in place, or proposed, were considered in assessing the potential for cumulative impacts to increase the significance of the impacts predicted for the Proposed Scheme on biodiversity. These projects are outlined in Appendix A21.2 in Volume 4 of the EIAR.

The potential for cumulative impacts on biodiversity to arise are limited to those residual impacts associated with the Proposed Scheme and those effects the Proposed Scheme will have on the receiving environment that are measurable in some way, but by themselves will not result in a likely significant residual effect on biodiversity.

The residual biodiversity impacts associated with the Proposed Scheme itself, as reported in Section 12.6 of Chapter 12 (Biodiversity) in this EIAR, are mostly not significant and those that are significant are at the local geographic scale. These effects are summarised in Table 21.10 under the following categories:

- Habitat loss;
- Habitat degradation; and
- Loss of roosting / foraging / commuting habitat, habitat fragmentation, disturbance / displacement effects, and/or mortality for fauna species.

Table 21.10: Summary of Construction Phase Significant Residual Biodiversity Impacts

Ecological Receptor	Ecological Valuation	Potential Impact (Pre-Mitigation and Monitoring)	Potential Significance	Significant Residual Impact (Post Mitigation and Monitoring)
Habitats (outside of designated areas for nature conservation)				
Tidal Rivers (CW2) (corresponding to Annex I Estuaries [1130])	National Importance	Habitat degradation (surface water quality; non-native invasive plant species)	Likely significant effect at the National geographic scale	No significant residual effect
Depositing / lowland rivers (FW2)	Local Importance (Higher Value)	Habitat degradation (surface water quality; non-native invasive plant species)	Likely significant effect at the Local - County geographic scale depending on watercourse in question	No significant residual effect
Canals (FW3)	National Importance	Habitat Loss and fragmentation; Habitat degradation (Surface Water Quality; non-native invasive plant species)	Likely significant effect at the National geographic scale	No significant residual effect
Large Reed and Sedge Swamp (FS1)	National Importance	Habitat Loss and fragmentation; Habitat degradation (Surface Water Quality; non-native invasive plant species)	Likely significant effect at the national geographic scale	No significant residual effect
(Mixed) broadleaved woodland (WD1)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Scattered trees and parkland (WD5)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Hedgerows (WL1)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Treelines (WL2)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Rare / Protected Plant Species				
Opposite-leaved pondweed	National Importance	Habitat Loss, Habitat degradation (surface water quality; hydrological regime)	Likely significant effect at the Local to National geographic scale	No significant residual effect
Fauna Species				
Bats	Local Importance (Higher Value)	Roost Loss, Habitat loss as a result of fragmentation of foraging / commuting habitat and commuting routes; Installation of temporary working and construction compound Lighting causing indirect disturbance of flight patterns	Likely significant effect at the Local geographic scale	No significant residual effect
Badger	Local Importance (Higher Value)	Loss of Foraging habitat and breeding / resting places, Disturbance / displacement; mortality risk	Not likely significant effect at the Local geographic scale	No significant residual effect
Otter	County Importance	habitat and food source degradation – water quality; habitat severance / barrier effect; disturbance / displacement - lighting)	Likely significant effect at the Local geographic scale	No significant residual effect

Ecological Receptor	Ecological Valuation	Potential Impact (Pre-Mitigation and Monitoring)	Potential Significance	Significant Residual Impact (Post Mitigation and Monitoring)
Marine mammals	County Importance – International Importance	Habitat and food resource degradation – Water Quality	Likely significant effect at the Local geographic scale	No significant residual effect
Other Mammal species protected under the Wildlife Acts	Local Importance (Higher Value)	Mortality Risk	Not likely significant effect at the Local geographic scale	No significant residual effect
SCI bird species	International Importance	See SPAs above	See SPAs above	No significant residual effect
All other breeding bird species (non-SCI)	Local Importance (Higher Value)	Habitat Degradation (hydrology)	Likely significant effect at the Local geographic scale	No significant residual effect
All other wintering bird species (non-SCI)	Local Importance (Higher Value)	Habitat Degradation (hydrology)	Likely significant effect at the Local geographic scale	No significant residual effect
Amphibians	Local Importance (Higher Value)	Habitat Degradation - surface water quality;	Likely significant effect at the Local geographic scale	No significant residual effect
Non-Annex fish species (e.g. brown trout, European eel)	Local Importance (Higher Value) – National Importance	Habitat Loss / severance and barrier effect; Habitat Degradation – surface water quality; Mortality Risk	Likely significant effect at the Local geographic scale	No significant residual effect
Invertebrates (aquatic)	Local Importance (Higher Value)	Habitat Loss; Habitat Degradation (surface water quality)	Likely significant effect at the Local geographic scale	No significant residual effect

21.3.1.7.1 Impacts from Habitat Loss

Potential cumulative impacts on habitat loss will relate to the following six key environmental receptor (KER) habitats where the Proposed Scheme will result in the residual loss of a proportion of KER habitats resulting in a residual effect.

The minor loss of Canal (FW3) and Reed and large sedge swamp (FS1) habitats from within the boundary of the Royal Canal pNHA will not be significant even at the local geographic level, given the extent of these habitat types within the locality and across the Royal Canal pNHA. Given the urban location of the Royal Canal pNHA, there is likely to be continued habitat degradation effects in relation to surface water quality, owing to the level of construction activity, and existing drainage infrastructure, that is typical of the City Centre. Any cumulative effects of habitat degradation on these habitat types are not likely to increase the impact significance above the residual local geographic scale. It should also be noted that the direct loss of these habitat types as a cumulative impact of the Proposed Scheme in tandem with other development projects is not anticipated.

The loss of Hedgerows (WL1), Treelines (WL2), (Mixed) Broadleaved Woodland (WD1) and Scattered Trees and Parkland (WD5) will not be significant at any geographic scale. The majority of these habitats are located adjacent to the existing roadway and are highly disturbed and typically fragmented or limited in nature. Given the location of the Proposed Scheme and the on-going urban development trends across Dublin, there is likely to be continued habitat loss and fragmentation. In relation to areas of locally important habitats that will be lost, given the nature and availability of the habitat types involved in the wider environment, any cumulative losses of these habitat types are not likely to increase the impact significance above the residual local geographic scale.

Various protective policies in place within the land use plans will also moderate any future losses of habitats of a biodiversity value, including the following policies within the Dublin City Development Plan 2016-2022 (DCC 2016) and the Fingal Development Plan 2017 – 2023 (FCC 2017).

The Proposed Scheme is compliant with all of the plan level biodiversity protection policies and objectives described within the Dublin City Development Plan 2016 – 2022 and Fingal Development Plan 2017 - 2023, as listed below. Furthermore, the Proposed Scheme will not prevent the achievement of any of these plan level biodiversity protection policies and objectives across the identified potential impact pathways.

Dublin City Development Plan 2016 – 2022 Policies and Objectives

- **GI017:** To seek the continued improvement of water quality, bathing facilities and other recreational opportunities in the coastal, estuarine and surface waters in the city and to protect the ecology and wildlife of Dublin Bay;
- **GI25:** To make provisions for habitat creation / maintenance and facilitate biodiversity by encouraging the development of linear parks, nature trails, wildlife corridors, urban meadows and urban woodlands;
- **GI26:** To have regard to the conservation and enhancement of significant non-designated areas of ecological importance in accordance with development standards set out in this plan;
- **GI025:** To protect trees in accordance with existing Tree Preservation Orders (TPOs) and, subject to resources, explore the allocation of additional TPOs for important / special trees within the city based on their contribution to amenity or the environment;
- **GI026:** To review ancient and species-rich hedgerows within the city (as identified in the 2006 survey of ancient and species rich hedgerows in Dublin city) and protect existing hedgerow sections; and
- **GI027:** To protect trees, hedgerows or groups of trees which function as wildlife corridors or 'steppingstones' in accordance with Article 10 of the EU Habitats Directive.

Fingal Development Plan 2017 - 2023

- **Objective GI03:** Develop the green infrastructure network to ensure the conservation and enhancement of biodiversity, including the protection of European Sites, the provision of accessible parks, open spaces and recreational facilities (including allotments and community gardens), the sustainable management of water, the maintenance of landscape character including historic landscape character and the protection and enhancement of the architectural and archaeological heritage;
- **Objective GI24:** Ensure biodiversity conservation and / or enhancement measures, as appropriate, are included in all proposals for large scale development such as road or drainage schemes, wind farms, housing estates, industrial parks or shopping centres;
- **Objective NH20:** Maintain and/or enhance the biodiversity of the Nature Development Areas indicated on the Green Infrastructure maps;
- **Objective NH23:** Protect the ecological functions and integrity of the corridors indicated on the Development Plan Green Infrastructure Maps;
- **Objective NH27:** Protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character and ensure that proper provision is made for their protection and management; and
- **Objective NH28:** Consider the use of TPOs to protect important trees, groups of trees or woodlands.

21.3.1.7.2 Impacts on Bats

Section 12.6 of Chapter 12 (Biodiversity) in this EIAR reports that there are no predicted residual impacts on bats with regard to loss of foraging habitat, fragmentation and disturbance / displacement.

Disturbance / displacement of bats and loss of foraging habitat and fragmentation to bat movements may result from other developments within the vicinity of the Proposed Scheme. Habitats / features which could be used by bats which are also proposed for removal / development in the immediate vicinity include hedgerows, treelines and woodlands. In addition to direct habitat loss the flight paths of bats moving between areas could be impacted by additional artificial lighting that may be proposed in the future as a result of the other proposed developments.

However, all of these impacts will be controlled by the assessment of individual planning applications which must consider the effects on protected species such as bats as part of their appraisal by the competent authority, having regard to the protective environmental policies outlined in the Dublin City Development Plan 2016-2022 (DCC 2016) and the Fingal Development Plan 2017 – 2023 (FCC 2017).

The Proposed Scheme is not likely to result in cumulative impacts with regard to these impacts on bats at any geographic scale for the Proposed Scheme alone.

21.3.1.7.3 Impacts on Birds

Section 12.6 of Chapter 12 (Biodiversity) in this EIAR reports that there are no predicted residual impacts on the local bird population with regard to disturbance and the loss of foraging / nesting habitat as a result of the Proposed Scheme.

Disturbance to local bird populations as well as loss of foraging and nesting habitat may result from other developments within the vicinity of the Proposed Scheme. Habitats / features which could be used by birds which are also proposed for removal / development in the immediate vicinity include canal, reed and large sedge swamp, hedgerows, treelines and scattered trees and parkland. Pressures on local bird species are likely to continue given the location of the Proposed Scheme in the wider environment. Given the on-going urban development across Dublin there is likely to be continued habitat loss and fragmentation of suitable foraging and nesting habitat as well as disturbance associated with continuing development.

However, disturbance or displacement impacts during construction will be temporary or short-term and are not likely to have long-term population level effects, even cumulatively with any future development projects that might be proposed.

Additionally, potential cumulative impacts will be controlled by the assessment of individual planning applications which must consider the effects on protected species such as birds as part of their appraisal by the competent authority, having regard to the protective environmental policies outlined in the Dublin City Development Plan 2016-2022 (DCC 2016) and the Fingal Development Plan 2017 – 2023 (FCC 2017).

The Proposed Scheme is not likely to result in cumulative impacts with regard to these impacts on birds at any geographic scale for the Proposed Scheme alone.

21.3.1.7.4 Impacts on Terrestrial Mammals including Badger and Otter

Section 12.6 of Chapter 12 (Biodiversity) in this EIAR reports that there are no predicted residual impacts with regard to disturbance from construction activities on terrestrial mammals including otter and badger as a result of the Proposed Scheme.

Disturbance to local mammal populations may result from other developments within the vicinity of the Proposed Scheme. Habitats / features which could be used by badger and / or otter which are also proposed for removal / development in the immediate vicinity include canal, hedgerows, treelines and scattered trees and parkland, while otter are known to use lands within the footprint of the Proposed Scheme with known otter holts present along the River Tolka and Liffey Estuary. Pressures on terrestrial mammal species are likely to continue given the location of the Proposed Scheme in the wider environment. Given the on-going urban development across Dublin there is likely to be continued disturbance associated with on-going development.

However, disturbance or displacement impacts during construction of the Proposed Scheme will be temporary or short-term and are not likely to have long-term population level effects, even cumulatively with any future development projects that might be proposed.

Additionally, potential cumulative impacts will be controlled by the assessment of individual planning applications which must consider the effects on protected species such as birds as part of their appraisal by the competent authority, having regard to the protective environmental policies outlined in the Dublin City Development Plan 2016-2022 (DCC 2016) and the Fingal Development Plan 2017 – 2023 (FCC 2017).

The Proposed Scheme is not likely to result in cumulative impacts with regard to these impacts on terrestrial mammals at any geographic scale for the Proposed Scheme alone.

21.3.1.7.5 Impacts on Fish

Section 12.6 of Chapter 12 (Biodiversity) in this EIAR reports that there are no predicted significant residual impacts (at any geographic scale) with regard to disturbance from construction activities on fish as a result of the Proposed Scheme.

Disturbance to fish may result from other developments within the vicinity of the Proposed Scheme involving in-stream works. Pressures on fish species may continue given the location of the Proposed Scheme in the wider environment. Given the on-going urban development across Dublin there is likely to be continued disturbance. However, disturbance or displacement impacts during construction of the Proposed Scheme will be temporary or short-term and are not likely to have long-term population level effects, even cumulatively with any future development projects that might be proposed.

Additionally, potential cumulative impacts will be controlled by the assessment of individual planning applications which must consider the effects on protected species as part of their appraisal by the competent authority, having regard to the protective environmental policies outlined in the Dublin City Development Plan 2016-2022 (DCC 2016) and the Fingal Development Plan 2017 – 2023 (FCC 2017).

The Proposed Scheme is not likely to result in cumulative impacts with regard to these impacts on fish at any geographic scale for the Proposed Scheme alone.

21.3.1.7.6 Other Biodiversity Impacts

The other impacts associated with the Proposed Scheme that are measurable in some way, but by themselves will not result in a likely significant effect on biodiversity are:

- Impacts on the existing hydrological and hydrogeological regimes;
- Impacts on air quality; and
- Disturbance to species not already listed in Table 21.10.

Specific assessments have been undertaken by air quality, hydrogeology and hydrology specialists to identify the potential for in-combination effects to occur. However, an overarching assessment is included below.

Any proposed projects must comply with statutory licensing and planning requirements and be in accordance with the objectives and policies of the relevant land use plans (development plans, local area plans etc.). These land use plans contain objectives and policies to ensure the protection of biodiversity.

Proposed projects will be subject to planning consent, including the preparation of an EIAR and AA Screening Report / NIS, if required. Following this, projects will be bound by environmental commitments confirmed within the planning consent.

Impacts on the Existing Hydrological and Hydrogeological Regimes

The Proposed Scheme will not have any significant residual effects on the existing hydrological or hydrogeological regime in those surface and groundwater catchments crossed by the Proposed Scheme, or in the downstream receiving surface and marine water environment, either through affecting existing flow conditions or affecting surface or groundwater quality, as is set out in detail in Chapter 13 (Water) and Chapter 14 (Land, Soils, Geology and Hydrogeology) of this EIAR, and in Appendix A13.1 Water Framework Directive Assessment in Volume 4 of the EIAR. Specific design and mitigation measures have been included to address any potential effects such that there will be no significant residual effects. Therefore, the Proposed Scheme is not anticipated to act in combination with any other projects to result in significant residual hydrological or hydrogeological effects.

The Proposed Scheme lies within Hydrometric Area (HA) 09 (Liffey and Dublin Bay) and is within the River Liffey catchment. The objectives for this catchment are outlined in the River Basin Management Plan for Ireland 2018-2021 (Government of Ireland 2021), which aims to protect all waters within the district and, where necessary, improve waters and achieve sustainable water use. The purpose of the River Basin Management Plan for Ireland 2018-2021 is to reduce pollution levels, to restore good water quality status and to prevent deterioration in water quality in the river basins and groundwater bodies. There are many land use plans and projects that lie within the catchment that have the potential to affect surface water and groundwater bodies. However, all of the overarching land use plans have environmental protective policies to protect the existing surface water and groundwater network. Therefore, there are no other plans or projects that are likely to result in a significant effect on biodiversity, cumulatively with the Proposed Scheme, as a consequence of surface water or groundwater impacts.

Impacts on Air Quality

The Proposed Scheme will not have any significant residual effects on the existing air environment as is set out in detail in Chapter 7 (Air Quality) of this EIAR. Specific design and mitigation measures have been included to address any potential effects such that there will be no significant residual cumulative effects on air quality. Therefore, the Proposed Scheme is not anticipated to act in combination with any other projects to result in significant residual air quality effects.

Impacts on Fauna Species (Excluding Those Discussed in Table 21.10) as a Result of Disturbance or Displacement

The Proposed Scheme will not result in a likely significant residual effect on any fauna species (excluding those listed in Table 21.10) as a result of disturbance or displacement effects during the Construction Phase. Disturbance or displacement impacts during the Construction Phase are temporary and are not likely to have long-term population level effects, even cumulatively with any future development projects that might be proposed.

Impacts on European Sites

The potential for other plans or projects to act cumulatively with the Proposed Scheme to adversely affect the integrity of any European sites is considered in Section 9 of the NIS, which is provided as a standalone document in the planning application package with this EIAR (termed 'in combination effects' in the context of the NIS assessment). The conclusion of that assessment is summarised below.

The Proposed Scheme will not affect the integrity of any European sites. It will not result in the loss or fragmentation of any Qualifying Interest (QI) habitats, or habitats supporting populations of QI / Special Conservation Interest (SCI) species, in (or associated with) any European sites, nor will it degrade any such habitats or affect QI / SCI species as a result of hydrological or hydrogeological impacts (quality or quantity), air quality impacts or introducing / spreading non-native invasive plant species.

The in-combination assessment has concluded that there is no potential for adverse effects on the integrity of any European sites, to arise as a consequence of the Proposed Scheme in combination with any other plans or projects, as in consideration of the mitigation measures detailed in Section 8 of the NIS, no adverse effects on European site integrity will arise from the implementation of the Proposed Scheme. Furthermore, for the same reasons, there will be no adverse effects on the integrity of any European sites as a consequence of the Proposed Scheme acting in-combination with any, some or indeed all taken together, of these plans or projects.

The implementation of, and adherence to, the policies and objectives within the Dublin City Development Plan 2016–2022 (DCC 2016), will ensure the protection of European sites across all identified potential impact pathways, and will include the requirement for any future project to undergo Screening for AA and / or AA, as relevant.

Therefore, as the Proposed Scheme will not adversely affect the integrity of European sites within the Zol of the Proposed Scheme, and given the protection afforded to European sites under the overarching land use plans, it has been concluded that there will be no adverse effects on the integrity of any European sites, either alone, or to arise as a consequence of the Proposed Scheme acting in combination with any other plans or projects. No additional mitigation measures are necessary or required following this assessment.

21.3.1.8 Water

The water assessment identified 32 other projects for potential construction related cumulative effects.

For 22 of these projects (10 DCC local planning applications, six FCC local planning applications and six Strategic Housing Developments), the water assessment identified the potential for overlap in the construction phases of the schemes which could lead to cumulative impacts on water quality from increased sedimentation and accidental releases of polluting substances. However, impacts from the Proposed Scheme will be negligible following the implementation of the Surface Water Management Plan (SWMP) (refer to Appendix A5.1 CEMP in Volume 4 of this EIAR) measures and it is assumed that the construction of the proposed other projects will implement good practice measures in construction and so cumulative impacts are assessed to be Not Significant.

For the remaining projects (six other Major Projects and five other Core Bus Corridor schemes), these projects will be subject to the EIA process, and as such, a full assessment and required mitigation will be proposed. It is anticipated that appropriate measures will be implemented during construction in accordance with their own guidance so that impacts on local water bodies will be Not Significant. Impacts from the Proposed Scheme will be negligible following the implementation of the SWMP measures. As a result, cumulative impacts will be Not Significant.

21.3.1.9 Land, Soils, Geology and Hydrogeology

The land, soils, geology and hydrogeology assessment identified that most of the other projects within the Zol of the Proposed Scheme will result in the loss of a small quantity of soil and geology during construction. However, the cumulative loss is still considered to be Not Significant on a local scale. As such, there are no likely significant direct or indirect cumulative impacts in combination with other proposed projects on land, soils, geology and hydrogeology.

21.3.1.10 Archaeological and Cultural Heritage

The archaeological and cultural heritage assessment did not identify any projects with the potential to give rise to cumulative effects during construction. This was because works associated with other projects within the Zol for archaeology and cultural heritage can and will be archaeologically mitigated for. Taken in conjunction with the Proposed Scheme, no significant cumulative impacts have been identified.

21.3.1.11 Architectural Heritage

The architectural heritage assessment identified four projects with the potential to give rise to cumulative effects on architectural heritage during construction:

- Major Project (MP08) - DART+ Programme West;
- Major Project (MP012) - DART+ Programme South West;
- Major Project (MP32) - MetroLink; and
- Major Project (MP34) - Cycling: Greater Dublin Area Cycle Network Plan (excluding Radial Core Bus Corridor elements).

The DART+ Programme West and South West and the MetroLink lie partly within the Royal Canal Conservation Area and are located at the Cross Guns Railway Tunnel (NIAH 50060112) and Cross Guns (Westmoreland) Bridge over Royal Canal (DCC RPS 8807). There is the potential for a cumulative impact as a result of the proposed works.

In regard to the Greater Dublin Area Cycle Network Plan, there is the potential for a direct and visual cumulative impact on adjoining protected structures and architectural heritage features.

Mitigation measures to protect these features will be put in place for the Proposed Scheme during the course of construction to reduce the potential for damage. Following mitigation, it is not anticipated that there will be significant residual impacts from the Proposed Scheme in any of these locations, as the mitigation will reduce the risk of potential damage. Therefore, there is no likely significant cumulative impact from the Construction Phase in-combination with other projects.

21.3.1.12 Landscape (Townscape) and Visual

The landscape (townscape) and visual assessment identified 37 other projects with the potential for likely significant cumulative effects with the Proposed Scheme during construction which were taken into assessment Stages 3 and 4 (see Appendix A21.1 and Appendix A21.2 in Volume 4 of this EIAR).

The landscape (townscape) and visual assessment identified the potential for temporary in-combination indirect townscape / visual effects to occur if construction periods coincide / are successive for 25 other projects. Such effects are likely to be localised and contained within the local townscape area, due to the enclosing effect of the surrounding built form.

For 22 of these other projects (13 DCC local planning applications, seven Strategic Housing Developments and two other Major Projects), the effects are likely to be localised Moderate and Temporary / Short-Term during construction in the local area.

In regard to the DART+ Programme West, the localised Moderate and Temporary / Short-Term cumulative construction effects in the local area are likely to be most notable at the intersections of R108 Prospect Road, Whitworth Road, R108 Phibsborough Road and the Royal Canal, as well as at the residential area of Claremont Lawns / Clareville Court which will experience cumulative tree loss. In regard to MetroLink, the localised Moderate and Temporary / Short-Term cumulative construction effects in the local area are likely to be most notable at the locations of the proposed Metro stations between Glasnevin and Ballymun.

For the remaining three other projects of the 25, due to the enclosing effect of the surrounding built form and enclosed nature of railway cuttings at the closest points to the Proposed Scheme, the potential townscape / visual effects are likely to be localised Slight and Temporary / Short-Term cumulative construction effects in the local area:

- DART+ Programme South West;
- Finglas LUAS (Green Line extension Broombridge to Finglas); and
- LUAS Cross City incorporating LUAS Green Line Capacity Enhancement - Phase 1.

In regard to the Greater Dublin Area Cycle Network Plan (excluding Radial Core Bus Corridor elements), the landscape (townscape) and visual assessment identified the potential for localised Moderate and Short-Term / Temporary cumulative construction effects at intersections of this project and the Proposed Scheme if construction periods overlap / are successive. These effects are likely to be limited to indirect visual effects on private properties and townscape effects on open spaces near to intersections of the other project and the Proposed Scheme, due to the enclosing effect of the surrounding built form.

For the Blanchardstown to City Centre Core Bus Corridor Scheme, the landscape (townscape) and visual assessment identified the potential for temporary in-combination indirect townscape / visual effects on the local intervening townscape around Smithfield, interconnecting roads, the Liffey Quays and other local receptors. There is the potential for Moderate and Short-Term / Temporary cumulative construction effects if the Blanchardstown to City Centre Core Bus Corridor Scheme and the Proposed Scheme construction periods coincide / are successive. As outlined in Section 21.2.6.2, it is proposed that the Proposed Scheme will not be constructed concurrently with the Blanchardstown to City Centre Core Bus Corridor Scheme so as to avoid potential impacts.

No cumulative construction townscape / visual effects are expected for the remaining 10 Core Bus Corridor schemes.

21.3.1.13 Waste and Resources

The waste management baseline for the EMWR, established for the assessment using publicly available data from the Regional Waste Management Offices and the EPA, has been used as the baseline for the cumulative assessment. Table 18.3, Table 18.4 and Table 18.5 in Section 18.4 of Chapter 18 (Waste & Resources) of this EIAR, set out permitted and licensed capacity and Article 27 notifications of S.I. No. 323/2020 - European Union (Waste Directive) Regulations 2020 (hereafter referred to as the Waste Directive Regulations (as amended)) for 2020. This data has been used to establish a baseline for 2020. The available C&D waste and by-product capacity in the EMWR for 2020 was approximately 10.7 million tonnes based on the following assumptions (see Table 21.11):

- Using the available capacity for permitted facilities for C&D wastes;
- Including only licensed facilities accepting soil and stones; and
- Including all Article 27 notifications for 2020 in the EMWR.

Table 21.11: C&D Waste Management Baseline for EMWR, 2020 (Permitted, Licensed and Article 27 Notifications)

C&D Waste Management Baseline for 2020	Authorised Annual Waste and By Product (tonnes)
Permitted capacity (Regional Waste Management Office (Offaly County Council 2021))	4,625,286
Licensed annual intake (soil and stone facilities) (EPA 2021e)	3,893,800
Article 27 (by-product) notifications (EPA 2020)	2,504,482
Total	10,663,568

Therefore, the authorised C&D waste and by-product tonnage in the EMWR in 2020, and so the construction and operation waste baseline, is an estimated 10.7 million tonnes per annum.

The Regional Waste Authorities state in the publication, Construction and Demolition Waste Management Plans 2015-2021: Update Report 2020 (Government of Ireland 2020) (which sets out the national capacity of primarily soil and stone treatment facilities):

'the licensed capacity is most prominent in the EMWR which has a healthy supply of active capacity and substantial new capacity due to come on stream. The Region contains 80% of the active national capacity ... New licensed facilities are also due to come on stream. Future capacities (new applications and un-commenced operations) exceed 2.1m tonnes nationally, with 73% of this capacity planned for the EMR... The urban centres of Dublin and Cork which are a focal point for development and construction are (or will be) well served by licensed capacity.'

'Nationally there were 325 registered and permitted facilities at the end of 2018, with an estimated 5.2m tonnes of lifetime capacity remaining by the end of the year. It is noted that the reported remaining capacity and intake data at permitted and registered facilities is an under-estimation due to incomplete rates of reporting.'

The Construction and Demolition Waste Management Plans 2015-2021: Update Report 2020 sets out that there were four inert landfill facilities active nationally in 2018, all located in the EMWR. Two of these facilities are located in Fingal and Kildare and the Construction and Demolition Waste Management Plans 2015-2021: Update Report 2020 notes that they have significant remaining capacity:

- IMS, Co. Dublin;
- Walshestown, Co. Kildare;
- Kyletalesha, Co. Laois; and
- Tara Mines, Co. Meath.

Due to the nature of waste management in Ireland, cumulative effects for waste have been considered on a regional basis. A shortlist of proposed projects planned within the region was also developed, including having regard to those projects set out in Project Ireland 2040 (Department of Public Expenditure and Reform 2018; Investment Projects and Programmes Office 2019). These projects were reviewed and screened based on the following criteria:

- Construction phases likely to overlap with the Proposed Scheme. Where unknown, overlap is considered as a worst case; and
- A similar project waste profile is expected to be generated (i.e., tunnelling excavation material, soil and stones and bitumen containing material).

A list of regional projects that have been taken into account in the cumulative impact assessment is provided in Table 21.12

Table 21.12: Regional Projects Included in Cumulative Impact Assessment

Project Name	Project Type	Anticipated Construction Completion (Year) (Where Known)	Waste Type Likely to be Generated
MetroLink	19km rail line running from Swords to Charlemont, majority of the line will be run underground via a single bore tunnel.	2028	Soil and stones / General C&D waste
Dart Underground	7.5km twin bore tunnel for electrified heavy rail in Dublin City Centre, linking the Northern line to the Heuston Main line.	TBC	Soil and stones / General C&D waste
Dublin Port Masterplan 2040	Works include construction of new quays and jetties, remediation of contamination on the bed of the basin, capital dredging to deepen the basin, infilling of the Basin at some berth locations and construction of a new river berth with a double tiered Ro-Ro ram and deepening of fairway and approach to Dublin port.	TBC	Soil and stones General C&D waste
N2 Slane Bypass	3.4km long bypass that runs from the east of Slane to the existing N2 at a location 500m north of McGruder's crossroads	2026	Soil and stones / Bitumen containing material / General C&D waste
Ardee bypass	6km single carriageway, commencing in the townland of Mandistown to Glebe townland north of Ardee.	2024	Soil and stones / Bitumen containing material / General C&D waste
M11 Capacity Enhancement (Phase 1 & Phase 2) including Glen of the Downs tunnel	The N11/M11 is 22 km in length between Junction 4 to Junction 14. The primary objectives of the scheme are to improve the efficiency of road based public transport and journey time, and to provide continuity of road type between Junction 6 and Junction 15. 2km tunnel under the west side of the Glen of the Downs.	TBC	Soil and stones / Bitumen containing material / General C&D waste
Blanchardstown Regional Drainage Scheme	The project involves the upgrade of the sewer network currently serving Blanchardstown, Mulhuddart and Castleknock as well as a number of towns in Meath.	2022	Soil and stones
North Dublin sewage plant (pipeline)	Construction of an underground pipeline beginning at Blanchardstown which will collect and transfer sewage, via a new pumping station at Abbotstown to the plant at Clonshaugh. The treated water will be discharged through a 6km marine outfall pipeline.	2026	Soil and stones
Water Supply Project – Eastern and Midlands Region	Abstraction and treatment of water at Parteen Basin in Co. Tipperary, together with a 170km underground treated water pipeline from Parteen Basin to Dublin	2030	Soil and stones
Greater Dublin Drainage Project	The orbital sewer route will intercept an existing sewer at Blanchardstown and will divert it from this point to the proposed wastewater treatment plant at Clonshaugh (13.7km in length; 5.2km of a 1.4m diameter rising main and 8.5km of a 1.8m diameter gravity sewer.)	2029	Soil and stones

Project Name	Project Type	Anticipated Construction Completion (Year) (Where Known)	Waste Type Likely to be Generated
Automated people mover (APM) Dublin Airport	Approximately twin bore tunnel across the apron in Dublin Airport for an APM	TBC	Soil and stones
Eastern Bypass project	Cut and cover tunnel - Dublin Tunnel to Sandymount Strand	TBC	Soil and stones
O'Devaney Gardens Regeneration Programme	Development consists of 1,047 residential units across ten blocks up to 14 storeys tall	2025	Soil and stones / Bitumen containing material / General C&D waste
Belcamp Hall Residential Development	Residential development consisting of 2,718 residential units (2,233 no. apartments, 485 no. houses), 2 no. creches and all associated site works.	TBC	Soil and stones / Bitumen containing material /General C&D waste

In addition to the projects listed above, the assessment has taken account of the other 11 Core Bus Corridor schemes. All of the 12 Core Bus Corridor schemes are anticipated to be constructed in the period 2023 to 2028.

The projects identified comprise a mixture of major infrastructure transport projects, commercial and residential projects. Each project would generate solid waste from construction and from operation for management within the regional areas. Waste will generally be generated over the period of construction for each project. Additionally, waste generation will vary over time as the nature of the projects are multi-year and are undertaken with a phased approach (i.e. demolition, excavation and construction).

21.3.1.13.1 Cumulative Construction Effects

Construction of projects within the region will produce C&D waste, a proportion of which will be sent for recycling, further treatment or disposal to landfill. In line with the waste hierarchy and relevant policy including the Waste Framework Directive (as amended), also applicable to the Proposed Scheme, it is anticipated that all these projects will seek to minimise disposal to landfill and manage waste in accordance with the waste hierarchy.

The Proposed Scheme, together with the other 11 Core Bus Corridor schemes and the projects listed in Table 21.12 will add to the need for off site capacity for recovery, recycling, treatment and disposal of waste to landfill. Many of the listed projects are in very early stages so documentation has not been published or associated planning documents submitted which would include waste generation estimates. However, it is anticipated that the proposed projects will give rise to similar types of wastes as the Proposed Scheme and that the quantities will vary depending on the type of project.

Opportunities are likely to continue to arise during the construction phase of other projects to provide C&D waste and surplus excavated material for use in other local construction projects, thereby increasing diversion of such materials from landfill.

As set out above, the EMWR has the most capacity of all the regions. The Regional Waste Management Offices Report states, the Dublin region is (or will be) well served by licensed capacity to support construction and development (Government of Ireland 2020). Additionally, it was acknowledged the volumes of waste being generated would support the provision of further licensed capacity:

'The available intake data indicates that current volumes would support the development of long-term licensed capacity in these areas to support planned infrastructure and housing developments.'

The Construction Phase impact of the Proposed Scheme has been assessed as Adverse, Not Significant and Short-Term. Therefore, given the likely potential for waste generation from other projects, the opportunities to divert waste from off site treatment and the amount of inert, non-hazardous and hazardous waste, treatment capacity likely to be available in the region in the coming years over the time period for the delivery of the Proposed

Scheme, it is considered that there will be no likely significant cumulative effects as a result of the construction of the Proposed Scheme in combination with the construction of the other 11 Core Bus Corridor schemes and the projects listed in Table 21.12.

21.3.1.14 Material Assets

Material quantities for the Proposed Scheme are considered insignificant, and therefore, no likely significant cumulative effects on material quantities are predicted as a result of the Proposed Scheme in combination with other projects in Dublin.

The material assets assessment did not identify any potential for likely significant cumulative effects on services and utilities during the Construction Phase. Either no utility diversions are proposed for the Proposed Scheme in the location of the projects within the Zol, or a potential for overlap in utilities was identified, but these would be managed in accordance with utility provider requirements and would not result in significant cumulative effects. On this basis, no projects were shortlisted for further assessment.

21.3.2 Operational Impacts

21.3.2.1 Traffic and Transport

A detailed assessment of cumulative impacts on traffic and transport is set out in Appendix A6.1 Traffic Impact Assessment Report in Volume 4 of the EIAR. Reference should be made to that appendix for details on cumulative transport demand, and the cumulative impacts on People Movement. A summary of the findings is set out in this Section.

In general, total trip demand (combining all transport modes) will increase into the future in line with projected population and employment growth. A greater share of meeting this increasing demand will be by sustainable modes (public transport, walking, cycling) as the GDA Transport Strategy (NTA 2016) is progressively implemented.

The analysis indicates that with the 12 Core Bus Corridor schemes in place, there will be a Positive and Significant impact on sustainable mode share. Cumulatively, the 12 Core Bus Corridor schemes, while supporting less congested bus based public transport and cycling movement, will also act as a constraint to increasing private car traffic within the study area, with the assessment indicating a reduction in car trips below 2020 (pre-COVID-19) levels.

In the Opening Year (2028) scenario, it is estimated that for people travelling within a 500m catchment area of the Core Bus Corridor schemes (including the City Centre), there will be a 12% increase in public transport trips, a 2% decrease in general traffic trips (i.e. motorists) and a 14% increase in cycling trips in the AM Peak Hour. Across the whole day (7am-7pm), there will be a corresponding 12% increase in public transport, a 3% decrease in general traffic and a 12% increase in cycling trips each day. In the Design Year (2043) scenario, it is estimated that for people travelling within the 500m Core Bus Corridor catchment area for all Core Bus Corridor schemes (including the City Centre), there will be an 11% increase in public transport trips, a 4% decrease in general traffic trips (i.e. motorists) and a 15% increase in cycling trips in the morning peak hour, and a 9% increase in public transport, a 5% decrease in general traffic and a 13% increase in cycling trips each day (7am-7pm).

General traffic levels will reduce more in 2043 when compared to 2028 due to the increased level of additional non-bus public transport infrastructure and services (MetroLink, LUAS extensions and DART+ from the GDA Transport Strategy (NTA 2016)) in tandem with the road capacity reduction measures as part of the Proposed Scheme leading to increased usage on all public transport modes.

The modelling outputs for the Opening Year (2028) cumulative scenario demonstrate that there is a high growth in bus patronage along all the Core Bus Corridor schemes in the AM Peak Hour. The bigger increases occur in the inbound direction on the Blanchardstown to City Centre, the Templeogue / Rathfarnham to City Centre and the Bray to City Centre Core Bus Corridor Schemes where the loadings reach more than 2,000 additional passengers per hour compared to the Do Minimum scenario.

In the Opening Year (2028) AM Peak Hour scenario, with the Proposed Scheme and the other 11 Core Bus Corridor schemes in place, there will be an estimated 10% more passenger boardings across all public transport

services and 17% more boardings on bus services. In the Opening Year (2028) Operational Cumulative PM Peak Hour scenario, with the Proposed Scheme and all other Core Bus Corridor schemes in place, there will be an estimated 11% increase in total passengers boarding public transport services and 18% more passengers boarding bus services.

In the Design Year (2043) AM and PM Peak Hour scenarios, the increase in total passengers boarding all public transport services will be 9% respectively, and the increase in passengers boarding bus services will increase by 23% and 22% respectively.

Overall, the Proposed Scheme and the other 11 Core Bus Corridor schemes are expected to facilitate a Positive, Profound and Long-Term cumulative effect on People Movement by sustainable modes. The Core Bus Corridor schemes are seen to enable significant improvements in People Movement by sustainable modes along the direct Core Bus Corridor alignments, particularly by bus and cycling, with reductions in car mode share due to the enhanced sustainable mode provision. The Proposed Scheme and the other 11 Core Bus Corridor schemes will provide for enhanced integration and efficiencies for all public transport modes by facilitating substantial increases in public transport average network wide travel speeds.

21.3.2.1.1 Consideration of Traffic Related Cumulative Effects in the Design Process

Throughout the development of the preliminary design for the Proposed Scheme there have been various design stages undertaken based on a common understanding of the maturity of the design at a given point in time. Part of this process was to ensure that the environmental and transport impacts were mitigated to the greatest extent possible during the design development iteration and to take account of information on potential impacts from the various EIA and Transport Impact Assessment (TIA) disciplines. This iterative approach resulted in mitigation being embedded into the design process by the continual consideration of potential environmental impacts. A key consideration was the potential for cumulative effects that the Proposed Scheme could have in combination with the other 11 Core Bus Corridor schemes under development.

A multi-tiered modelling framework (described further in Chapter 6 (Traffic & Transport)) was developed to support this iterative design process, whereby the emerging design for each of the Proposed Schemes has been tested using the transport models as part of this iteration both in isolation and with all Core Bus Corridor schemes in place. Each BusConnects Infrastructure team for each Core Bus Corridor scheme worked closely together to align proposals at direct interface points (e.g. overlapping junctions) as well in the indirect / offline areas where displaced traffic would arise. This included the provision of complimentary traffic management arrangements and / or turn bans to ensure that any displaced traffic was kept to a minimum and / or was maintained on higher capacity roads, whilst continuing to meet the scheme objectives along the Proposed Scheme.

For the Proposed Scheme, the iterative design process concluded when the BusConnects Infrastructure team were satisfied that the Proposed Scheme, both in isolation and in combination with the other 11 Core Bus Corridor schemes, met its required objectives (maximising the people movement capacity of the Proposed Scheme) and that the environmental impacts and level of residual impacts were reduced to a minimum.

21.3.2.1.2 Traffic Related Cumulative Effects

To examine the potential cumulative traffic effects that the Proposed Scheme may have in combination with any of the other Core Bus Corridor schemes, an area of influence for each scheme was determined to understand the scale of traffic displacement and its interactions with other schemes. The 'area of influence' is the area in which traffic flows are likely to change as a result of the Proposed Scheme measures, as indicated by the transport modelling.

The outcome of this assessment revealed that the Proposed Scheme has some level of indirect interface with the proposed Swords and Blanchardstown to City Centre Core Bus Corridor Schemes with modelling indicating that both the Proposed Scheme and the aforementioned schemes have overlapping traffic Zols (e.g. each scheme results in traffic displacement effecting the other corridor).

The Proposed Scheme proceeds along R108 Phibsborough Road and has a direct interface with the proposed implementation of traffic management measures for the Blanchardstown to City Centre Core Bus Corridor Scheme at the Monck Place and Phibsborough Junctions.

Works proposed to these junctions as part of the Blanchardstown to City Centre Core Bus Corridor Scheme (which has the greater influence on traffic displacement) include the introduction of short one-way sections, kerblines realignment and uncontrolled raised crossings, along with landscaping and a cycle track at the Monck Place Junction along with the introduction of right-turn bans onto R108 Phibsborough Road.

No specific operational traffic management proposals were required as part of the Swords to City Centre Core Bus Corridor Scheme as the proposals did not result in impacts to local roads.

When the Proposed Scheme is operational (as well as all other proposed Core Bus Corridor schemes), this has the effect of constraining the opportunity for traffic to displace onto adjoining / adjacent roads when compared to the effect when only one of the Core Bus Corridor schemes is operational. In addition to this, with all the Core Bus Corridor schemes operational, there is predicted to be a higher modal shift from private car trips to sustainable modes of travel compared to the singular scheme scenario. This is due to the combined effect of all Core Bus Corridor schemes being operational and the journey time savings and reliability for bus travel and the interchange opportunities that this provides to travel around Dublin, in combination with the BusConnects network re-design proposals. In addition, the Core Bus Corridor schemes will facilitate a step change in the level of segregated cycling provision in comparison with existing conditions along the entire length of the corridors resulting in more people cycling.

The result of the above is that the cumulative effect of all of the Core Bus Corridor schemes, when operational, and as part of the wider roll-out of the wider GDA Transport Strategy infrastructure measures (NTA 2016), is that future growth in overall travel demand will be catered for predominately by sustainable modes. No potential significant negative effects over and above those considered in the standalone assessments for the Operational Phase were identified in the cumulative impact assessment, and therefore, no additional mitigation measures are considered necessary.

21.3.2.2 Air Quality

21.3.2.2.1 Local Air Quality

The traffic data used in the cumulative assessment for the Do Minimum and Do Something scenarios for future years also considers development, traffic growth and transport schemes proposed for the Dublin area which may have an effect on traffic volumes.

The air quality impact assessment of cumulative road traffic emissions from the Operational Phase of the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes has been carried out according to methodology outlined in Section 7.2.4.1 in Chapter 7 (Air Quality).

Four new additional significant adverse localised impacts on the R108 Phibsborough Road Junction with the R101 North Circular Road and eight new additional significant substantial adverse localised impacts on the R108 Phibsborough Road and its junction with the R101 North Circular Road are identified when comparing the Do Minimum to the Do Something cumulative construction scenario compared with the standalone scenario assessed in Section 7.4.3.2 in Chapter 7 (Air Quality) (refer to Appendix A.21.3 in Volume 4 of this EIAR for the full set of air quality results). The substantial adverse impacts and the moderate adverse impacts predicted in the Opening Year (2028) are predicted to experience Adverse and Slight or Negligible impacts in the Design Year (2043). Annual mean NO₂ concentrations exceeded the limit value in 2028 and are well below the limit value in 2043.

In accordance with the EPA Guidelines (EPA 2022), the impacts associated with the cumulative Operational Phase traffic emissions arising from the Proposed Scheme, in combination with the other 11 Core Bus Corridor schemes are overall Neutral and Long-Term.

To put the impacts of the Proposed Scheme into context, a comparison of the impacts associated with the Proposed Scheme in isolation and the total impacts predicted across all Core Bus Corridor schemes in the cumulative Operational Phase is shown in Table 21.13. Impacts are based on significance criteria outlined in Table 7.10 in Chapter 7 (Air Quality).

Table 21.13: Comparison of Potential Cumulative Impacts During Operational Phase

NO ₂ Impacts (Number of Modelled Receptors)							
Operational Phase	Negligible	Slight Adverse	Moderate Adverse	Substantial Adverse	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Proposed Scheme	230	9	7	8	51	32	47
Cumulative All Core Bus Corridors	4,769	203	68	18	532	207	177

It is clear from the above table that the Proposed Scheme generates little or mostly positive change in air quality in the context of the cumulative situation with all Core Bus Corridor schemes in operation.

21.3.2.2.2 Ecological Assessment

An assessment of the cumulative impact of the Proposed Scheme and the other 11 Core Bus Corridor schemes on ecological receptors has been undertaken using the approach outlined in Section 7.2.4.3 in Chapter 7 (Air Quality).

The cumulative impact of the Proposed Scheme and the other 11 Core Bus Corridor schemes on the nearby ecologically sensitive areas within 200m of roads impacted by the Proposed Scheme, as defined in Section 7.2.4.3 in Chapter 7 (Air Quality), is outlined in Table 21.14. The annual mean NO_x concentration has been compared to the critical level of 30µg/m³ at each of the designated habitat sites. All sites exceed the critical level for NO_x in both the Do Minimum and the cumulative operational Do Something scenarios, within 200m of the nearest impacted road.

Table 21.14: Significance of Operational Cumulative Impacts at KERs (NO_x Annual Mean Concentration In 2028)

Annual Mean NO _x in 2028 at Closest Point Within Ecological Site To Road							
Receptor	Receptor Location (ITM)	Do Minimum (µg/m ³)	Distance from Road Beyond which Concentration is Below Critical Level (30µg/m ³) (m)	Do Something (µg/m ³)	Distance from Road Beyond which Concentration is Below Critical Level (30µg/m ³) (m)	Impact (DS – DM) (µg/m ³)	Change as a Percentage of Critical Level (30µg/m ³) (%)
Royal Canal pNHA (Binn's Bridge, western side)	715830, 736004	150.3	>200m	165.5	>200m	15.2	51%
Royal Canal pNHA (Binn's Bridge, eastern side)	715846, 735998	41.7	>200m	40.3	>200m	-1.3	-4%
Royal Canal pNHA (Cross Guns Bridge, western side)	715015, 736301	36.8	>200m	35.2	>200m	-1.6	-5%
Royal Canal pNHA (Cross Guns Bridge, eastern side)	715027, 736292	36.5	>200m	35.4	>200m	-1.1	-4%
Royal Canal pNHA (Whitworth Road)	715183, 736244	33.9	>200m	36.1	>200m	2.1	7%

Table 21.15 outlines the annual mean nitrogen deposition in 2028 at the closest points within ecological sites to the road. Nitrogen deposition levels have been compared to the lower and higher critical loads for the designated habitat sites in Table 21.15. All sites are below the lower critical load for the designated habitat site in both the Do Minimum and the Do Something cumulative operational scenarios, with the exception of the Royal Canal pNHA (Binn's Bridge). Nitrogen deposition levels here are above the lower critical load in the Do Minimum and while there is a small increase in the Do Something, by 2043 this is expected to decrease due to reductions in emissions between 2028 and 2043 from advancements in engine technology and a higher percentage of electric vehicles in the fleet.

Table 21.15: Significance of Cumulative Operational Impacts at KERs (Nitrogen (N) Deposition in 2028)

Annual Mean N Deposition in 2028 At Closest Point Within Ecological Site to Road									
Receptor	Receptor Location (ITM)	Lower Critical Load for Most Sensitive Feature (kgN/ha/yr)	Do Minimum (kgN/ha/yr)	Distance from Road Beyond which Deposition is Below Critical Load (m)	Do Something (kgN/ha/yr)	Distance from Road Beyond which Deposition is Below Critical Load (m)	Change Relative to Lower Critical Load (%)	Distance from Road Beyond which the Change is <1% (m)	Change in Deposition (kgN/ha/yr)
Royal Canal pNHA (Binn's Bridge, western side)	715830, 736004	5	7.23	50m	7.76	50m	11%	0m	0.53
Royal Canal pNHA (Binn's Bridge, eastern side)	715846, 735998	5	2.77	0m	2.65	0m	-2%	0m	-0.12
Royal Canal pNHA (Cross Guns Bridge, western side)	715015, 736301	5	2.49	0m	2.39	0m	-2%	0m	-0.09
Royal Canal pNHA (Cross Guns Bridge, eastern side)	715027, 736292	5	2.46	0m	2.39	0m	-1%	0m	-0.06
Royal Canal pNHA (Whitworth Road)	715183, 736244	5	2.64	0m	2.80	0m	3%	80m	0.15

In accordance with the EPA Guidelines (EPA 2022), the ecological impacts associated with the cumulative Operational Phase traffic emissions arising from the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes are overall Negative, Slight and Long-Term.

21.3.2.2.3 Regional Air Quality Assessment

The potential changes in regional air emissions when comparing the Do Minimum to the cumulative Do Something in the Operational Phase have been assessed using the ENEVAL Tool (methodology set out in in Section 7.2.4.2 in Chapter 7 (Air Quality)).

Pollutant emissions (in tonnes) produced in both the Do Minimum and Do Something cumulative scenarios during the Opening Year (2028) of the Operational Phase are shown in Table 21.16.

Table 21.16: Cumulative Operational Phase Regional Pollutant Emissions (tonnes) – Opening Year (2028)

	Vehicle Class	NO _x (tonnes)	NO ₂ (tonnes)	PM ₁₀ (tonnes)	PM _{2.5} (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)	Butadiene (tonnes)
DM	Car	1318	382	9.2	8.7	79	1700	0.9	1.2
DS		1309	380	9.1	8.7	79	1704	0.9	1.1
Change		-8.7	-2.5	-0.06	-0.06	-0.6	4.2	-0.006	-0.01
% Change		-0.7%	-0.7%	-0.6%	-0.6%	-0.7%	0.2%	-0.7%	-1.1%
DM	Goods	1675	473	3.8	3.6	46	248	0.4	0.5
DS		1710	481	3.9	3.7	47	257	0.5	0.6
Change		35	8.5	0.08	0.07	0.8	9.0	0.03	0.01
% Change		2.1%	1.8%	2.0%	2.0%	1.7%	3.6%	6.4%	1.8%
DM	Bus	17	1.7	0.2	0.2	0.7	5.4	0	0.006
DS		16	1.6	0.1	0.1	0.6	4.8	0	0.005
Change		-1.2	-0.1	-0.02	-0.02	-0.1	-0.7	0	-0.001
% Change		-6.9%	-6.9%	-12.7%	-12.7%	-13.3%	-12.3%	0%	-12.8%
DM	Total	3010	857	13	12	127	1953	1.3	1.7
DS		3035	863	13	12	127	1966	1.3	1.7
Change		25	5.9	-0.003	-0.003	0.1	12.5	0.02	-0.004
% Change		0.8%	0.7%	-0.02%	-0.02%	0.1%	0.6%	1.7%	-0.2%

The Proposed Scheme will be overall beneficial with regards to cars and buses, with reductions in emissions of all pollutants modelled. The majority of these reductions result from a predicted modal shift, with decreased car usage (see Chapter 6 (Traffic & Transport)) and a cleaner and more efficiently routed bus fleet. The NTA has committed to replacing its diesel-powered vehicles with plug-in hybrid and fuel cell electric buses by 2028 and zero emission vehicles by 2043, so the reductions in emissions due to the Proposed Scheme are due to more efficiently operated routes. Emissions from goods vehicles increase for all pollutants, reflecting the technical challenges in converting particularly the HGV fleet to electric vehicles.

Pollutant emissions (in tonnes) produced in both the Do Minimum and cumulative Do Something scenarios during the Design Year (2043) of the Operational Phase are shown in Table 21.17.

Table 21.17: Cumulative Operational Phase Regional Pollutant Emissions (tonnes) – Design Year (2043)

	Vehicle Class	NO _x (tonnes)	NO ₂ (tonnes)	PM ₁₀ (tonnes)	PM _{2.5} (tonnes)	HC (tonnes)	CO (tonnes)	Benzene (tonnes)	Butadiene (tonnes)
DM	Car	508	147	4.3	4.1	37	654	0.4	0.6
DS		507	146	4.3	4.0	37	661	0.4	0.6
Change		-1.2	-0.3	-0.01	-0.01	-0.1	7.0	-0.0005	-0.006
% Change		-0.2%	-0.2%	-0.3%	-0.3%	-0.3%	1.1%	-0.1%	-1.1%
DM	Goods	1081	284	3.3	3.1	34	190	0.3	0.4
DS		1117	291	3.4	3.2	34	197	0.3	0.4
Change		35	7.2	0.08	0.08	0.7	7.2	0.02	0.005
% Change		3.3%	2.5%	2.4%	2.4%	2.0%	3.8%	7.0%	1.3%
DM	Bus	16	1.6	0.2	0.1	0.7	5.5	0	0.006
DS		15	1.5	0.1	0.1	0.6	4.8	0	0.005
Change		-1.0	-0.1	-0.02	-0.02	-0.1	-0.7	0	-0.001
% Change		-6.1%	-6.1%	-12.6%	-12.6%	-13.2%	-12.2%	0%	-12.8%
DM	Total	1606	432	7.7	7.3	72	850	0.6	0.95
DS		1639	439	7.8	7.4	72	863	0.6	0.95
Change		33	6.8	0.05	0.05	0.5	13.5	0.02	-0.002
% Change		2.1%	1.6%	0.6%	0.6%	0.6%	1.6%	3.0%	-0.2%

In accordance with the EPA Guidelines (EPA 2022), and considering that the change in concentrations is within the traffic model and ENEVAL tool margin of variability, the regional impacts associated with the cumulative Operational Phase traffic emissions arising from the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes are considered overall Neutral and Long-Term. Emissions from goods vehicles increase for all pollutants, reflecting the technical challenges in converting particularly the HGV fleet to electric vehicles.

21.3.2.2.4 Summary of Potential Cumulative Operational Phase Air Quality Impacts

In 2028, the majority of all modelled receptors have the potential to experience negligible impacts as a result of the cumulative Operational Phase of the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes. As outlined previously, the traffic data used in the cumulative assessment for the cumulative Do Minimum and Do Something for future years represents other potential projects.

Overall therefore, it is considered that the residual effects during the cumulative Operational Phase of the Proposed Scheme and the other 11 Core Bus Corridor schemes are Neutral and Long-Term whilst meeting the scheme objectives set out in Chapter 1 (Introduction). Twelve additional potential Negative and Significant impacts have been identified over and above the standalone assessment for the Proposed Scheme, which are predicted to reduce to Not Significant by 2043 (refer to Table 21.18).

Table 21.18: Summary of Potential Cumulative Operational Phase Air Quality Impacts

Assessment Topic	Potential Impact – Cumulative Operational
Road traffic impacts on local human receptors	Neutral and Long-Term
Road traffic impacts on local ecological receptors	Negative, Slight and Long-Term
Regional air quality	Neutral and Long-Term

21.3.2.3 Climate

The Climate Action and Low Carbon Development (Amendment) Act, 2021, as amended, commits to a reduction in GHG emissions such that the total amount of annual GHG emissions in the year ending on 31 December 2030 is 51% less than the annual GHG emissions reported for the year ending on 31 December 2018. Policy changes will include the acceleration of the electrification of the transport system, including electric bikes, electric vehicles and electric public transport, alongside a ban on new registrations of petrol and diesel cars from 2030. In addition, there is a policy to ensure an unprecedented modal shift in all areas by a reorientation of investment to walking, cycling and public transport.

In 2028, the Do Minimum and Do Something scenarios assume a number of transport schemes to be in the traffic model including the roll out of the DART+ Programme, LUAS Green Line capacity enhancement and the Greater Dublin Area Cycle Network Plan implementation (excluding BusConnects Core Bus Corridor elements) as well as general traffic growth. The 2043 Do Minimum and Do Something scenarios assume the full implementation of the GDA Transport Strategy schemes (NTA 2016) and so assumes that proposed major transport schemes such as MetroLink, DART+ Tunnel, LUAS line extensions to Lucan, Finglas and Bray are all fully operational as well as general traffic growth.

The climate impact assessment of road traffic emissions from the Operational Phase of the Proposed Scheme cumulatively with the other 11 Core Bus Corridors schemes has been carried out according to methodology outlined in Section 8.3.4.2 in Chapter 8 (Climate). The core assessment scenario outlined below has considered a reasonable worst-case operational scenario for assessment purposes. In addition to the core scenario, an alternative scenario has been analysed in order to demonstrate the potential for further carbon reduction should the alternative scenario, in terms of higher bus frequencies materialise. The assessment has been carried out according to best practice and guidelines relating to climate and GHG emissions.

Given the current absence of specific sectoral carbon budgets in Ireland, for the purposes of this assessment any changes in net GHG emissions (either positive or negative) due to the Proposed Scheme will be significant. This viewpoint aligns with the IEMA Guidance (IEMA 2017) which advises that all carbon emissions contribute to climate change and in the absence of a defined threshold (e.g. national sector-specific targets and trajectories), any increase (or decrease) in carbon emissions may be considered as significant. The EPA Guidelines (EPA 2022) describe the quality of effects in terms of positive, neutral and negative where neutral is defined as effects that are imperceptible, within normal bounds of variation. Taking into account both the IEMA Guidance and the EPA Guidelines approach, this Chapter has assessed impacts as being either Neutral or Positive / Negative and Significant, with Neutral defined as a change in GHG emissions which is less than $\pm 0.5\%$ of the baseline emission level.

The direct and indirect impacts have been considered with reference to the following study area extents:

- **Direct Study Area** – The Proposed Scheme cumulatively with the other 11 Core Bus Corridors (i.e. the transport network along the Proposed Scheme); and
- **Indirect Study Area** – This is the area of influence that the Proposed Scheme has cumulatively with the other 11 Core Bus Corridor schemes in terms of changing traffic volumes above a defined threshold with reference to TII's Traffic and Transport Assessment Guidelines (TII 2014).

21.3.2.3.1 Direct Cumulative Operational Phase Carbon Emissions

The BusConnects Core Bus Corridor schemes will provide an attractive alternative to private car travel, encouraging more travel by more sustainable modes. Supported by the Proposed Scheme and other projects planned under the GDA Transport Strategy (NTA 2016), a greater share of travel demand will be by sustainable modes (public transport, walking and cycling). The Proposed Scheme in combination with the other 11 Core Bus Corridor schemes will result in reductions in capacity for general traffic along its route with a rebalancing of this capacity towards sustainable modes. The potential changes in GHG emissions due to the direct Operational Phase traffic impacts of the Proposed Scheme cumulatively with the other 11 Core Bus Corridor schemes have been assessed using the Environmental Appraisal Module, which is based on the ENEVAL software (refer to Chapter 8 (Climate) for further information).

A comparison between Do Minimum and cumulative Do Something GHG emissions for total car and bus in the Opening Year (2028) predicts a decrease of 29.5kt in CO_{2eq} cumulatively along the routes of the Core Bus Corridor

schemes (refer to Table 21.19). This is equivalent to a 27% decrease in CO_{2eq} relative to the Opening Year Do Minimum estimates.

Table 21.19: Direct Cumulative Operational Phase CO_{2eq} Emissions – Opening Year (2028)

Scenario	Vehicle Class	CO _{2eq} (kt CO _{2eq})
DM	Car	104
DS		77
Change		-27
% Change		-26%
DM	Goods	67
DS		55
Change		-12
% Change		-17%
DM	Bus	5.2
DS		2.5
Change		-2.7
% Change		-51%
DM	Total	176.2
DS		134.9
Change		-41.3
% Change		-23%
DM	Total (Car and Bus)	109
DS		79.5
Change		-29.5
% Change		-27%

A comparison between the direct Do Minimum and Do Something operational cumulative GHG emissions in the Design Year (2043) predicts a decrease of 12kt in CO_{2eq} (refer to Table 21.20). This is equivalent to a 25% decrease in CO_{2eq} relative to the Design Year Do Minimum estimates. This lower reduction compared to the 2028 projections is due to decreases in carbon emissions from all vehicles in the 2043 scenario.

Table 21.20: Direct Cumulative Operational Phase CO_{2eq} Emissions – Design Year (2043)

Scenario	Vehicle Class	CO _{2eq} (kt CO _{2eq})
DM	Car	47.5
DS		35.5
Change		-12.
% Change		-25.0%
DM	Goods	59.4
DS		50.3
Change		-9.1
% Change		-15.0%
DM	Bus	0.0
DS		0.0
Change		0.0
% Change		0.0
DM	Total	107
DS		85.8
Change		-21.2
% Change		-19.8%
DM	Total (Car and Bus)	47.5
DS		35.5
Change		-12.0
% Change		-25.0%

21.3.2.3.2 Indirect Cumulative Operational Phase Carbon Emissions

The CBC Infrastructure Works aims to provide an attractive alternative to the private car and promote a modal shift to public transport, walking and cycling. It is, however, recognised that there will be an overall reduction in operational capacity for general traffic along the direct study area given the proposed changes to the road layout and the rebalancing of priority to walking, cycling and bus. This reduction in operational capacity for general traffic along the Proposed Scheme and the other 11 Core Bus Corridor schemes will likely create some level of trip redistribution onto the surrounding road network, in the absence of wider regional wide demand management measures (outside the scope of the CBC Infrastructure Works).

The potential changes in GHG emissions due to the indirect Operational Phase traffic impacts of the Proposed Scheme cumulatively with the other 11 Core Bus Corridor schemes have been assessed using the Environmental Appraisal Module, which is based on the ENEVAL software.

A comparison between the indirect cumulative Do Something and Do Minimum CO_{2eq} emissions in the Opening Year (2028) predicts an overall increase of 22.7kt in CO_{2eq} due to the indirect impact of the Proposed Scheme in parallel with the other 11 Core Bus Corridor schemes (refer to Table 21.21). This is equivalent to a 4.8% increase in CO_{2eq} relative to the Opening Year Do Minimum estimates.

Table 21.21: Indirect Cumulative Operational Phase CO_{2eq} Emissions – Opening Year (2028)

Scenario	Vehicle Class	CO _{2eq} (kt CO _{2eq})
DM	Car	459
DS		482
Change		23
% Change		5%
DM	Goods	425.5
DS		443.1
Change		17.6
% Change		4.1%
DM	Bus	15.4
DS		15.2
Change		-0.2
% Change		-1.5%
DM	Total	900.3
DS		940.6
Change		40.3
% Change		4.5%
DM	Total (Car and Bus)	474.8
DS		497.5
Change		22.7
% Change		4.8%

A comparison between the cumulative indirect Do Something and Do Minimum GHG emissions in the Design Year (2043) predicts an overall increase of 11.4kt in CO_{2eq} (refer to Table 21.22). This is equivalent to a 5.3% increase in CO_{2eq} relative to the Design Year Do Minimum estimates.

Table 21.22: Indirect Cumulative Operational Phase CO_{2eq} Emissions – Design Year (2043)

Scenario	Vehicle Class	CO _{2eq} (kt CO _{2eq})
DM	Car	214.7
DS		226.1
Change		11.4
% Change		5.3%
DM	Goods	393.2
DS		407.2
Change		14.0
% Change		3.6%
DM	Bus	0
DS		0
Change		0
% Change		0%
DM	Total	607.9
DS		633.3
Change		25.4
% Change		4.2%
DM	Total (Car and Bus)	214.7
DS		226.1
Change		11.4
% Change		5.3%

21.3.2.3.3 Overall Cumulative Operational Phase Carbon Emissions

The potential changes in GHG emissions due to the combined direct and indirect Operational Phase traffic impacts of the Proposed Scheme cumulatively with the other 11 Core Bus Corridor schemes have been assessed.

A comparison between the cumulative operational Do Something and Do Minimum GHG emissions in the Opening Year (2028) in parallel with the other 11 Core Bus Corridor schemes predicts a decrease of 6.9kt in CO_{2eq} (refer to Table 21.23). This is equivalent to a 1.2% decrease in CO_{2eq} relative to the Opening Year Do Minimum estimates. To put these figures in context, approximately 12,000kt CO₂ equivalent were emitted in Ireland by the transport sector in 2019 (EPA 2021) and approximately 9,000kt CO₂ equivalent emissions are projected in 2028.

The Core Bus Corridor schemes will also support the delivery of government strategies outlined in the 2021 Climate Action Plan (CAP) (Department of the Environment, Climate and Communications (DECC 2021)) and the Climate Action and Low Carbon Development (Amendment) Act, 2021 by enabling sustainable mobility and delivering a sustainable transport system. Its aim is to provide enhanced walking, cycling and bus infrastructure on key access corridors in the Dublin region. This will subsequently enable and deliver integrated sustainable transport movement along these corridors. BusConnects will provide connectivity and integration with other public transport services leading to more people availing of public transport. The CAP outlines measures to deliver decarbonisation targets for transport. The delivery of the Proposed Scheme, the BusConnects programme and other major sustainable-mobility projects listed in the CAP are critical to the achievement of climate reduction targets.

Table 21.23: Combined Direct and Indirect Cumulative Operational Phase CO_{2eq} Emissions – Opening Year (2028)

Scenario	Vehicle Class	CO _{2eq} (kt CO _{2eq})
DM	Car	563.4
DS		559.4
Change		-4
% Change		-0.7%
DM	Goods	492.5
DS		498.4
Change		5.9
% Change		1.2%
DM	Bus	20.6
DS		17.7
Change		-2.9
% Change		-14.4%
DM	Total	1,076.5
DS		1075.5
Change		-1.00
% Change		-0.1%
DM	Total (Car and Bus)	583.9
DS		577.1
Change		-6.9
% Change		-1.2%

A comparison between the cumulative operational Do Something and Do Minimum GHG emissions in the Design Year (2043) cumulatively with the other 11 Core Bus Corridor schemes predicts a decrease of 0.6kt in CO_{2eq} (refer to Table 21.24). This is equivalent to a 0.24% decrease in CO_{2eq} relative to the Design Year Do Minimum estimates.

Both the Do Minimum and Do Something benefit from predicted increases in electric car usage and further electrification of the bus fleet. Light Goods Vehicles (LGVs) and HGVs vehicles are estimated to contribute the majority of CO₂ emissions in 2043, reflecting the technical challenges in converting particularly the heavy goods fleet to electric vehicles.

Table 21.24: Combined Direct and Indirect Cumulative Operational Phase CO_{2eq} Emissions – Design Year (2043)

Scenario	Vehicle Class	CO _{2eq} (kt CO _{2eq})
DM	Car	262
DS		261.4
Change		-0.6
% Change		-0.2%
DM	Goods	452.6
DS		457.5
Change		4.9
% Change		1.1%
DM	Bus	0
DS		0
Change		0
% Change		0%
DM	Total	714.8
DS		719.1
Change		4.3
% Change		0.6%
DM	Total (Car and Bus)	262.2
DS		261.6
Change		-0.6
% Change		-0.24%

Using the EPA definitions of significance (EPA 2022), the impact of the Proposed Scheme cumulatively with the other 11 Core Bus Corridor schemes has the potential to be Positive and Significant in 2028 and Neutral in 2043. Thus, the potential impact to climate during the Operational Phase of the Proposed Scheme cumulatively with the other 11 Core Bus Corridor schemes is initially Positive and Significant.

For context, the reduction in GHG emissions in the cumulative assessment for 2028, is equivalent to the removal of approximately 23,000 car trips per weekday from the road network. This represents a significant contribution towards the national target of 500,000 additional trips by walking, cycling and public transport per day by 2030 as outlined as a target in the CAP (DECC 2021).

Overall, the Operational Phase of the Proposed Scheme cumulatively with the 11 other Core Bus Corridor schemes will lead to a decrease in GHG emissions associated with the Proposed Scheme cumulatively with the other 11 Core Bus Corridor schemes.

In terms of policy measures, CO₂ emissions for the average new car fleet will reduce from 130g/km (grams per kilometre) over the period 2015 to 2019 to 95g/km in 2021 (as per Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO₂ emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011). In addition, from 2025 the average emissions from new car fleet are required to reduce by 15% relative to 2021 levels and, by 2030, the average emissions from new car fleet are required to reduce by 37.5% relative to 2021 levels as outlined in Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO₂ emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011.

In relation to decarbonising the transport sector, the CAP has set a target that all new cars and vans sold in Ireland will be zero carbon emissions or zero emissions capable by 2030. Targets are also included for public transport

buses and trains. The realisation of these targets will ensure that GHGs from transport will decrease significantly in line with the projections outlined in the CAP.

The other source of GHG emissions during the Operational Phase is maintenance. Maintenance GHG emissions of the Proposed Scheme cumulatively with the other 11 Core Bus Corridor schemes is predicted to be 5,665 tonnes of CO_{2eq} over the 60 year operational life span. It is expected that GHG emissions from the 12 BusConnects Core Bus Corridor schemes and the other GDA Transport Strategy schemes (NTA 2016) will primarily arise from the use of bitumen containing material to maintain road pavement quality. The impact on GHG emissions due to the embodied carbon associated with the maintenance phase of the Operational Phase of the Proposed Scheme will be Negative, Significant and Permanent.

Table 21.25 summarises the potential impacts associated with the Proposed Scheme cumulatively with the operation of the other 11 Core Bus Corridor schemes. The potential impact to climate due to the cumulative operation of all 12 Core Bus Corridor schemes is anticipated to be Positive and Significant in 2028 and Neutral in 2043.

Table 21.25: Summary of Potential Operational Phase Impacts Due to Proposed Cumulative Operation of All Schemes

Assessment Topic	Potential Impact – Cumulative Construction
Maintenance	Negative, Significant and Permanent
Operational Traffic	Positive and Significant in 2028 and Neutral in 2043.

The CBC Infrastructure Works will also support the delivery of government strategies outlined in the CAP (DECC 2021) and the Climate Action and Low Carbon Development (Amendment) Act, 2021 by enabling sustainable mobility and delivering a sustainable transport system. Its aim is to provide enhanced walking, cycling and bus infrastructure on key access corridors in the Dublin region. This will subsequently enable and deliver integrated sustainable transport movement along these corridors. The CBC Infrastructure Works will provide connectivity and integration with other public transport services leading to more people availing of public transport, helping to further reduce GHG emissions.

21.3.2.3.4 Climate Sensitivity Analysis and Other Considerations

Introduction

As outlined previously, the CBC Infrastructure Works aims to provide an attractive alternative to the private car and promote a modal shift to public transport, walking and cycling. It is, however, recognised that there will be an overall reduction in operational capacity for general traffic along the direct study area of the Core Bus Corridor schemes given the proposed changes to the road layout and the rebalancing of priority to walking, cycling and bus. This reduction in operational capacity for general traffic along the Core Bus Corridor schemes will likely create some level of trip redistribution onto the surrounding road network, in the absence of wider regional wide demand management measures (outside the scope of the CBC Infrastructure Works).

The Do Minimum and Do Something scenarios are based on the assumption that travel behaviour will remain broadly consistent over time and that car demand, used for this assessment, represents a likely worst-case scenario. It is possible that societal trends in the medium to long-term may reduce car demand further due to the ongoing changes to travel behaviours and further shifts towards sustainable travel, flexibility in working arrangements brought on following COVID-19 restrictions, and delayed car ownership trends that are emerging. Due to the uncertainties around how travel behaviours may change in the future, it was considered prudent to assess a worst-case scenario based on current trends for the core scenario.

Increased Bus Frequency Resilience Scenario

To fully understand the benefits that the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes could provide in relation to carbon reduction, a further sensitivity analysis has been undertaken to demonstrate the potential that the Core Bus Corridor schemes have in supporting further reductions in carbon above those levels presented in the worst-case assessment scenarios above. An increased bus frequency resilience scenario was undertaken. Further to this sensitivity test, consideration has also been given to the

potential enabling effects that the CBC Infrastructure Works will have in supporting a significant increase in cycle mode share and to support traffic demand management measures.

As described in Chapter 6 (Traffic & Transport), for the purposes of this EIAR and the transport modelling undertaken in support of the EIAR, no increase in bus service frequency beyond that planned under the current BusConnects Network redesign proposals was assessed. The bus frequencies used in the modelling are based on the proposed service rollout as part of the BusConnects Network Redesign and are the same in both the Do Minimum and Do Something scenarios. This rollout is currently underway. The rationale for undertaking this approach was that the planning consent being sought and which this EIAR supports is solely for the infrastructural improvements associated with providing bus priority along the Proposed Scheme.

This analysis, however, is highly conservative as the bus priority infrastructure improvements and indeed the level of protection it will provide to bus journey time consistency and reliability will provide a significant level of resilience for bus services that will use the Core Bus Corridor schemes, from implementation and into the future. This resilience will allow the service pattern and frequency of bus services to be increased into the future to accommodate additional demand without having a significant negative impact on bus journey time reliability or the operation of cycle and pedestrian facilities. In order to assess this resilience and the potential impacts of this resilience on carbon emissions, an additional analysis has been undertaken, which is detailed in Chapter 6 (Traffic & Transport).

This assessment shows that the Proposed Scheme can accommodate higher levels of bus frequency whilst maintaining journey time reductions and reliability. A key benefit of the provision of a resilient BusConnects Service Network, one which can provide reliable and consistent journey times, is that it has potential to cater for further significant transfer from private car travel to more sustainable and environmentally friendly travel via public transport.

Following on from the analysis in Chapter 6 (Traffic & Transport), an additional climate scenario assessment was undertaken to estimate the potential carbon emissions savings that could be achieved if the additional residual capacity, facilitated by the Core Bus Corridor schemes, was satisfied by a shift from car to bus. To undertake this assessment a carbon calculator was developed to account for the potential per person carbon emissions savings for each car removed from the network and absorbed by the additional residual capacity provided by increased bus frequency. The calculator includes the following assumptions:

- Bus design capacity of 90 people;
- Additional bus frequency of 10 buses per hour per BusConnects Spine route;
- Average emissions per car – 120 / 55g CO₂ / km (Source: ENEVAL software (2028 / 2043));
- Average emissions per bus (average across fleet) – 422 / 0g CO₂ / km (Source: ENEVAL software (2028 / 2043));
- Annualisation factor – 251 (i.e. weekdays only (excluding bank holidays)); and
- Average trip length of 9.9km (Source: NTA Regional Modelling System).

To account for the uncertainty associated with future carbon policies (e.g. beyond the current planned increase in the carbon tax to €100 per tonne by 2030) that will be imposed by the Government aimed at reducing carbon emissions, the assessment examined the impact of a notional 100%, 75% and 50% transfer from car-based travel to public transport with the uplifted bus service frequency along the Proposed Scheme corridor in place. Table 21.26 and Table 21.27 outline the results of the sensitivity analysis.

Table 21.26: Combined Direct and Indirect Operational Phase CO₂ Emissions with Additional Service Frequency – Opening Year (2028)

Additional Service Frequency Scenario	Vehicle Class	Core Scenario CO ₂ (kt CO ₂)	100% Uptake of Residual Capacity from Car	75% Uptake of Residual Capacity from Car	50% Uptake of Residual Capacity from Car
			CO ₂ (kt CO ₂)	CO ₂ (kt CO ₂)	CO ₂ (kt CO ₂)
DM	Car	563.4	562.9	562.9	562.9
DS		559.4	531.4	536	540.7
Change		-4	- 31.5	- 26.9	- 22.2
% Change		-0.7%	-5.6%	-4.8%	-3.9%

Table 21.27: Combined Direct and Indirect Operational Phase CO₂ Emissions with Additional Service Frequency – Design Year (2043)

Additional Service Frequency Scenario	Vehicle Class	Core Scenario CO ₂ (kt CO ₂)	100% Uptake of Residual Capacity from Car	75% Uptake of Residual Capacity from Car	50% Uptake of Residual Capacity from Car
			CO ₂ (kt CO ₂)	CO ₂ (kt CO ₂)	CO ₂ (kt CO ₂)
DM	Car	262	262	262	262
DS		261.4	248.1	250.3	252.5
Change		- 0.6	- 13.9	- 11.7	- 9.5
% Change		-0.2%	-5.3%	-4.5%	-3.6%

The analysis shows that should a portion of the drivers currently modelled as redistributed general traffic make the decision to make their journeys by public transport, the impact of this shift in transport mode would result in a further significant reduction in GHG emissions compared to the core scenario. The core scenario assumes no additional frequency beyond that planned under the current BusConnects Network Redesign proposals. Even if an uptake of only 50% of the residual capacity was achieved by a transfer from car, a 3.9% and 3.6% reduction in CO₂ emissions across the study area could potentially be achieved in 2028 and 2043 respectively.

For context, the 31.51kt and 13.91kt reduction in CO₂ emissions in 2028 and 2043 respectively, achieved by a 100% uptake of residual capacity, is equivalent to the removal of approximately 105,500 and 102,200 car trips per weekday from the road network in 2028 and 2043. With a 50% uptake of residual capacity, the equivalent reduction in weekday car trips would be 74,400 and 69,700 in 2028 and 2043 respectively. This represents a significant contribution towards the national target of 500,000 additional trips by walking, cycling and public transport per day by 2030 as outlined as a target in the CAP (DECC 2021).

Future Growth in Cycling

The Core Bus Corridor schemes will facilitate a step change in the level of segregated cycling provision in comparison with existing conditions along the entire length of the corridors. The representation of improvements to cycling infrastructure in the transport models follows a standard approach and are appropriate for the strategic nature of the model. It is applied by way of an increase in cycling speed on the network where the improvements have been made, as well as new connectivity by way of new links as part of the CBC Infrastructure Works. Modelling cycling infrastructure improvements using speeds is a standard approach that means an increase in cycling mode share can be obtained through a reduction in the modelled cost of a journey by bicycle relative to other modes. This has been applied as part of the modelling to represent improvements with a cycling mode share of approximately 6% achieved. The transport modelling undertaken, is therefore conservative in terms of the predicted cycling mode share. This has the effect that predicted traffic levels are on the higher and conservative side in relation to a potential future receiving environment. This is appropriate for EIAR purposes as a reasonable worst-case has been assessed in terms of traffic levels on the road network.

It must be noted, however, that the Core Bus Corridor schemes have been designed to cater for much higher levels of cycling uptake and the significant segregation and safety improvements to walking and cycling infrastructure. This will provide the opportunity for a significant increase in the movement of people travelling sustainably along the corridor and will therefore cater for higher levels of future population and employment growth and support higher cycling mode share levels, which would otherwise not be achieved in the absence of the schemes. The background environment changes with regards to cycling segregation and safety improvements will encourage more people to cycle in greater numbers. The Core Bus Corridor schemes provide the capacity to facilitate a greater uptake in cycling than what has been predicted in the core assessment and facilitates the opportunity for further reductions in CO_{2eq} emissions, beyond those reported in the above assessment.

Demand Management

The GDA Transport Strategy (NTA 2016), of which the Proposed Scheme is a key element of, aims to provide for the efficient, effective and sustainable movement of people and goods and to accommodate future travel growth in a managed and balanced way. Increased public transport provision, coupled with enhanced cycling and walking facilities in the urban areas, will enable a transition to more sustainable travel modes for many people in addition to providing the means to cater for much of the increased travel demand. However, without complementary demand management measures the full benefits of the GDA Transport Strategy will not be achieved.

The Core Bus Corridor schemes will be an enabler to allow for further reductions in car mode share with corresponding transfer to public transport, walking and cycling modes. Sustainable modes capacity is significantly enhanced by the Core Bus Corridor schemes which in turn will support demand management measures which could be applied to meet climate emissions targets. This growth in sustainable mode share cannot be accommodated in the absence of the Proposed Scheme and the other Core Bus Corridor schemes. A greater increase in sustainable mode share can be accommodated by the Core Bus Corridor schemes which will in turn lead to further reductions in CO_{2eq} emissions, beyond those reported in the above assessment.

21.3.2.3.5 Climate Impact Summary

The Proposed Scheme in combination with the other Core Bus Corridor schemes achieves the scheme objectives in supporting the delivery of an efficient, low carbon and climate resilient public transport service, which supports the achievement of Ireland's emission reduction targets. The Proposed Scheme has the potential to reduce GHG emissions equivalent to the removal of approximately 105,500 and 102,200 car trips per weekday from the road network in 2028 and 2043 respectively. This represents a significant contribution towards the national target of 500,000 additional trips by walking, cycling and public transport per day by 2030 as outlined as a target in the CAP (DECC 2021). It is concluded that, cumulatively, the CBC Infrastructure Works will make a significant contribution to carbon reduction.

21.3.2.4 Noise and Vibration

Since the Operational Phase assessment for noise and vibration takes account of the traffic model outputs (which incorporates future traffic growth from projected development including GDA Transport Strategy (NTA 2016) developments (NTA 2016)), the cumulative operational impacts, as assessed in Chapter 9 (Noise & Vibration), represent a cumulative scenario with the consideration of future development.

The impact assessment of cumulative road traffic noise levels associated with the Operational Phase of the Proposed Scheme in combination with the other 11 Core Bus Corridor schemes has been carried out according to methodology outlined in Section 9.4.4.1 in Chapter 9 (Noise & Vibration). The modelled results were compared to those predicted for the standalone Proposed Scheme, to determine if any additional impacts are expected.

The traffic data used in the both the standalone Proposed Scheme and cumulative assessment for future years also considers projects and transport schemes proposed for the Dublin area which may have an effect on traffic volumes.

The potential changes in traffic noise due to the cumulative Operational Phase traffic impacts have been assessed in this Section and compared with those assessed for the standalone Proposed Scheme. The assessment has concluded that during the Opening Year (2028), there will be a small number of roads where slight to moderate impacts will be experienced during the short to medium-term when compared to the Proposed Scheme in

isolation. During the Design Year (2043), traffic volumes, for the majority, have the potential to be lower than the Opening Year (2028) along the surrounding road network which result in lower calculated traffic noise impacts.

The identified roads with potential noise impacts of moderate or greater compared to the standalone Proposed Scheme are summarised in Table 21.28 for the Opening Year (2028) and the Design Year (2043).

Table 21.28: Summary of Potential Operational Traffic Noise Impacts Due to Standalone Proposed Scheme and Cumulative Operational- Opening Year (2028) and Design Year (2043)

Road	Potential Impact – Standalone Proposed Scheme	Potential Impact – Cumulative Operational - 2028	Potential Impact – Cumulative Operational - 2043
St Helens Road	Indirect, Negative, Slight to Moderate and Short to Medium-Term	Indirect, Negative, Slight to Moderate, Short to Medium-Term	Indirect, Negative, Slight and Long-Term
Marys Lane	Indirect, Negative, Moderate, and Short to Medium-Term	Indirect, Negative, Moderate, and Short to Medium-Term	Indirect, Negative, Slight and Long-Term
Mountjoy Square North	Indirect, Negative, Imperceptible / Positive and Short to Medium-Term	Indirect, Negative, Moderate, and Short to Medium-Term	Indirect, Negative, Not Significant and Long-Term
Gardiner Row	Indirect, Negative, Imperceptible / Positive and Short to Medium-Term	Indirect, Negative, Moderate, and Short to Medium-Term	Indirect, Negative, Slight and Long-Term
Wellington Street Lower	Indirect, Negative, Imperceptible / Positive and Short to Medium-Term	Indirect, Negative, Moderate, and Short to Medium-Term	Indirect, Negative, Not Significant and Long-Term
St Joseph's Parade	Indirect, Negative, Not Significant and Short to Medium-Term	Indirect, Negative, Moderate to Significant, and Short to Medium-Term	Indirect, Negative, Slight and Long-Term
Georges Lane	Indirect, Negative, Slight and Short to Medium-Term	Indirect, Negative, Moderate, and Short to Medium-Term	Indirect, Negative, Not Significant and Long-Term
Watling Street	Indirect, Negative, Imperceptible / Positive and Short to Medium-Term	Indirect, Negative, Moderate, and Short to Medium-Term	Indirect, Negative, Slight and Long-Term
Monck Place	Indirect, Negative, Not Significant and Short to Medium-Term	Indirect, Negative, Moderate, and Short to Medium-Term	Indirect, Negative, Not Significant and Long-Term
Avondale road	Indirect, Negative, Not Significant and Short to Medium-Term	Indirect, Negative, Moderate to Significant, and Short to Medium-Term	Indirect, Neutral, Imperceptible and Long-Term
Home Farm Road	Indirect, Negative, Imperceptible / Positive and Short to Medium-Term	Indirect, Negative, Moderate, and Short to Medium-Term	Indirect, Negative, Imperceptible and Long-Term
Stephen Street Upper	Indirect, Negative, Not Significant and Short to Medium-Term	Indirect, Negative, Moderate, and Short to Medium-Term	Indirect, Negative, Slight and Long-Term

During the Opening Year (2028), 10 of the roads assessed as part of the standalone assessment are calculated to experience higher noise impacts, defined as moderate or greater when assessed against the cumulative scenario of all 12 Core Bus Corridor schemes in place. The impacts are increased from Indirect, Neutral, Imperceptible to Slight and Short to Medium-Term to Indirect, Negative, Moderate and Moderate Significant and Short to Medium-Term in accordance with the methodology outlined in Section 9.4.4.1 in Chapter 9 (Noise & Vibration). The impacts are calculated at roads outside of the Proposed Scheme due to traffic redistribution.

During the future Design Year (2043), the potential cumulative noise impacts are lower than the Opening Year (2028) along the same roads due to the lower magnitude of impact assigned to changes in road traffic noise over

time and lower traffic volumes across the network into the future. The combined effect results in an Indirect, Negative, Imperceptible to Not Significant and Long-Term magnitude of impact which is comparable when compared to the standalone Proposed Scheme.

Section 9.4.4.1.1.6 of Chapter 9 (Noise & Vibration) notes that traffic noise levels along the surrounding road network, will be lower than those assumed for the impact assessment due to lower noise emissions from the future fleet of electric vehicles along urban and suburban roads with lower speeds, particularly those along residential streets and roads. In reality, the impacts determined and presented for both years will be further reduced when the lower noise emissions associated with electric fleet along low speed roads are factored in.

21.3.2.5 Population

The population assessment considered potential cumulative effects on land take, amenity and accessibility during operation. Ten projects were shortlisted as having potential interfaces with population receptors affected by the Proposed Scheme as assessed in Chapter 10 (Population).

The assessment identified three projects with the potential for Positive and Long-Term cumulative impacts in conjunction with the Proposed Scheme as a result of improvements to accessibility and positive impacts on amenity in the immediate vicinity of the projects:

- DCC planning reference 2628/17: extension to the existing Phibsborough Shopping Centre;
- Major Project (MP14) - Finglas LUAS (Green Line extension Broombridge to Finglas); and
- Major Project (MP32) - MetroLink.

For the remaining shortlisted projects, no cumulative impacts during the operation of the Proposed Scheme were identified.

21.3.2.6 Human Health

The human health assessment identified 16 other projects with the potential for likely significant cumulative effects with the Proposed Scheme during operation and took these into the assessment Stages 3 and 4 (see Appendix A21.1 in Volume 4 of this EIAR). The shortlisted projects include:

- Major Project (MP14) Finglas LUAS (Green Line extension Broombridge to Finglas);
- Major Project (MP 15) DART+ Tunnel Element (Kildare Line to Northern Line);
- Major Project (MP 17) LUAS Cross City incorporating LUAS Green Line Capacity Enhancement - Phase 1;
- Major Project (MP32) MetroLink;
- Major Project (MP34) Cycling: Greater Dublin Area Cycle Network Plan (excluding Radial Core Bus Corridor elements);
- Clongriffin to City Centre Core Bus Corridor Scheme;
- Swords to City Centre Core Bus Corridor Scheme;
- Blanchardstown to City Centre Core Bus Corridor Scheme;
- Lucan to City Centre Core Bus Corridor Scheme;
- Liffey Valley to City Centre Core Bus Corridor Scheme;
- Tallaght / Clondalkin to City Centre Core Bus Corridor Scheme;
- Templeogue / Rathfarnham to City Centre Core Bus Corridor Scheme;
- Kimmage to City Centre Core Bus Corridor Scheme;
- Belfield / Blackrock to City Centre Core Bus Corridor Scheme;
- Bray to City Centre Core Bus Corridor Scheme; and
- Ringsend to City Centre Core Bus Corridor Scheme.

The human health assessment judged that there were likely significant cumulative effects from the above transport projects, even though five of the Core Bus Corridor schemes will be outside the ZoI for the Proposed Scheme when considered in isolation. This is because cumulatively the Core Bus Corridor schemes would have the effect of linking all the schemes' human health study areas, thereby affecting a much greater population. Assuming all

12 Core Bus Corridor schemes would become operational, as well as the DART+, MetroLink, LUAS and the GDA Cycle Network Plan, it is considered likely that this would encourage greater uptake of sustainable transport options among the population surrounding the Proposed Scheme by offering a choice of efficient public transport journeys and active travel opportunities. This would be beneficial to health by improving wellbeing from greater journey reliability, access to services (including health services) for those without a car and supporting greater physical activity as a part of an active travel journey or overall journey via public transport. The implementation of the above projects will facilitate a step change in modal shift, reducing reliance on car travel.

In the medium to long-term this should help environmental improvement such as reduced air pollutants, improved urban realm and better use of social space. Due to the substantial size of the overall population with the opportunity to benefit from the proposals, the effect is assessed as Positive, Very Significant and Long-Term for human health.

21.3.2.7 Biodiversity

Considering the environmental protection policies included within the relevant land use plans, and environmental assessments completed as part of the planning application for other projects, the Proposed Scheme is not anticipated to act in combination with any other projects to result in significant residual air quality effects any greater than that already predicted for the Proposed Scheme alone (i.e., significant at the local geographic scale). The other impacts associated with the Proposed Scheme that are measurable in some way, but by themselves will not result in a likely significant effect on biodiversity are:

- Impacts on the existing hydrological and hydrogeological regimes; and
- Disturbance or displacement to species (birds, badger and otter).

Specific assessments have been undertaken by hydrogeology and hydrology specialists to identify the potential for cumulative effects to occur. However, an overarching assessment is included below.

21.3.2.7.1 Impacts on the Existing Hydrological and Hydrogeological Regimes

The Proposed Scheme will not have any significant residual effects on the existing hydrological or hydrogeological regime in those surface and groundwater catchments crossed by the Proposed Scheme or in the downstream receiving surface and marine water environment, either through affecting existing flow conditions or affecting surface or groundwater quality, as is set out in detail in Chapter 13 (Water) and Chapter 14 (Land, Soil, Geology and Hydrogeology) of the EIAR, and in Appendix A13.1 Water Framework Directive Assessment in Volume 4 of the EIAR. Specific design and mitigation measures have been included to address any potential effects such that there will be no significant residual effects.

The Proposed Scheme lies within Hydrometric Area (HA) 09 (Liffey and Dublin Bay) and is within the River Liffey catchment. The objectives for this catchment are outlined in the River Basin Management Plan for Ireland 2018-2021 (Government of Ireland 2018), which aims to protect all waters within the district and, where necessary, improve waters and achieve sustainable water use. The purpose of the River Basin Management Plan for Ireland 2018-2021 is to reduce pollution levels, to restore good water quality status and to prevent deterioration in water quality in the river basins and groundwater bodies. There are many land use plans and projects that lie within the catchment that have the potential to affect surface water and groundwater bodies. However, all of the overarching land use plans have environmental protective policies to protect the existing surface water and groundwater network. Therefore, there are no other plans or projects that are likely to result in a significant effect on biodiversity, cumulatively with the Proposed Scheme, as a consequence of surface water or groundwater impacts.

21.3.2.7.2 Impacts on Fauna Species (Birds, Badger and Otter) as a Result of Disturbance or Displacement

The Proposed Scheme will not result in a likely significant residual effect on any fauna species as a result of disturbance or displacement effects during the Operational Phase. The ZOI from the Proposed Scheme is limited to the immediate vicinity and will not result in a likely significant residual effect on any fauna species as a result of disturbance or displacement effects. Considering the land use zonings in the areas through which the Proposed Scheme will pass (residential, commercial or industrial zoning), and the minimal effect of operational disturbance from road traffic in an already highly urbanised locality, future development is not likely to result in a significant effect on biodiversity, cumulatively with the Proposed Scheme, as a consequence of disturbance or displacement impacts.

21.3.2.8 Water

The water assessment identified 32 other projects for potential operation related cumulative effects.

For 22 of these projects (10 DCC local planning applications, six FCC local planning applications and six Strategic Housing Developments), the water assessment identified potential for cumulative impacts on surface water runoff. However, the Proposed Scheme includes Sustainable Drainage Systems (SUDs) to ensure no net increase in runoff and regulations require all new developments to adhere to this. As such, there will be no cumulative impacts during operation.

For the remaining projects (six other Major Projects and five other Core Bus Corridor schemes), there may be an increase in impermeable area to facilitate the projects. However, it is anticipated that this will be subject to the same standards required by DCC as is the Proposed Scheme and SUDs will be implemented to ensure no net increase in runoff. As such, there will be no cumulative impacts on water during operation.

21.3.2.9 Land, Soils, Geology and Hydrogeology

The land, soils, geology and hydrogeology assessment identified that there are no likely significant direct or indirect cumulative impacts of the Proposed Scheme in combination with the other projects on land, soils, geology and hydrogeology during the Operational Phase.

21.3.2.10 Archaeological and Cultural Heritage

The archaeological and cultural heritage assessment did not identify any projects with the potential to give rise to cumulative effects during operation of the Proposed Scheme. It is considered therefore, that the operation of the Proposed Scheme in combination with other proposed projects will not result in significant cumulative impacts on archaeological and cultural heritage.

21.3.2.11 Architectural Heritage

The architectural heritage assessment did not identify any projects with the potential to give rise to cumulative effects during operation of the Proposed Scheme. It is considered therefore, that the operation of the Proposed Scheme in combination with other proposed projects will not result in significant cumulative impacts on architectural heritage.

21.3.2.12 Landscape (Townscape) and Visual

The landscape (townscape) and visual assessment identified 37 other projects with the potential for likely significant cumulative effects with the Proposed Scheme during operation which were taken into the assessment Stages 3 and 4 (see Appendix A21.1 and Appendix A21.2 in Volume 4 of this EIAR).

The landscape (townscape) and visual assessment identified the potential for Moderate and Long-Term cumulative townscape / visual effects with the Greater Dublin Area Cycle Network Plan (excluding Core Bus Corridor elements). The primary potential cause of cumulative effects during operation would be the combined long-term effects from cumulative loss of trees during construction.

The landscape (townscape) and visual assessment also identified potential for Slight, Positive and Long-Term cumulative operational townscape / visual effects on townscape for the Proposed Scheme with the Blanchardstown to City Centre Core Bus Corridor Scheme on the area around Smithfield / Liffey Quays. There would be cumulative improvements in the streetscape and effects are likely to be generally positive.

For the other 10 Core Bus Corridor schemes, the potential for temporary in-combination indirect townscape effects is limited by distance and no cumulative operational townscape / visual effects are expected.

For the remaining shortlisted projects, there will be minor cumulative increases in the intensity of built form in the landscape setting. However, this is in keeping with an area of ongoing development and no significant cumulative effects are expected.

21.3.2.13 Waste and Resources

The predominant source of Operational Phase waste from the Proposed Scheme may arise as a result of carriageway maintenance which will be undertaken at regular intervals, or as necessary. This will primarily consist of bitumen containing material due to maintenance of carriageway pavement. The potential impact of operational, C&D waste will be Positive (on the basis that less material will be generated and less overall maintenance will be required compared to the Do Nothing scenario), Not Significant and Long-Term. It is therefore considered that the Operational Phase waste arising from the Proposed Scheme considered in combination with the types of waste arising from other projects will not give rise to likely significant cumulative effects.

21.3.2.14 Material Assets

No likely significant cumulative effects were identified for material assets for the Operational Phase and so no projects were shortlisted for further assessment.

21.4 Environmental Interactions

Table 21.29 sets out a matrix to indicate where interactions between different effects on different environmental factors have been addressed. This is in line with the approach set out in the EIA Guidelines (EPA 2022). These interactions are described briefly in Table 21.29.

Table 21.29: Environmental Interactions Matrix

Typical Inter-Relationship Matrix – Environmental Elements	Population		Human Health		Biodiversity		Land and Soils		Water		Air Quality		Climate		Noise and Vibration		Waste		Landscape/Townscape		Cultural Heritage		Architectural Heritage		Material Assets		Traffic and Transport		Major Accidents and / or Disasters	
	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Population																														
Human Health	✓	✓																												
Biodiversity																														
Land and Soils			✓		✓																									
Water			✓		✓	✓	✓																							
Air Quality	✓	✓	✓	✓	✓	✓																								
Climate				✓						✓	✓	✓																		
Noise and Vibration	✓	✓	✓	✓	✓	✓																								
Waste							✓																							
Landscape/Townscape	✓	✓		✓	✓	✓	✓		✓																					
Cultural Heritage																				✓	✓									
Architectural Heritage																					✓	✓								
Material Assets			✓				✓																✓	✓						
Traffic and Transport	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓									✓	✓				
Major Accidents and / or Disasters	✓	✓	✓	✓	✓		✓		✓	✓		✓		✓						✓					✓					

Notes: This matrix should be read down, starting with each topic identified across the top. ✓ = significant interaction between. Blank cells indicate no or weak interaction. Con. = Construction phase. Op. = Operational phase.

21.4.1.1 Interactions between Population and Human Health

The topics of 'population' and 'human health' are inextricably linked. Chapter 10 (Population) of this EIAR has focused on how the Proposed Scheme could have impacts on communities and the local economy (commercial businesses). As outlined in the methodology in Chapter 11 (Human Health), the social conditions, community networks and economic conditions within which people live are considered wider determinants of health and have an important influence on human health.

21.4.1.1.1 Construction Phase

The population assessment has identified areas of community and commercial land take, some of which would be permanent. The impacts would be felt at a local, individual level rather than widespread community level. It is considered that the impacts would be strongly linked with impacts on amenity and general disruption from construction activities. Similarly, both the population and human health assessments identify that accessibility may be temporarily disrupted for pedestrians and cyclists during construction, with requirements for short diversions. However, access to businesses and properties will be maintained at all times. Health outcomes associated with these construction impacts are likely to be psychosocial, such as stress and anxiety. Where footpaths or cycle tracks are affected by construction, a safe route will be provided past the work area, and where practicable, provisions for matching existing facilities for pedestrians and cyclists will be made. This will limit the likelihood of adverse psychosocial responses.

21.4.1.1.2 Operational Phase

The population and human health assessments identify positive impacts on accessibility. While the population assessment looks at this in relation to community and commercial receptors, the human health assessment considers the health outcomes which may be associated with this improved accessibility. This could include improved and more equitable access to health, education and other services. This is also a social impact, improving the wider determinant of health in relation to transport and opportunities to access services. Health outcomes may also be associated with improved physical fitness arising from increased active travel linked to the proposed improvements to walking and cycling infrastructure and improved social interactions.

21.4.1.2 Interactions between Population and Air Quality, Noise and Vibration and Landscape (Townscape) and Visual

Chapter 10 (Population) assesses impacts on amenity, which involves an assessment of the interactions between landscape (townscape) and visual, air quality, and noise and vibration. It therefore inherently addresses environmental interactions during both the Construction and Operational Phases. Reference should be made to Chapter 10 (Population) for the assessments on commercial and community amenity. Visual impacts and landscape impacts on properties have been assessed in Chapter 17 (Landscape (Townscape) & Visual).

The Construction Phase will have impacts on a number of local amenities and open spaces used by the community. Access will be maintained to the open spaces and reinstated at the end of the Construction Phase, with replacement / set back boundary fences, footpaths, and replacement and new tree planting.

21.4.1.3 Interactions between Human Health; Land, Soils, Geology and Hydrogeology; Water; and Air Quality; and Noise and Vibration

The quality of the environment, including exposure to pollution and environmental hazards, is an important consideration in health protection. The human health assessment reported in Chapter 11 (Human Health) has considered the interaction of these environmental factors on human health.

Chapter 13 (Water) assesses a variety of potential impacts on water including impacts on water quality and impacts on flood risk, both of which have an interaction with human health.

Chapter 14 (Land, Soils, Geology & Hydrogeology) assesses the potential for the excavation of contaminated ground, which can pose an environmental health hazard.

21.4.1.3.1 Construction Phase

Chapter 13 (Water) has assessed the potential impacts for temporary increases in flood risk from possible disruption of local drainage systems due to construction works, as well as temporary increases in hardstanding and / or soil compaction which could temporarily increase surface water runoff rates to water bodies. The assessment has also considered the potential to impact on water quality due to contamination with anthropogenic substances such as oil, chemicals or concrete washings. These issues can pose a risk to human health. However, the water assessment found impacts on water during construction to be imperceptible and so there is no likely significant interaction between water and human health from this Proposed Scheme during construction.

During construction, there is a risk of excavating potentially contaminated ground. Chapter 14 (Land, Soils, Geology & Hydrogeology) has identified potential sources of contamination from a review of current and historic land uses. The processes in place for the investigation of potential ground contamination and management and disposal of contaminated substances ensure health protection. These measures are outlined in Section 14.5 of Chapter 14 (Land, Soils, Geology & Hydrogeology). There are very limited areas of excavation, so the risk of disturbing contaminated materials is slight. Therefore, there is no likely significant interaction between land, soils, geology, and hydrogeology, and human health from the Proposed Scheme during construction.

Chapter 11 (Human Health) has assessed the interaction between air quality and noise and vibration and human health. Reference should be made to Chapter 11 (Human Health) for an assessment of potential health outcomes linked with these issues during the Construction Phase.

21.4.1.3.2 Operational Phase

Chapter 13 (Water) has assessed potential impacts on water quality such as from dispersal of traffic onto other roads meaning 'routine' road contaminants, such as hydrocarbons and metals may drain to a different catchment or have less stringent pollution control infrastructure. No potential impact on flood risk was assessed on the basis that the drainage design ensures no net increase in runoff rates. In terms of potential impacts on surface water quality, the water assessment identified that the impacts were imperceptible. Therefore, there is no likely significant interaction between water and human health from the Proposed Scheme during the Operational Phase.

Chapter 14 (Land, Soils, Geology & Hydrogeology) assesses no significant residual impacts from the Proposed Scheme. On this basis there is no likely significant interaction between land, soils, geology, and hydrogeology, and human health from the Proposed Scheme during the Operational Phase.

Chapter 11 (Human Health) has assessed the interaction between air quality and noise and vibration and human health. Reference should be made to Chapter 11 (Human Health) for an assessment of potential health outcomes linked with these issues during the Operational Phase.

21.4.1.4 Interactions between Human Health and Landscape (Townscape) and Visual

The assessment of human health has an indirect interaction between landscape (townscape) and visual via the assessment of amenity in Chapter 10 (Population).

21.4.1.4.1 Operational Phase

The quality of the built environment can influence how people feel about a place and is therefore connected with mental wellbeing. Improvements to the urban realm have been identified as a possible pathway to supporting more social interaction, which is beneficial to health outcomes.

21.4.1.5 Interactions between Human Health and Material Assets

Material assets are resources of both natural and human origin that have intrinsic value. Chapter 19 (Material Assets) provides an assessment of impacts on major infrastructure and utilities and imported materials. That Chapter 19 (Material Assets) notes that other types of material assets are assessed in other chapters of the EIAR, for example, roads and traffic are assessed in Chapter 6 (Traffic & Transport).

21.4.1.5.1 Construction Phase

During construction, the material assets assessment identified Negative, Moderate and Temporary impacts of disruption to water supplies, electricity, gas and telecommunications, due to diversions which may be required for the Proposed Scheme. There is an interaction with human health as these disruptions could affect the essential services needed to support healthy lives (i.e. fresh water, sanitation, energy and communication). In the case of the Proposed Scheme it is not considered that any of these disruptions would be of a duration to affect health at a population level. The most likely health effects are transient psychosocial impacts such as annoyance and frustration, which are unlikely to result in any change of overall health status.

21.4.1.5.2 Operational Phase

No significant Operational Phase impacts on material assets were identified, and therefore, there is no likely interaction between material assets and human health during the Operational Phase.

21.4.1.6 Interactions between Population, Human Health, Air Quality, Noise and Vibration and, Traffic and Transport

There is significant interaction between these topics. The traffic and transport assessment has informed the assessments of population, human health, air quality and noise and vibration. The population assessment has considered effects on accessibility which directly interacts with traffic and transport. The population assessment has also assessed effects on amenity which relate to traffic emissions of air pollution and noise, which indirectly interact with traffic and transport. The human health assessment has considered the evidence of associations with health outcomes from exposure to air pollution, traffic noise as well as changes to wider determinants of health such as traffic and transport, and access. It is considered that the key interactions for both the Construction and Operational Phases, are inherently captured across Chapter 6 (Traffic & Transport), Chapter 7 (Air Quality), Chapter 9 (Noise & Vibration), Chapter 10 (Population) and Chapter 11 (Human Health).

21.4.1.7 Interactions between Biodiversity, Traffic and Transport, Land, Soils, Geology and Hydrogeology; Water; and Air Quality; Noise and Vibration and, Landscape (Townscape) and Visual

The biodiversity assessment has considered the interactions between species, habitats and various other environmental issues. Specifically, there is an interaction between traffic and transport and mortality risk for species. There is an interaction between water, air quality and biodiversity as declines in surface water quality and air pollution can contribute to habitat degradation. Non-native invasive plant species can be spread through soils, and also contribute to habitat degradation, meaning there is an interaction with biodiversity. Some trees and areas of other planting will be removed during the Construction Phase, as set out in in Chapter 17 (Landscape (Townscape) & Visual). However, the Proposed Scheme also includes for replacement and new trees and other planting, with associated opportunities for enhancement of local biodiversity. While it will take time for new trees to establish and mature, no significant medium or long-term impact will arise from the interrelationship between biodiversity and landscape and visual factors. Chapter 12 (Biodiversity) describes and assesses how different impacts of the Proposed Scheme on traffic, water, soils, air quality, noise and landscape may interact with biodiversity interests. Reference should be made to Chapter 12 (Biodiversity) to understand those interactions.

21.4.1.8 Interactions between Land, Soils, Geology and Hydrogeology and Water

There is an interaction between Chapter 14 (Land, Soils, Geology & Hydrogeology) and Chapter 13 (Water). Chapter 14 (Land, Soils, Geology & Hydrogeology) assesses potential impacts on water supply and the pollution of groundwater and watercourses from potential land contamination. There is therefore a potential interaction between land contamination and surface water. Surface water is interlinked with hydrogeology, so while impacts on these issues are assessed in separate chapters, there is an interrelationship. It is considered that these interactions are captured within Chapter 14 (Land, Soils, Geology & Hydrogeology) and Chapter 13 (Water) since they are intrinsic to the assessments.

21.4.1.9 Interactions between Land, Soils, Geology and Hydrogeology; Waste and Material Assets

The main interaction between these topics will be during the Construction Phase.

21.4.1.9.1 Construction Phase

Chapter 19 (Material Assets) assesses the impact of imported materials, whereas Chapter 18 (Waste & Resources) assesses the use of site-won materials which can be reused within the Proposed Scheme. There is an interaction between these issues as the amount of material to be imported will depend on the amount of material which can be recovered and reused on-site. Chapter 14 (Land, Soils, Geology & Hydrogeology) provides an assessment of impacts on soils, including potentially contaminated land. There is an interaction between this issue and waste because the likelihood of excavated materials being suitable for use on-site will depend on whether or not it is contaminated, and the type of contamination. This would be established through detailed ground investigations as set out in Chapter 14 (Land, Soils, Geology & Hydrogeology). One of the main reasons for undertaking any excavation of soils as part of the Proposed Scheme is to allow for utility diversions. The need to utility diversions is assessed in Chapter 19 (Material Assets), whereas the likelihood of encountering contaminated materials from this activity is assessed in Chapter 14 (Land, Soils, Geology & Hydrogeology).

21.4.1.10 Interactions between Land, Soils, Geology and Hydrogeology; and Traffic and Transport

Chapter 14 (Land, Soils, Geology & Hydrogeology) identifies traffic and transport as a potential source of pollution during the Operational Phase of the Proposed Scheme. Specifically, it identifies the potential for occasional accidental leakage of oil, petrol or diesel (all can come from motor vehicles), allowing contamination of the surrounding environment. While there is an interaction, this same interaction exists in the Do Nothing scenario and so the significance of the impact is imperceptible.

21.4.1.11 Interactions between Water and, Traffic and Transport

Chapter 13 (Water) identifies the potential impact from the interaction between traffic and transport and the water environment. It refers to traffic modelling described in Chapter 6 (Traffic & Transport) to inform the likelihood of a significant impact on pollutants and sediment from road surface runoff. The chapter identifies that all changes in traffic flows would occur within the same drainage catchments and so there would be no significant impacts from this interaction.

21.4.1.12 Interactions between Climate, Air Quality, Material Assets, Waste and, Traffic and Transport

Chapter 8 (Climate) provides an assessment of the effects of the Proposed Scheme on GHG emissions.

21.4.1.12.1 Construction Phase

There is an interaction between climate and material assets as the amount of material to be imported, and waste generated during construction of the Proposed Scheme, influences the embodied carbon footprint of the Proposed Scheme, which is assessed in Chapter 8 (Climate). The redistribution of traffic associated with the traffic management during construction, will also generate GHG emissions, which have informed the assessment in Chapter 8 (Climate).

21.4.1.12.2 Operational Phase

Operational Phase traffic is intrinsic to the assessment of climate impacts reported in Chapter 8 (Climate). This interaction is therefore captured within that chapter.

21.4.1.13 Interactions between Climate and Water

The impact of climate change is considered in the flood risk assessment (Appendix A13.2 in Volume 4 of this EIAR), which is summarised in Chapter 13 (Water) and Chapter 8 (Climate). The interaction between climate change and flood risk is therefore captured in these assessments.

21.4.1.14 Interactions between Landscape (Townscape) and Visual

As an environmental factor landscape and visual considerations have natural relationships with all other environmental factors. Some are clearly direct relationships (e.g., population and visual impacts; biodiversity and landscape; land, soils and water and landscape; or the setting around features of cultural heritage etc.). Others

may be indirect (e.g. human health, air quality and landscape, material assets and landscape and visual aspects). Wherever possible these potential interactions have been incorporated into the landscape and visual impact assessment presented in this Chapter.

The principal potential interrelations for landscape and visual impact with other environmental factors are outlined in the following paragraphs. The main interactions have been identified for Construction Phase impacts. Other interrelations do not have the potential for significant impacts with landscape and visual aspects.

21.4.1.14.1 Construction Phase

The Construction Phase will have impacts on a number of local amenities and open spaces, which have an interaction with population and human health. Access will be maintained to the open spaces and reinstated at the end of the Construction Phase, with replacement / set back boundary fences, footpaths, and replacement and new tree planting, wherever possible. The visual and landscape impacts on properties are assessed in Chapter 17 (Landscape (Townscape) & Visual).

The Proposed Scheme is located within a developed sub-urban / urban area. Nevertheless, the Construction Phase of the Proposed Scheme has the potential to interact with local drainage and is located in the vicinity of the Royal Canal and the River Tolka. However, no significant works are proposed for these river corridors and the proposed drainage is integrated with the existing network. Additional drainage improvement measures, such as SUDS are also included with the Proposed Scheme. No significant impact arises from the interrelationship between water and landscape and visual factors.

The Proposed Scheme is located within a developed sub-urban / urban area. Nevertheless, the Construction Phase of the Proposed Scheme will impact on small areas of land / soil along the road corridor, mainly roadside verges, edges of open spaces, small landscape areas and garden areas. The Proposed Scheme will result in an overall minor reduction of soil area, mainly as a result of localised road widening, however, disturbed areas will be reinstated, and landscaped. No significant medium or long-term impact arises from the interrelationship between land and soils and landscape and visual factors.

21.4.1.15 Interactions Between Landscape (Townscape) & Visual, Architectural Heritage, Archaeology and Cultural Heritage

Architectural heritage has an influence on the quality of townscape and therefore there is an interaction between these topics. Also, archaeological heritage may also be of architectural interest. Cultural heritage includes tangible heritage such as archaeology, architectural heritage, settlements, buildings and structures, designed landscapes, in addition to placenames and intangible heritage such as folklore, traditions and traditional practices. These issues are therefore interrelated.

Visual impacts and landscape impacts on features / properties of cultural heritage value have been assessed in Chapter 17 (Landscape (Townscape) & Visual). The Construction Phase will have impacts on a number of local features of heritage value (e.g., protected structures, Conservation Areas, historic mileposts etc.) and the impacts on these features are set out in Chapter 17 (Landscape (Townscape) & Visual).

The main impacts on archaeology, cultural heritage and architectural heritage would take place during the Construction Phase. Relevant interactions are captured in Chapter 15 (Archaeological & Cultural Heritage) and Chapter 16 (Architectural Heritage).

21.4.1.16 Interactions between Material Assets and Traffic and Transport

Chapter 19 (Material Assets) notes that roads and traffic can also be classed as material assets. However, the issues of roads and traffic are assessed in Chapter 6 (Traffic & Transport). The interaction of the traffic and transport infrastructure included as part of the Proposed Scheme with material assets is captured in Chapter 19 (Material Assets) and includes issues such as utility diversions during construction and use of energy during the Operational Phase.

21.4.1.17 Risk of Major Accidents and / or Disasters

Chapter 20 (Risk of Major Accidents and / or Disasters) inherently considers several potential interactions. For example, it assesses the risk of impacts on or from utilities (interacting with Chapter 19 (Material Assets)) such as a gas mains strike. It assesses the risk of tree instability, which has an interaction between Chapter 17 (Landscape (Townscape) & Visual) and it assesses the risk of spreading non-native invasive species which is interrelated with Chapter 12 (Biodiversity) and Chapter 14 (Land, Soils, Geology & Hydrogeology). Also related to Chapter 14 (Land, Soils, Geology & Hydrogeology) is the risk of encountering contaminated ground or materials. Chapter 20 (Risk of Major Accidents and / or Disasters) assesses the risk of extreme weather events, which are linked to Chapter 8 (Climate) and flood risk in Chapter 13 (Water) and Appendix A13.2 FRA in Volume 4 of this EIAR. The risk of a major road traffic event due to construction traffic is also assessed in Chapter 20 (Risk of Major Accidents and / or Disasters) which is an issue interrelated with Chapter 6 (Traffic & Transport) as well as Chapter 11 (Human Health). Since all identified risks have the potential to harm human health, the assessment in Chapter 20 (Risk of Major Accidents and / or Disasters) is strongly interrelated to human health.

21.5 Mitigation

21.5.1 Construction Phase

As set out in Section 21.2.6 of this Chapter, there is a likelihood of significant negative traffic related impacts should all 12 Core Bus Corridor schemes be constructed at the same time. The mitigation for this will be to programme the construction phases of the Core Bus Corridor schemes (assuming they are consented) so that the four schemes identified in Section 21.2.6.2 of this Chapter will not be constructed concurrently with adjoining schemes. For example, no section of the Proposed Scheme will be constructed at the same time as Blanchardstown to City Centre or Swords to City Centre Core Bus Corridor Schemes. In this regard, scheme construction programming will be controlled and implemented by the NTA.

Limiting the schemes under construction concurrently will minimise additional congestion and associated air quality and noise impacts over and above the standalone schemes.

Appropriate construction planning of the Proposed Scheme and other nearby projects was identified as mitigation for the human health and population assessments which identified potential cumulative impacts of general construction disruption on neighbouring communities.

In relation to the potential for cumulative effects on architectural heritage, mitigation is as outlined in Appendix A16.3 in Volume 4 of this EIAR.

Mitigation of landscape (townscape) and visual impacts during the Construction Phase is focused on ensuring the protection of elements to be retained (e.g. mature trees) and providing for a degree of visual screening of particular aspects of the works (e.g. the Construction Compounds). However, mitigation of Construction Phase impacts on landscape (townscape) and visual characteristics directly impacted through removal is neither possible nor practicable.

Other major infrastructure projects could directly interface with the construction of the Proposed Scheme. Interface liaison will take place on a case-by-case basis through the NTA, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

21.5.2 Operational Phase

No other significant negative effects over and above those considered in the standalone assessments for the Operational Phase were identified in the cumulative impact assessment. No additional mitigation measures are considered necessary.

21.6 Summary of Residual Cumulative Impacts and Environmental Interactions

This Chapter has identified and assessed the likely significant cumulative effects caused by the Proposed Scheme in combination with other existing and planned projects. This Section provides a summary of the main effects predicted.

21.6.1 Construction Phase

The results of the modelling showed that with the CTMPs for all schemes in place at the same time, there would be significant traffic displacement across the Dublin area. The large cumulative increase of traffic on local roads has the potential to generate a significant adverse impact of traffic congestion along with the risk of generating air quality and noise impacts. A revised construction scenario was developed which is based on four schemes which cannot be constructed concurrently with adjoining schemes. This scenario was developed to minimise potential significant impacts on traffic, air quality and noise.

For the landscape (townscape) and visual assessment, if construction periods overlap / are successive, there remains the potential for localised moderate temporary / short-term cumulative effects during construction in the townscape / streetscape with other projects. However, it is likely that the extent of any such impacts will be localised and contained.

The combined impact on climate of the Proposed Scheme with other schemes under construction concurrently is considered to result in a cumulative Negative, Significant and Short-Term impact. In general, the carbon emissions associated with embodied carbon and energy to construct schemes on a national basis is accounted for cumulatively as part of the ETS. Impacts on climate associated with the Proposed Scheme cumulatively with the construction of all other Core Bus Corridor schemes are predicted to be Negative, Significant and Short-Term.

Negative, Moderate and Temporary cumulative effects during construction remain for four local planning applications and one Strategic Housing Development in combination with the Proposed Scheme as a result of impacts on human health. As outlined in Section 5.9 in Chapter 5 (Construction) of this EIAR, liaison with third-party developers will take place on a case-by-case basis, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

No other significant construction related cumulative effects were identified from the Proposed Scheme in combination with other projects (including the other Core Bus Corridor schemes) over and above those identified in the standalone assessments.

21.6.2 Operational Phase

For operational effects, the assessments assume all 12 proposed Core Bus Corridor schemes would be operational, along with other identified projects and GDA Transport Strategy projects (NTA 2016) included in the Do Minimum and Do Something scenarios. For traffic and transport, the assessment predicted that the Proposed Scheme and the other 11 Core Bus Corridor schemes are expected to facilitate a Positive, Profound and Long-Term cumulative effect on People Movement by sustainable modes. The Core Bus Corridor schemes are seen to enable significant improvements in People Movement by sustainable modes along the direct Core Bus Corridor routes, particularly by bus and cycling, with reductions in car mode share due to the enhanced sustainable mode provision. The Proposed Scheme and the other 11 Core Bus Corridor schemes will provide for enhanced integration and efficiencies for all public transport modes by facilitating substantial increases in public transport average network wide travel speeds.

The climate impact assessment predicts a Negative, Significant and Permanent cumulative impact on climate during the maintenance phase of the Operational Phase. A Positive and Significant impact is predicted on climate in 2028 with a Neutral impact in 2043 due to the predicted cumulative change in operational traffic and the significant mode shift from cars to more sustainable modes (walking, cycling and public transport). Fewer climate

benefits are seen in 2043 relative to 2028 due to the further electrification of the wider fleet in both the Do Minimum and Do Something scenarios.

The CBC Infrastructure Works will also support the delivery of government strategies outlined in the CAP (DECC 2021) and the Climate Action and Low Carbon Development (Amendment) Act, 2021 by enabling sustainable mobility and delivering a sustainable transport system. The CBC Infrastructure Works will provide connectivity and integration with other public transport services leading to more people availing of public transport, helping to further reduce GHG emissions.

Based on the analysis outlined above, it is concluded that the CBC Infrastructure Works achieves the project objectives in supporting the delivery of an efficient, low carbon and climate resilient public transport service, which supports the achievement of Ireland's emission reduction targets. The CBC Infrastructure Works has the potential to reduce GHG emissions equivalent to the removal of approximately 105,500 and 102,200 car trips per weekday from the road network in 2028 and 2043 respectively. This represents a very significant contribution towards the national target of 500,000 additional trips by walking, cycling and public transport per day by 2030 as outlined as a target in the CAP (DECC 2021). It is concluded that, cumulatively, the CBC Infrastructure Works will make a significant contribution to carbon reduction.

There is potential for Positive, Very Significant and Long-Term cumulative effects on human health as a result of the other Core Bus Corridor schemes. The Core Bus Corridor schemes would be complementary to the Proposed Scheme and offer a greater choice of priority bus routes for bus passengers. It is considered likely that this would encourage greater uptake of bus services among the population surrounding the Proposed Scheme by offering a choice of efficient public transport journeys. This would be beneficial to health by improving wellbeing from greater journey reliability, access to services for those without a car and supporting greater physical activity as a part of an overall journey via public transport.

Similarly, for five other major projects it is considered that the proposals and the Proposed Scheme are complementary and could have cumulative beneficial effects by connecting different communities and destinations, which would improve general accessibility to areas of leisure and employment which can have positive effects on mental health. This is judged to be Positive and Significant in the Long-Term on human health for three Major Projects and Positive and Moderate in the Long-Term on human health for two Major Projects.

For the landscape (townscape) and visual assessment, replacement planting as part of the Proposed Scheme would reduce the cumulative effects during operation with the Greater Dublin Area Cycle Network Plan (excluding Core Bus Corridor elements) but there remains potential for a Slight and Long-Term cumulative townscape / visual effect.

For the landscape (townscape) and visual assessment, the potential for Positive, Slight and Long-Term townscape / streetscape and visual effects also remain on the area around the Proposed Scheme and the Blanchardstown to City Centre Core Bus Corridor Scheme in Smithfield / Liffey Quays during operation.

21.6.3 Environmental Interactions

Significant environmental interactions occur between the topics of population, human health, air quality, noise and vibration and traffic and transport. The assessments made for each of those topics consider those interactions both directly and indirectly. As an environmental factor, landscape and visual considerations have natural relationships with all other environmental factors. Some are direct relationships (e.g., population and visual impacts; biodiversity and landscape; land, soils and water and landscape; or the setting around features of cultural heritage etc.). Others may be indirect (e.g. human health, air quality and landscape, material assets and landscape and visual aspects). Wherever possible, these potential interactions have been incorporated into the relevant assessments.

In brief, the Proposed Scheme will address sustainable mode transport infrastructure deficits while contributing to an overall integrated sustainable transport system as proposed in the GDA Transport Strategy (NTA 2016). It will increase the effectiveness and attractiveness of bus services operating along the corridor and will result in more people availing of public transport due to the faster journey times and reliability improvements which the Proposed Scheme will provide. This in turn will support the potential to increase the bus network capacity of services operating along the corridor and thereby further increasing the attractiveness of public transport. In

In addition to this, the significant segregation and safety improvements to walking and cycling infrastructure that is a key feature of the Proposed Scheme will further maximise the movement of people travelling sustainably along the corridor and will therefore cater for higher levels of future population and employment growth.

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