Chapter 06
Traffic & Transport

Contents

6. Traffic & Transport

6.1 Introduction

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

The chapter describes the traffic and transportation impacts in accordance with the requirements of the relevant Environmental Protection Agency's (EPA) guidance on the information to be contained in EIARs. To accompany this chapter, a Traffic Impact Assessment (TIA) has been prepared. The TIA presents a comprehensive review of the traffic and transportation impacts associated with the Proposed Scheme, which has informed the production of this EIAR Traffic & Transport chapter. The TIA should be read in conjunction with this EIAR chapter and is included as Appendix A6.1 (Transport Impact Assessment Report) in Volume 4 of this EIAR.

The Proposed Scheme commences at R136 Ballyowen Road, and travels north to meet R835 Lucan Road. From here it proceeds east on N4 Lucan Road, and passes through the M50 Interchange to meet R148 Palmerstown Bypass Chapelizod Bypass, continuing through its junctions with Kennelsfort Road Upper and Lower, The Oval and Lucan Old Road, to the junction with R833 Con Colbert Road.

From here, the route continues east past Memorial Road and the R101 South Circular Road, where R148 Con Colbert Road becomes R148 St John's Road West. The route passes through the St John's Road / Military Road junction, continues past Heuston Station and ends at R148 Victoria Quay, just to the south of the River Liffey.

The Proposed Scheme includes an upgrade of the existing bus priority and pedestrian and cycle facilities. The scheme includes a substantial increase in the level of bus priority provided along the corridor, including the provision of additional lengths of bus lane resulting in improved journey time reliability. Throughout the Proposed Scheme bus stops will be enhanced to improve the overall journey experience for bus passengers and cycle facilities will be substantially improved with segregated cycle tracks provided along the links and protected junctions with enhanced signalling for cyclists provided at junctions.

Table 6.1 summarises the changes which will be made to the existing transport environment along the corridor as a result of the Proposed Scheme.

Table 6.1: Summary of Changes as a result of the Proposed Scheme

Total Length of Proposed Scheme	**9.6km**	
Bus Priority	**Existing (km)**	**Proposed Scheme (km)**
Bus Lanes		
Eastbound	7.45	9.17
Westbound	6.4	8.6
Bus Measures		
Proportion of Route with Bus Priority Measures	72%	93%
Cycle Facilities – Segregated		
Eastbound	0.73	6.45
Westbound	0.73	6.31
Cyclist Facilities – Non-segregated		
Eastbound	0.85	0.28
Westbound	1.5	0.4
Total Cyclist Facilities (both directions)	3.83	13.44
Proportion Segregated (including Quiet Street Treatment)	25.85%	95%
Pedestrian Facilities		
Number of Side Entry Treatments (raised tables)	1	19

Total Length of Proposed Scheme	9.6km	
Bus Priority	**Existing (km)**	**Proposed Scheme (km)**
Number of Signalised Crossings	20	28

The Proposed Scheme, as described in Chapter 4 (Proposed Scheme Description) is supported by a series of drawings, which are contained in Volume 3 of the EIAR. The following drawings (listed in Table 6.2) should be read in conjunction with this chapter.

Table 6.2: List of Drawings

Drawing Series Number	Description
BCIDA-ACM-GEO_GA-0006_XX_00-DR-CR-9001	General Arrangement
BCIDA-ACM-GEO_CS-0006_XX_00-DR-CR-9001	Typical Cross Sections
BCIDA-ACM-TSM_GA-0006_XX_00-DR-CR-9001	Traffic Signs and Road Markings
BCIDA-ACM-TSM_SJ-0006_XX_00-DR-TR-9001	Junction System Design

Cumulative impacts of Traffic and Transport, along with other topics, can be found in Chapter 21 (Cumulative Impacts & Environmental Interactions) of this EIAR, as well as in Appendix A6.1 (Transport Impact Assessment Report) in Volume 4 of this EIAR.

6.1.1 Aim and Objectives of the Proposed Scheme

The aim of the Proposed Scheme is to provide enhanced walking, cycling and bus infrastructure on this key access corridor in the Dublin region, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the core bus corridor (CBC) Infrastructure Works, applicable to the Traffic and Transport assessment of the Proposed Scheme, are to:

- Enhance the capacity and potential of the public transport system by improving bus speeds, reliability and punctuality through the provision of bus lanes and other measures to provide priority to bus movement over general traffic movements;
- Enhance the potential for cycling by providing safe infrastructure for cycling, segregated from general traffic wherever practicable;
- Support the delivery of an efficient, low carbon and climate resilient public transport service, which supports the achievement of Ireland's emission reduction targets;
- Enable compact growth, regeneration opportunities and more effective use of land in Dublin, for present and future generations, through the provision of safe and efficient sustainable transport networks;
- Improve accessibility to jobs, education and other social and economic opportunities through the provision of improved sustainable connectivity and integration with other public transport services; and
- Ensure that the public realm is carefully considered in the design and development of the transport infrastructure and seek to enhance key urban focal points where appropriate and feasible.

The planning and design of the Proposed Scheme has been guided by these aims and objectives, with the need for the Proposed Scheme described in detail in Chapter 2 (Need for the Proposed Project) of this EIAR.

6.1.1.1 People Movement

The aims and objectives outlined above are underpinned by the central concept and design philosophy of '***People Movement'.*** People Movement is the concept of the optimisation of roadway space and / or the prioritisation of the movement of people over the movement of vehicles along the route and through the junctions along the Proposed Scheme. The aim being the reduction of journey times for higher person carrying capacity modes (bus, walking and cycling), which in turn provides significant efficiencies and benefits to users of the transport network and the environment.

A typical double-deck bus takes up the same road space as three standard cars but typically carries 50-100 times the number of passengers per vehicle. On average, a typical double-deck bus carries approximately 60-70 passengers making the bus typically 20 times more efficient in providing people movement capacity within the equivalent spatial area of three cars. These efficiency gains can provide a significant reduction in road network congestion where the equivalent car capacity would require 50 or more vehicles based on average occupancy levels. Consequently, by prioritising the movement of buses over cars, significantly more people can be transported along the limited road space available. Similarly, cyclists and pedestrians require significantly less roadway space than general traffic users to move safely and efficiently along the route. Making space for improved pedestrian infrastructure and segregated cycle tracks can significantly benefit these sustainable modes and encourage greater use of these modes.

With regards to this traffic and transport chapter, People Movement is the key design philosophy and the Proposed Scheme impacts (both positive and negative) have been assessed on that basis.

6.1.1.2 Preliminary Design Guidelines

To support the 'People Movement' led approach to the design of the Proposed Scheme, the Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors (PDGB) (NTA 2021) (refer to Appendix A4.1 in Volume 4 of this EIAR) was developed. This guidance document was prepared to ensure that a consistent design approach was taken across the various BusConnects Schemes and that the objectives of the project are achieved. A 'People Movement' led design involves the prioritisation of people movement, focusing on maximising the throughput of sustainable modes (i.e. Walking, Cycling and Bus modes) in advance of the consideration and management of general vehicular traffic (private car) at junctions.

In support of this approach, a project specific People Movement at Signals Calculator (PMSC) was developed. The PMSC was applied at the initial design development stage, to provide an initial estimate of green time allocation for all movements at a typical junction, on the basis that sustainable mode movements should be accommodated foremost to maximise people movement with the remaining green time allocated to general traffic movements. The calculations were underpinned by:

- The number of buses required to be accommodated along the Proposed Scheme, as per the BusConnects Network Re-design proposals;
- The provision of a high Level of Service for cyclists at each junction along the Proposed Scheme; and
- The pedestrian crossing width and crossing timing requirements based on the provision of a high Level of Service for pedestrians at each junction along the Proposed Scheme.

The outputs of the calculator provided an initial estimate of the green times and vehicle capacity movements based on inputs and assumptions for each junction along the Proposed Scheme. The calculator provided an estimate of the People Movement for the junction in question (by mode) and was used to adjust proposals with a view to maximising the total person throughput at each junction along the Proposed Scheme during the iterative design process, described further below in Section 6.2.3. Details on the development of junction designs along the Proposed Scheme are included in Appendix A6.3 (Junction Design Report) in Volume 4 of this EIAR.

The People Movement Calculation and the identification of available general traffic capacity from this initial exercise was enhanced further by the Proposed Scheme Transport Models described in Section 6.2.3.

6.1.2 Iterative Design Process and Mitigation by Design

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 the environmental and transport impacts were mitigated to the greatest extent possible during design development and to enable information on potential impacts to be provided from the various Environmental Impact Assessment (EIA) and Transport Impact Assessment (TIA) disciplines back into the design process for consideration and inclusion in the proposals This resulted in mitigation being embedded into the design process by the consideration of potential environmental impacts throughout the Preliminary Design

development. A multi-tiered modelling framework (described in Section 6.2.3) was developed to support this iterative design process.

Diagram 6.1 below illustrates this process whereby the emerging design for the Proposed Scheme has been tested using the transport models as part the iteration. The transport models provided an understanding of the benefits and impacts of the proposals (mode share changes, traffic redistribution, bus performance etc.) with traffic flow information also informing other environmental disciplines (such as Air Quality, Noise and Vibration, Climate etc.) which in turn allowed feedback of potential impacts into the design process to allow for changes and in turn mitigation to be embedded in the designs. The design process included physical changes (e.g., cycle lane widening) and adjustments to traffic signals including changes to staging, phasing and green times to limit traffic displacement to the greatest extent possible as well as traffic management arrangements and/or turn bans where appropriate. This ensured that any traffic displacement was kept to a minimum and was maintained on higher capacity roads, whilst continuing to meet scheme objectives along the Proposed Scheme.

The iterative process concluded when the design team were satisfied that the Proposed Scheme 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.

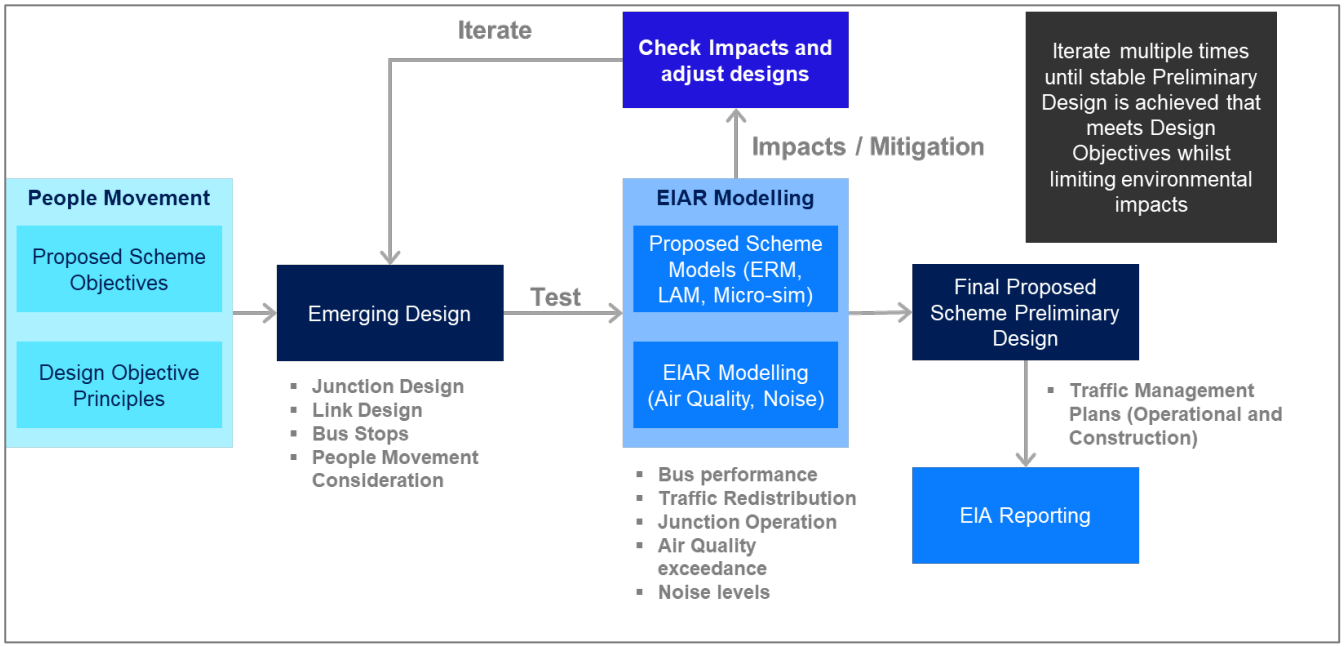


Diagram 6.1 Proposed Scheme Impact Assessment and Design Interaction

The impacts presented in this chapter are based on the final Preliminary Design for the Proposed Scheme which includes the embedded mitigation developed as part of the iterative design method described above.

6.2 Methodology

The methodology for the traffic and transport related impacts of the Proposed Scheme has incorporated a number of key references and inter-related stages, which have been outlined in the following sections.

6.2.1 Study Area

The direct and indirect impacts have been considered with reference to the following study area extents (as shown in Diagram 6.2):

- **Direct Study Area** – The Proposed Scheme (i.e. the transport network within the red line boundary); and
- **Indirect Study Area**– This is the area of influence that the Proposed Scheme has on changing traffic volumes above a defined threshold with reference to TII's Traffic and Transport Assessment

Guidelines (May 2014) (see Section 6.4.5.4.6 for further details on the threshold applied in relation to traffic volume changes used in the definition of the indirect study area).

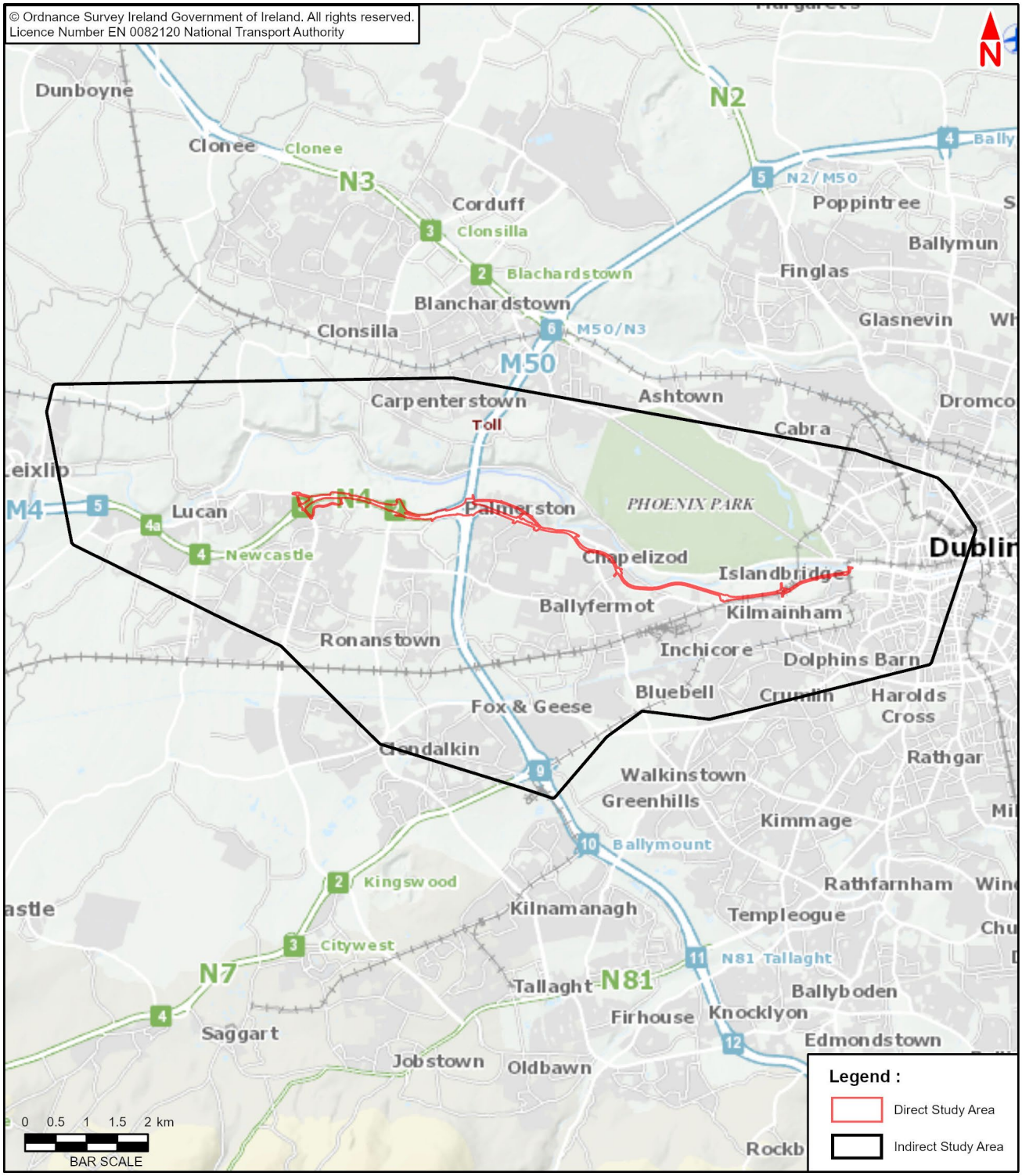


Diagram 6.2: Proposed Scheme Direct & Indirect Study Area

6.2.2 Relevant Guidelines, Policy and Legislations

The policies and legislation which are applicable to the Traffic & Transport chapter are detailed in Chapter 2 (Need for the Proposed Project) of the EIAR and in Appendix A6.1 (Transport Impact Assessment Report) of Volume 4

of this EIAR. The specific traffic and transport guidelines which have informed this chapter are detailed in turn below.

6.2.2.1 Traffic and Transport Assessment Guidelines

To determine the traffic and transport impact that the Proposed Scheme has in terms of an increase in general traffic flows on the direct and indirect study areas, a robust assessment has been undertaken, with reference to Transport Infrastructure Ireland's (TII) most recent Traffic and Transport Assessment Guidelines (TII 2014).

This document is considered best practice guidance for the assessment of transport impacts related to changes in traffic flows due to proposed developments and is an appropriate means of assessing the impact of general traffic trip redistribution on the surrounding road network.

According to Section 1.3 of the Traffic and Transport Assessment Guidelines (TII 2014):

> *'a Traffic and Transport Assessment is a comprehensive review of all the potential transport impacts of a proposed development or re-development, with an agreed plan to mitigate any adverse consequences'.*

The guidelines aim to provide a framework to promote an integrated approach to development, ensuring that proposals promote more efficient use of investment in transportation infrastructure which reduces travel demand and promotes road safety and sustainable travel.

The TIA, which supports this EIAR chapter, follows the Traffic and Transport Assessment Guidelines and offers an impartial description of the likely impacts of the Proposed Scheme, outlining both its positive and negative aspects.

6.2.2.2 Design Manual for Urban Roads and Streets

The Design Manual for Urban Roads and Streets (DMURS) (Department of Transport, Tourism and Sport (DTTS) 2019) promotes an integrated street design approach within urban areas (i.e. cities, towns and villages) focused on:

- Influence by the type of place in which the street is located; and
- Balancing the needs of all users.

A further aim of this Manual is to put well designed streets at the heart of sustainable communities to promote access by walking, cycling and public transport.

The principles, approaches and standards set out in this Manual apply to the design of all urban roads and streets (with a speed limit of 60 km/h or less), except: (a) Motorways (b) In exceptional circumstances, certain urban roads and streets with the written consent of Sanctioning Authorities.

The Manual is underpinned by a holistic design-led approach, predicated on a collaborative and consultative design process. There is specific recognition of the importance to create secure and connected places that work for all, characterised by creating new and existing streets as attractive places with high priority afforded to pedestrians and cyclists while balancing the need for appropriate vehicular access and movement.

To achieve a more place-based/integrated approach to road and street design, the following four core principles are promoted within the manual:

- Connected Networks - To support the creation of integrated street networks which promote higher levels of permeability and legibility for all users, and with emphasis on more sustainable forms of transport;
- Multi-Functional Streets - The promotion of multi-functional, place-based streets that balance the needs of all users within a self-regulating environment;
- Pedestrian Focus - The quality of the street is measured by the quality of the environment for the user hierarchy pedestrians considered first; and

- Multi-disciplinary Approach - Greater communication and co-operation between design professionals through the promotion of a plan-led, multidisciplinary approach to design.

The Proposed Scheme has been designed and assessed with reference to these guidelines.

6.2.2.3 Traffic Signs Manual (Chapter 8: Temporary Traffic Measures and Signs for Roadworks)

The Traffic Signs Manual (Department of Transport (DoT), 2019) promotes safety, health and welfare for road workers and users. The manual details the traffic signs which may be used on roads in Ireland, including sign layout, sign symbols, the circumstances in which they are required, and the associated rules for positioning them.

Of direct relevance to the assessment of traffic and transport impacts, Chapter 7 - Road Markings outlines the function of road markings, the legalities of road markings and the application of road markings on roads in Ireland. Chapter 8 - Temporary Traffic Measures and Signs for Roadworks outlines the application of temporary traffic management (TTM) at work sites on public roads; this chapter offers instructions and guidance to road users in relation to the use of TTM and outlines the signs to be used at roadworks.

6.2.2.4 Traffic Management Guidelines

The Traffic Management Guidelines (DoT, 2019) provides guidance on a number of issues including, but not limited to, traffic planning, traffic calming and management, incorporation of speed restraint measures and the provision of suitably designed facilities for public transport users and vulnerable road users.

A core component of the Guidelines is rooted in decision making and balancing priorities, including those that are in conflict with one another. The Guidelines identifies common objectives to be addressed when managing the transport network:

- Environment Improvement;
- Congestion Relief;
- Capacity Improvement;
- Safety;
- Accessibility;
- Economic Vitality; and
- Politics.

The Proposed Scheme has been designed and assessed with reference to these guidelines. In addition to the above key guidelines, the Proposed Scheme has been designed and assessed with reference to a set of policy and guidance documents outlined in Section 6.7 of this chapter.

6.2.3 Proposed Scheme Impact Assessment Modelling Tools

This section summarises the various transport modelling tools that have been developed and used to inform the preparation of the TIA and this chapter of the EIAR. The purpose of each tool has been detailed and its use for each element of the Proposed Scheme assessment has been defined.

The different modelling tools that have been developed as part of the assessment, do not work in isolation, but instead work as a combined modelling system driven by the NTA's Eastern Regional Model (ERM) as the primary source for multi-model demand and trip growth. Demand information is then passed to the cordoned Local Area Model (LAM), corridor micro-simulation models and junction models which have been refined and calibrated to represent local conditions to a greater level of detail than that contained in the ERM.

In summary, there are four tiers of transport modelling which have been used to assess the impacts of the Proposed Scheme:

- **Tier 1 (Strategic Level):** The NTA's East Regional Model (ERM) is the primary tool which has been used to undertake the strategic modelling of the Proposed Scheme and has provided the strategic multi-modal demand outputs for the proposed forecast years;

- **Tier 2 (Local Level):** A Local Area Model (LAM) has been developed to provide a more detailed understanding of traffic movement at a local level. The LAM is a subset model created from the ERM and contains a more refined road network model used to provide consistent road-based outputs to inform the TIA, EIA and junction design models. This includes information such as road network speed data and traffic redistribution impacts for the Operational Phase. The LAM also provides traffic flow information for the micro-simulation model and junction design models and has been used to support junction design and traffic management plan testing;
- **Tier 3 (Corridor Level):** A micro-simulation model of the full 'end to end' corridor has been developed for the Proposed Scheme. The primary role of the micro-simulation model has been to support the ongoing development of junction designs and traffic signal control strategies and to provide bus journey time information for the determination of benefits of the Proposed Scheme; and
- **Tier 4 (Junction Level):** Local junction models have been developed, for each junction along the Proposed Scheme to support local junction design development. These models are informed by the outputs from the above modelling tiers, as well as the junction designs which are, as discussed above, based on people movement prioritisation.

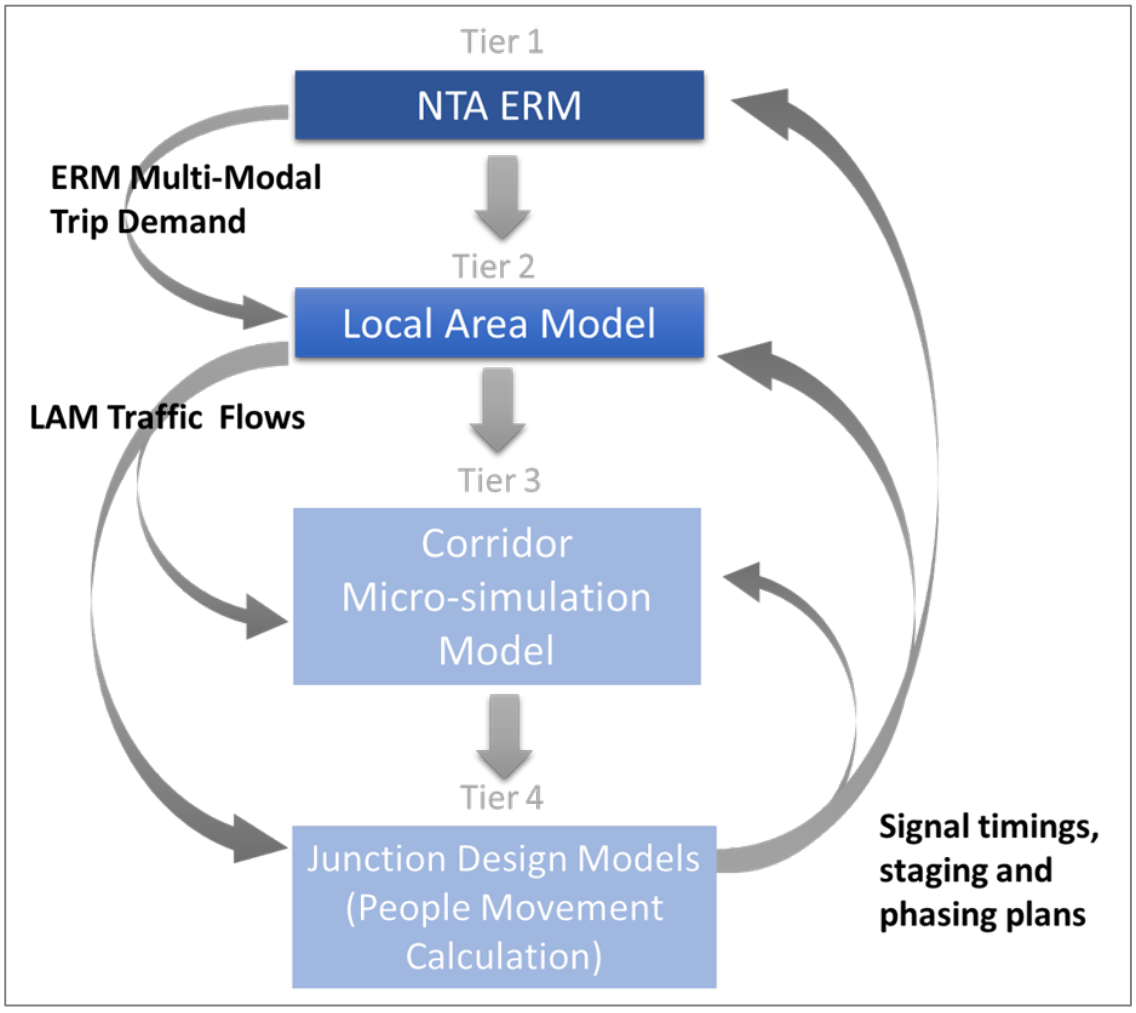


Diagram 6.3: Proposed Scheme Modelling Hierarchy

Further detail on the transport model development process, the traffic data inputs used, the calibration, validation and forecast model development for the suite of transport models can be found in the Transport Modelling Report in Appendix A6.2 (Transport Modelling Report) and Appendix A6.3 (Junction Design Report) of Volume 4 of this EIAR.

6.2.4 Appraisal Method for the Assessment of Impacts

6.2.4.1 Overview

This section details the methodologies that have been used to assess the potential traffic and transport impacts of the Proposed Scheme during both the Construction and Operational Phases. The assessments have been carried out as follows:

- Outlining the Assessment Topics;
- Determining the Predicted Magnitude of Impacts;
- Defining the Sensitivity of the Environment; and
- Determining the Significance of Effects.

The above approach has been carried out in accordance with procedures described in the Guidelines to be Contained in EIARs (EPA 2022) and methodologies outlined in the 'Traffic and Transport Assessment Guidelines (TII 2014), using a Multi-Modal Level of Service (LoS) approach.

6.2.4.2 Outlining the Assessment Topics

The traffic and transportation impacts have been broken down into the following assessment topics for both the Construction and Operational Phases:

- The qualitative assessments are as follows:
  - **Pedestrian Infrastructure**: The changes to the quality of the pedestrian infrastructure as a result of the Proposed Scheme;
  - **Cycling Infrastructure:** The changes to the quality of the cycling infrastructure as a result of the Proposed Scheme;
  - **Bus Infrastructure:** The changes to the quality of the bus infrastructure as a result of the Proposed Scheme; and
  - **Parking / Loading:** The changes to the availability of parking and loading as a result of the Proposed Scheme.
- The quantitative assessments, which have been undertaken using the Proposed Scheme modelling tools described previously, are as follows:
  - **People Movement:** An assessment has been carried out to determine the potential impact that the Proposed Scheme will have on the projected volume of people (by mode – Walking, Cycling, Bus and General Traffic) moving along the Proposed Scheme during the Operational Phase only;
  - **Bus Performance Indicators**: The changes to the projected journey times and reliability for buses as a result of the Proposed Scheme; and
  - **General Traffic:** The direct and indirect impacts that will occur for the general traffic conditions on the Proposed Scheme and surrounding road network.

6.2.4.3 Determining the Predicted Magnitude of Impacts

The methodology used for determining the predicted magnitude of impacts has considered the traffic and transport conditions of the environment before and after the Proposed Scheme is in place.

The impact assessments have been carried out using the following scenarios:

- **'Do Nothing'** – The 'Do Nothing' scenario represents the current baseline traffic and transport conditions of the direct and indirect study areas **without** the Proposed Scheme in place and other GDA Strategy projects, which has been outlined in Section 6.3 (Baseline Environment). This scenario forms the reference case by which to compare the Proposed Scheme ('Do Something') for the qualitative assessments only.
- **'Do Minimum'** – The 'Do Minimum' scenario (Opening Year 2028, Design Year 2043) represents the likely traffic and transport conditions of the direct and indirect study areas including for any

transportation schemes which have taken place, been approved or are planned for implementation, **without** the Proposed Scheme in place. This scenario forms the reference case by which to compare the Proposed Scheme ('Do Something') for the quantitative assessments. Further detail on the scheme and demand assumptions within this scenario are included further below in Section 6.4.3.

- **'Do Something'** – The 'Do Something' scenario represents the likely traffic and transport conditions of the direct and indirect study areas including for any transportation schemes which have taken place, have been approved or are planned for implementation, **with** the Proposed Scheme in place (i.e. the Do Minimum scenario with the addition of the Proposed Scheme). The Do Something scenario has been broken into two phases:
  - Construction Phase (Construction Year 2024) – This phase represents the single worst-case period which will occur during the construction of the Proposed Scheme.
  - Operational Phase (Opening Year 2028, Design Year 2043) – This phase represents when the Proposed Scheme is fully operational.

The assessment of changes between the Do Minimum and Do Something scenarios have been presented in either a positive, negative or neutral magnitude of impact as a result of the Proposed Scheme, depending on the assessment topic. A high, medium, low or negligible rating has been applied to each impact assessment to determine the Magnitude of Impact. Refer to Section 6.4 for further information on the methodology in applying these ratings for each assessment.

6.2.4.3.1 Level of Service Impact Assessment

To outline the changes in conditions between the Do Minimum and Do Something scenarios a Level of Service (LoS) approach has been developed for the impact assessments, where appropriate. This concept allows a straightforward comparison of two differing scenarios using a series of metrics specifically developed for this purpose.

The concept of LoS was originally developed in the United States' Transportation Research Board's (TRB) Highway Capacity Manual (TRB 2000). Under this concept, potential values for a performance measure are divided into six ranges, with each range assigned a letter grade ranging from "A" (highest quality) to "F" (lowest quality). LoS concepts are applied universally throughout the world and have their basis in the Highway Capacity Manual and, particularly for bus network assessments, in the Transit Capacity and Quality of Service Manual (TRB 2003).

LoS concepts are not target based or rigid in their application and bespoke versions are developed to suit the particular receiving environment of the scheme under consideration or the particular user problems that the scheme and/or project is seeking to address. A mix of quantitative and qualitative indicators can be used and summarised as a LoS. The process enables integrated planning and decision making across all modes rather than any specific mode which can create a bias in the assessment process (e.g. focusing on Car Volume over Capacity (V/C)). It is intended that the LoS framework for the Proposed Scheme will provide an easily understandable summary of the impact of each assessment topic, where applied.

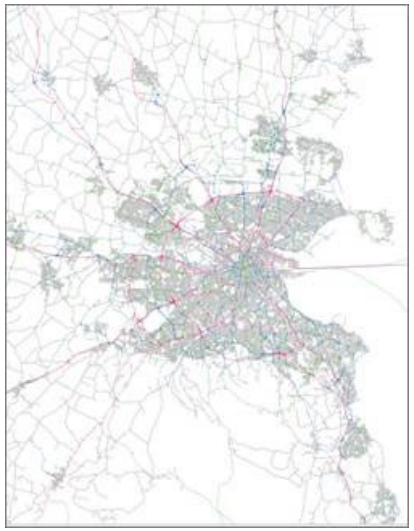
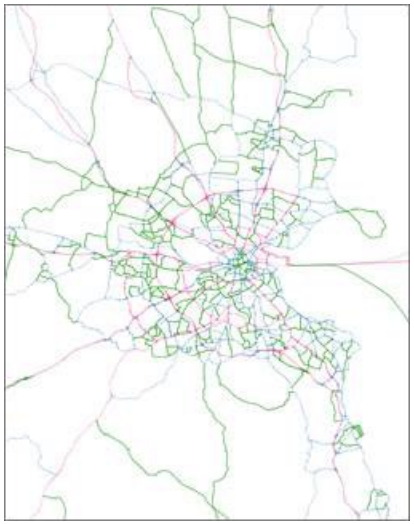
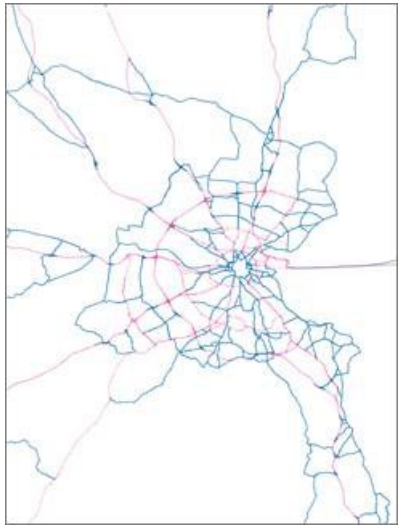
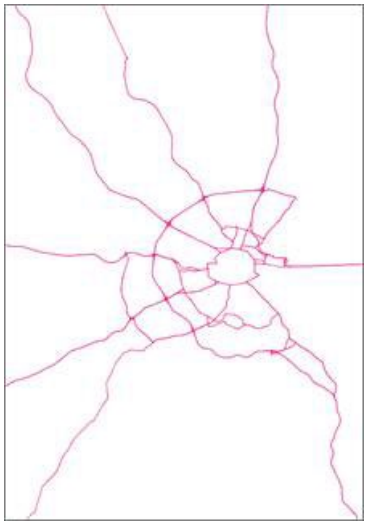
6.2.4.4 Defining the Sensitivity of the Environment

The impact assessment sensitivities established for the Traffic and Transport Chapter have been informed using the following data sources:

- OpenStreet Map – to identify community facilities, and open spaces within 50m of the Proposed Scheme; and
- The LAM (NavStreets) and Google Traffic data – to identify the capability of roads to cater for traffic volumes and existing congested junctions / road links.

The content of Table 6.3 outlines the two sets of sensitivity ratings that have been applied to the impact assessments, depending on whether the assessment location is within the direct or indirect study area.

Table 6.3: BusConnects Traffic and Transport Sensitivities

Assessment Area	Sensitivity			
	High	Medium	Low	Negligible
Proposed Scheme / Direct Study Area Sensitivities	Sections of the Proposed Scheme that are in the vicinity of community facilities such as schools or colleges, neighbourhood centres; and currently experiencing congestion for pedestrians, cyclists, buses or general traffic	Sections of the Proposed Scheme that currently experience congestion for pedestrians, cyclists, buses or general traffic that have not been identified as high sensitivity	Sections of the Proposed Scheme near public open space, nature conservation areas, residential areas that have not been identified as medium or high sensitivity	Areas of low sensitivity to traffic flows i.e. isolated sites or areas with a high standard road network
Indirect Study Area Sensitivities	Category 5: Low capacity, low operating speeds. Local and minor roads. (shown in grey) 	Category 4: High capacity, moderate operating speeds. Roads connecting between neighbourhoods. (shown in green) 	Category 3 roads: *High capacity, high* operating speeds (less than Category 2). Roads connecting Category 2 roads. (shown in blue) 	Category 1: High capacity, high operating speeds. Roads connecting between major cities or urban areas; and Category 2: Roads connecting Category 1 roads, enabling high capacity through and between cities (shown in red) 

6.2.4.5 Determining the Significance of Effects

The Significance of Effects rating has been established using Table 6.4, which was derived from Figure 3.5 of the EPA Guidelines on EIARs. This enables the sensitivities and magnitudes of impact to determine the significance of a particular impact. For example, a section of a Proposed Scheme with a high sensitivity and a long-term medium positive impact would have a predicted 'Positive, Very Significant and Permanent' impact. A section of a Proposed Scheme with a low sensitivity and a short-term low negative impact would have a predicted 'Negative, Slight and Temporary' impact.

Table 6.4: Significance of Effects Matrix for Traffic and Transport Chapter

		Sensitivity of Existing Environment			
		High	Medium	Low	Negligible
Description Impact	High	Profound	Very Significant	Moderate	Slight
	Medium	Very Significant	Significant	Moderate	Not Significant
	Low	Moderate	Moderate	Slight	Not Significant
	Negligible	Not Significant	Not Significant	Not Significant	Imperceptible

The definitions for the Significance of Effects ratings for the Proposed Scheme ranging from Imperceptible to Profound are outlined in Table 6.5.

Table 6.5: EIAR Impact Significances

Significance of Effects (EPA)	Typical Criteria Descriptors
Imperceptible	An effect capable of measurement but without significant consequences.
Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics

Potential mitigation and monitoring measures have been considered for assessments that result in a negative impact of significant or higher (i.e. significant, very significant or profound).

6.2.5 Data Collection and Collation

The assessment of the Traffic & Transport impacts of the proposed scheme has two distinct parts, namely, qualitative methods which consider the physical changes to transport networks and quantitative methods which are based upon traffic modelling. The following sections describe the data collection and collation for each method of assessment.

6.2.5.1 Qualitative Assessment Data Collection

This section discusses the data collection undertaken to inform the qualitative assessment metrics set out in Section 6.2.4.

6.2.5.1.1 Site Surveys

A walkover of the route of the Proposed Scheme was undertaken and photographs were used to record locations of particular importance. This ensures an up to date record of the existing environment was used to complete the qualitative assessment. The surveys focused on the following aspects which are relevant to the assessment:

- Provision for the movement of pedestrians, cyclists and vehicles;
- Location of, and facilities at, bus stops; and
- Existing parking and loading facilities.

These surveys were supplemented by specially commissioned aerial orthophotography along the full length of the Proposed Scheme.

6.2.5.1.2 Mapping Data

Three sources of mapping data have been used to inform the analysis, Ordnance Survey Mapping (OSM), NavStreets and OpenStreet Map.

OSM is created by Ordnance Survey Ireland which provides detailed mapping for a variety of uses. For the Traffic and Transport Chapter OSM has been used to establish accurate road naming and the location of physical highway features.

NavStreets is a street-level GIS dataset which covers the Republic of Ireland, including the Greater Dublin Area. Two sets of data from this dataset have been used to inform the EIAR:

- Road Network: Functional Class of each road link in the road network, which is a road type indicator, reflecting traffic speed and volume, as well as the importance and connectivity of the road. The Functional Class information has been used to help inform the metrics for identifying the sensitivities of roads in the indirect study area.
- Points of Interest: NavStreets contains information on a wide range of “points of Interest”. This has been referred to when identifying sensitive community receptors, such as schools, healthcare facilities, places of worship, retail clusters, etc, when determining how sensitive a particular location is to changes in terms of traffic and transport facilities.

OSM and NavStreets have been supplemented by OpenStreet Map which is an open source database of geographic data (i.e. Points of Interest, Land Use and Places of Worship). This has been used to further identify community facilities and open spaces in proximity to the Proposed Scheme.

6.2.5.2 Quantitative Assessment Data Collection

This section discusses the data collection undertaken to inform the quantitative assessment metrics set out in Section 6.2.4. Further detail can be found in Appendix A6.2 (Transport Modelling Report) of Volume 4 of this EIAR.

6.2.5.2.1 Existing Data Review (Gap Analysis)

A review of existing traffic survey data available for the area of interest was undertaken from the following sources:

- NTA Traffic Count Database: A mixture of Automatic Traffic Counts (ATC) and Junction Turning Counts (JTC) from previous studies covering a range of years; and
- TII Counters: Permanent TII ATCs located on national strategic roads across the network with data publicly available online.

The NTA, Dublin City Council and the other local authorities undertake periodic counts within their administrative areas in connection with their own local schemes. These surveys are conducted throughout the year and a limited set of data was available within the area of the Proposed Scheme.

Information on bus passenger volumes was already available and included in the modelling process as part of the ERM base model calibration and validation, which includes the annual canal (Royal and Grand Canals) and M50 cordon counts as well as ticketing data.

6.2.5.2.2 Commissioned Traffic Survey Data

Due to the scale of the CBC Infrastructure Works, the Proposed Scheme required a full set of consistent updated traffic counts for a neutral period e.g. November / February when schools, colleges were in session. Traffic surveys were undertaken in November 2019 and February 2020 (Pre-Covid) with the surveyed counts used as inputs to the model calibration and validation process of the strategic model and micro-simulation model. The two types of counts used in the study are Junction Turning Counts (JTCs) and Automatic Traffic Counts (ATCs).

6.2.5.2.2.1 Junction Turning Counts (JTCs)

The JTCs are 24-hour counts broken down into 15-minute segments over a full day. All main junctions along the Proposed Scheme have been included and provide information on the volume, and types of vehicles, making turning movements at each location. This data is utilised within the models to ensure that the flow of vehicles through the main junctions on the network is being represented accurately.

6.2.5.2.2.2 Automatic Traffic Counts (ATCs)

The ATC data provides information on:

- The daily and weekly profile of traffic along the Proposed Scheme; and
- Busiest time periods and locations of highest traffic demand on the network.

The ATCs were taken for an entire week. A summary of the collected data can be found in Appendix A6.1 (Transport Impact Assessment Report) of Volume 4 of this EIAR.

6.2.5.2.3 Road and Bus Journey Time Data

6.2.5.2.3.1 Bus Journey Time Data

Bus Journey Time data for the Proposed Scheme was provided by the NTA from the Automatic Vehicle Location (AVL) dataset used to monitor bus performance. The data provides information on bus travel time and dwell times at existing bus stops and has been used to inform the development of the transport models used to assess the impacts of the Proposed Scheme.

6.2.5.2.3.2 TomTom Road Journey Time Data

Road Journey time data for the Proposed Scheme models has been sourced from TomTom, who calculate journey times using vehicle position data from GPS-enabled devices and provide this on a commercial basis to a number of different users. The NTA purchased a license to access the anonymised Custom Area Analysis dataset through the TomTom TrafficStats portal. The NTA has an agreement with TomTom to provide travel time information covering six areas of Ireland and for certain categories of road.

Data is provided based on the area specified by the agreement; however, the date and time range of the data can be specified by the user. For the development of the strategic model and micro-simulation models the following query on the data was applied:

- 2019 weekdays (Monday to Thursday) from mid-January until end of November, excluding all public / bank holidays and days close to those dates.

The data is provided in the form of a GIS shapefile and accompanying travel time database file. The shapefile contains topographical details for each road segment, which is linked to the travel time database via a unique link ID. The database file then contains average and median travel time, average and median speed, the standard deviation for speed, the number of observations and percentile speeds ranging from 5th to 95th for each link.

6.2.5.2.3.3 TomTom Data Processing

In order to compare the journey times of specific links and routes between the TomTom data and the road assignment models, the two datasets were linked. After importing both the road assignment model and TomTom networks into the GIS environment, ensuring both datasets are in the same coordinate system, the selected routes were then linked using a spatial join functionality.

Before applying the data to the models, it was checked to ensure that it was fit for purpose. The review included checks of the number of observations that form the TomTom average and median times and checks of travel times against Google Maps travel times.

The TomTom Custom Area Analysis dataset was processed to provide observed journey times against which the strategic and micro-simulation models could be validated along the Proposed Scheme route.

6.2.5.2.3.4 TomTom Data Application

The processed journey time data was used to validate the LAM and the micro-simulation models at an end-to-end travel time level, with intermediate segment travel times used to inform the calibration of both models. Further information about the journey time validation process can be found in Appendix A6.2 (Transport Modelling Report) of Volume 4 of this EIAR.

6.3 Baseline Environment

6.3.1 Overview

This Section provides an overview of the existing traffic and transport conditions within the redline boundary of the Proposed Scheme. The baseline conditions have been informed by several site visits of the local environment, comprehensive traffic surveys, and a desktop review of the most recent aerial photography.

Overall cycling infrastructure provision on the corridor consists of 30.5% cycle priority westbound / outbound (9.9% cycle track, 20.6% cycle lane), with 21.2% eastbound / inbound (9.9% cycle track, 11.4% cycle lane).

Bus services along the Proposed Scheme currently operate within a constrained and congested environment, with 67% priority westbound / outbound and 77% priority eastbound / inbound on the corridor. An examination of Automatic Vehicle Location (AVL data, collected by the NTA) indicates that the current standard deviation for journey times of buses on the corridor is 10 minutes. With any further increases in traffic levels, this variability of bus speeds is expected to be exacerbated, thus impacting further on bus passengers. In addition, longer and less reliable bus services will require operators to use additional buses to maintain headways to fill gaps created in the timetable. Aligned to this, the small number of remaining sections of unprioritised bus network at key locations can lead to bunching of buses which, in turn, means stops can become overcrowded, creating delays in boarding and alighting and an unbalanced use of bus capacity.

In describing the baseline conditions, the scheme has been divided into three sections. These sections are outlined as follows and are illustrated in Figure 6.1 and Figure 6.2a to Figure 6.2c in Volume 3 of this EIAR:

- Section 1 - N4 Junction 3 to M50 Junction 7 – N4 Lucan Road – N4 Lucan Road;
- Section 2 - M50 Junction 7 to R148 Con Colbert Road – Palmerstown bypass and Chapelizod bypass; and
- Section 3 – R148 Con Colbert Road to City Centre (Frank Sherwin Bridge) – Con Colbert Road and St John's Road West.

6.3.2 Section 1 – N4 Junction 3 to M50 Junction 7 – N4 Lucan Road

This Section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 1 of the Proposed Scheme.

Section 1 of the Proposed Scheme is approximately 2.8km in length and begins at Junction 3 of the N4 Lucan Road at the R835 Lucan Road / R136 Ballyowen Road junction and ends at the crossing with the M50 at Junction

7. It passes Ballydowd to its south, Hermitage Golf Club to its north, and Liffey Valley Shopping Centre to the south before Junction 7 with the M50. In addition, Section 1 of the Proposed Scheme includes Hermitage Road, which it is proposed will be designated as a 'Quiet Street, to provide an alternative link between the Hermitage Estate and the two-way facility on the north side of the N4, via the existing shared bridge by the Mount Andrews Estate / St Loman's Hospital.

The Liffey Valley Shopping Centre (LVSC) is one of the key attractors along this section for pedestrians, cyclists, buses, and private and service vehicles. It is located to the south of the Proposed Scheme and can be accessed by pedestrians and cyclists via a shared overbridge over the N4, which connects Old Lucan Road, and eastbound bus stops on the N4 to the LVSC. There is no direct road access to the LVSC from the N4. Vehicles travelling to and from LVSC primarily do so from N4 Junction 2 and R113 Fonthill Road North.

6.3.2.1 Pedestrian Infrastructure

In general, and in relation to the surrounding land use, the pedestrian facilities along Section 1 of the Proposed Scheme are considered to be adequate, in accordance with DMURS.

For the majority of its length on this section, N4 Lucan Road has continuous shared cycle / footways of approximately 2.0m – 3.0m in width on both sides of the road with street lighting columns situated along the carriageway at approximately 40.0m intervals. Although the standard width for a shared facility is 3m, given the low numbers of pedestrians likely to walk alongside the N4, this provision is still considered to be adequate.

The R136 Ballyowen Road has a footpath of approximately 2.0m wide on the eastern side of the road, leading to a footbridge over the N4. Hermitage Road has footpaths of approximately 1.8m wide on both sides of the road with street lighting and there is pedestrian link between Hermitage Road and Ballyowen Lane through Hermitage Park.

The location of controlled and uncontrolled pedestrian crossings along Section 1 of the Proposed Scheme are shown in Figure 6.3a in Volume 3 of this EIAR.

Controlled or grade-separated crossing facilities can be found at the following locations:

- There are four cross-carriageway bridges throughout the extent of Section 1 of the Proposed Scheme:
- The first is located on the eastern side of the R136 Ballyowen Road, as it crosses over the N4 carriageway. This is a separate structure to the road bridge, and runs alongside the road bridge. The usable width of the bridge is 3m, which is wider than the 2m footways to the north and south;
- The Mount Andrew Estate overbridge is located in the midsection, connecting to the inbound bus stop at the bridge and the shared foot/cycle path along the northern side of the N4. The shared cycle / pedestrian bridge is accessed via ramps, and has a useable width of 2m, which is below the standard 3m width for shared facilities; and
- Lastly, a shared cycle / pedestrian bridge crosses the N4 Lucan Road between The King's Hospital School and Liffey Valley Shopping Centre, which also provides a connection to the inbound bus stops on the southern side of the N4. The bridge is accessed from the north side by ramps, and from the south side by ramps and steps. It has a useable width of 2m, which is below the standard 3m width for shared facilities.
- There are signalised crossings on two out of three arms of the R835 Lucan Road / R136 Ballyowen Road; the R835 Lucan Road East arm with a three-stage staggered crossing and the R136 Ballyowen Road arm with a four-stage crossing;
- There is a signalised pedestrian crossing of the N4 Lucan Road westbound off-slip at the junction with the R136 Ballyowen Road;
- There is a signalised pedestrian crossing of the Hermitage Road arm at the junction with the R136 Ballyowen Road; and
- There is a signalised crossing at the end of the inbound off-slip at N4 Junction 2 (at the R113 Fonthill Road North / N4 on/off-slips four-arm roundabout), leading to the Hermitage Medical Clinic.

There are also several uncontrolled pedestrian crossings along Section 1 of the Proposed Scheme which benefit from tactile paving and dropped kerbs.

6.3.2.2 Cycling Infrastructure

There are cycle lanes in both directions on the R136 Ballyowen Road between the N4 overbridge and R835 Lucan Road. Across the overbridge itself there are no cycle facilities, apart from an advanced stop line on the southbound direction. Between Hermitage Road and the N4 overbridge, there is a southbound 1.5m wide on-road cycle lane, but no northbound cycle facilities.

On the R835 Lucan Road, between the R136 Ballyowen Road junction and the N4, there is a short eastbound section of shared bus / cycle lane immediately to the east of the junction.

From the roundabout with Lucan Retail Park Car Park, there is a shared facility for pedestrians and cyclists along the northern side of the on-slip to the N4 Lucan Road. This continues alongside the N4 Lucan Road carriageway, between R835 Lucan Road and R113 Fonthill Road North, and varies between 2m and 3m in width. The standard width for a shared facility is 3m.

Heading westbound from the R113 Fonthill Road North, there is a shared facility for pedestrians and cyclists adjacent to the N4 Lucan Road. This runs as far as Mount Andrew Estate overbridge, beyond which an on-road cycle lane continues westbound along the N4 Lucan Road off-slip (R136 Ballyowen Road exit).

The remainder of this section between the R113 Fonthill Road North and the M50 interchange has both eastbound and westbound bus lanes but no dedicated cycle facilities. An off-road cycle track passes over the M50 via the shared pedestrian / cycle bridge, connecting the Liffey Valley Shopping Centre with Old Lucan Road to the north-east of M50 Junction 7.

There are no signal controlled crossing facilities for cyclists at any junctions within Section 1. Ten bike lockers are located on the northern footway to the west of the R835 Lucan Road / R136 Ballyowen Road junction. Five ‘Sheffield’ cycle stands are located at Bus Stop 2234, 80m to the east of the same junction.

The existing cycle facilities along Section 1 of the Proposed Scheme are illustrated in Figure 6.4a in Volume 3 of this EIAR.

6.3.2.3 Bus Infrastructure

6.3.2.3.1 Bus Priority Measures

Dedicated bus lanes are present at the following locations:

- On R136 Ballyowen Road southbound between the N4 overbridge and Hermitage Road;
- On R136 Ballyowen Road northbound across the N4 overbridge;
- On R136 Ballyowen Road between the N4 eastbound off-slip and R835 Lucan Road, where 80m-long northbound and southbound bus lanes are present;
- On the N4 Lucan Road eastbound between the R136 Ballyowen Road and the M50 interchange;
- On the N4 Lucan Road eastbound off-slip heading towards the Fonthill Interchange; and
- On the N4 Lucan Road westbound from the M50 interchange to a point 700m to the east of the R136 Ballyowen Road slip road.

6.3.2.3.2 Bus Stop Facilities

There are currently nine bus stops throughout Section 1 of the Proposed Scheme. Four of these stops are located along the N4 Lucan Road eastbound, inbound to the City Centre, and five are on the westbound, outbound side. The inbound stops are:

- Stop 2234, on R835 Lucan Road at the Lucan Retail Park, 90m from Ballyowen Road;
- Stop 2236 on N4 Lucan Road close to Mount Andrew Court;

- Stop 5056 on the R113 eastbound off-slip; and
- Stop 2239 on N4 Lucan Road at the Liffey Valley Centre.

The outbound stops are:

- Stop 2213, on N4 Lucan Road at the Liffey Valley Centre;
- Stop 2214 on N4 Lucan Road close to Toyota Liffey Valley;
- Stop 2215 on N4 Lucan Road at St Loman's Hospital;
- Stop 2216 on N4 Lucan Road at Ballyowen Lane; and
- Stop 4599 on the R136 off slip.

Table 6.6 outlines the availability of bus stop facilities at the existing nine bus stops along Section 1 of the Proposed Scheme.

Table 6.6: Section 1 – Availability of Bus Stop Facilities (of a Total Nine Bus Stops)

Bus Stop Facility	Number of Bus Stops in Baseline with Facility	Percentage of Bus Stops in Baseline with Facility
RTPI	3	33%
Weekly Timetable information	8	89%
Shelter	7	78%
Seating	5	56%
Accessible Kerbs	8	89%
Indented Drop Off Area	5	56%

In total, 78% of bus stops have a shelter, and 89% of stops have accessible kerbs. A third of stops provide Real Time Passenger Information (RTPI). RTPI provision in the area is concentrated in areas of greater footfall, i.e. Lucan Retail Park and Liffey Valley Shopping Centre.

The existing bus facilities along Section 1 of the Proposed Scheme are in Figure 6.5a in Volume 3 of this EIAR. The bus services that operate along Section 1 are outlined in Table 6.7.

Table 6.7: Section 1 – Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
C1	Sandymount, Lucan, Ballyowen, Adamstown	20 minutes	30 minutes
C2	Sandymount, Palmerstown, Lucan, Ballyowen, Adamstown	20 minutes	30 minutes
C3	Ringsend, Palmerstown, Lucan, Leixlip, Maynooth	30 minutes	30 minutes
C4	Ringsend, Palmerstown, Lucan, Celbridge, Maynooth	30 minutes	30 minutes
C5	Ringsend, Chapelizod, Lucan, Leixlip, Maynooth	5 services (all between 0:35 and 4:35)	5 services (all between 0:35 and 4:35)
C6	Ringsend, Chapelizod, Lucan, Celbridge, Maynooth	5 services (all between 0:05 and 4:05)	5 services (all between 0:05 and 4:05)
X25	Bellfield, Donnybrook, Lucan, Maynooth	3-5 services	No Services
X26	Maynooth, Leixlip, Lucan, Smithfield, Dublin City South	3 services (all between 7:10 and 7:40)	No Services

Service	Route	Typical Service Frequency	
		Weekday	Weekend
X28	Bellfield, Donnybrook, Lucan, Celbridge	5 Services	No Services
P29	Ringsend, Palmerston, Ballyowen, Lucan, Adamstown	4 Services	No Services
X30	Bellfield, Donnybrook, Ballyowen, Lucan, Hillcrest	2 Services	No Services
X31	Dublin City South, Palmerstown, Lucan, Leixlip, Louisa Valley	3 Services	No Services
120	Connolly Station, Lucan, Straffan, Clane, Derrintum, Edenderry	30 minutes	30 minutes
B120	Connolly Station, Celbridge, Straffan, Clane, Newbridge	3 Services	2 Services
F120	Connolly Station, Liffey Valley, Clane, Prosperous, Newbridge	1 Service	No Services
X120	Connolly Station, Liffey Valley, Clane, Prosperous, Derrintum, Edenderry	2 Services	No Services
845	Birr, Kilcormac, Tullamore, Lucan, Donnybrook, Bellfield	4 Services	No Services
847	Portumna, Mucklagh, Maynooth, Lucan, Dublin, Donnybrook, Bellfield	1 Service	1 Service

The bus stops in this section serve Dublin Bus, Bus Éireann (BÉ), and BÉ Expressway routes, providing access to Heuston Station, Merrion Square, and express access to University College Dublin (UCD). There are regional services also available, linking this section to Mullingar, Ballina, and Sligo.

6.3.2.4 General Traffic

The main road junctions within Section 1 of the Proposed Scheme are:

- R136 Ballyowen Road / Hermitage Road;
- R136 Ballyowen Road / N4 westbound on / off-slip roads;
- R136 Ballyowen Road / N4 eastbound off-slip road;
- R136 Ballyowen Road / R835 Lucan Road;
- R835 Lucan Road / Lucan Retail Park / Hermitage Golf Club roundabout;
- R835 Lucan Road / N4 Lucan Road;
- N4 Lucan Road / Liffey Valley; and
- N4 Lucan Road / M50 Junction 7.

The characteristics of each major junction is described in turn below, alongside satellite images which are extracts from Figure 6.6 in Volume 3 of this EIAR.

R136 Ballyowen Road / Hermitage Road three-arm signalised junction: The R136 Ballyowen Road North arm has two traffic lanes and an on-road cycle lane approaching the junction. The inside lane is a bus lane until approximately 25.0m before the stop line where it permits left turning vehicles onto Hermitage Road. The right lane is for ahead movements. There are two lanes exiting the junction onto this arm. The approach and exit lanes are separated by a central reservation.

The R136 Ballyowen Road South arm has three traffic lanes and an on-road cycle lane approaching the junction. The inside lane is a bus lane and the middle lane is for general traffic ahead movements. The right lane is a flare lane of approximately 40.0m long and has a separate signal phase to the ahead movements. There is a storage box in the centre of the junction for right turners. There are two traffic lanes and a cycle lane exiting the junction onto this arm. The approach and exit lanes are separated by a central reservation.

The Hermitage Road arm has one lane approaching and exiting the junction which are separated at the stop line by a traffic island.

In the centre of the junction there are two yellow boxes which sit across the R136 Ballyowen Road northbound and southbound general traffic lanes. These characteristics are illustrated by Image 6.1.

Image 6.1: R136 Ballyowen Road / Hermitage Road Junction

R136 Ballyowen Road / N4 westbound on / off-slip roads: Travelling north on the R136 Ballyowen Road towards Lucan Retail Park, the road firstly connects with the on and off slip roads of the N4 westbound carriageway at a signalised junction.

The R136 Ballyowen Road North is a bridge over the N4 approximately 80m in length and has two lanes approaching the junction, the left lane for ahead movements and the right lane for right turn movements onto the N4 Lucan Road on-slip. There are two lanes exiting the junction onto this arm, the inside of which is a bus lane. There is an advanced stacking location for cyclists on this arm.

The R136 Ballyowen Road South arm has two lanes approaching the junction, the right lane for ahead movements and the left lane for left turn movements onto the N4 Lucan Road on-slip. There are two lanes exiting the junction onto this arm, the inside of which is a bus lane.

The N4 Lucan Road off-slip is one-way travelling westbound and has three lanes approaching the junction, the left of which is for left turn movements onto the R136 Ballyowen Road South and is controlled by a separate signal head, and the centre and right lanes for ahead and right turn movements respectively controlled by the same signal head. There is an advanced stacking location for cyclists on this arm.

The N4 Lucan Road on-slip is one-way comprising two lanes which join the N4 Lucan Road travelling eastbound. There is a yellow box in the centre of the junction. This junction is shown in Image 6.2.

Image 6.2: R136 Ballyowen Road / N4 westbound on / off-slip roads Junction

R136 Ballyowen Road / N4 eastbound off-slip road: The R136 Ballyowen Road then connects with the eastbound off-slip of the N4 at a signalised junction at the northern end of the bridge. The northern approach to this junction has two 3.5m wide lanes and a cycle lane which ceases at the junction. A cycle lane also commences at the southern approach to the junction and continues into the northern exit arm. This junction is shown in Image 6.3.

Image 6.3 R136 Ballyowen Road / N4 eastbound off-slip road Junction

R136 Ballyowen Road / R835 Lucan Road three-arm signalised junction: At the north-west periphery of the Retail Park, R136 Ballyowen Road meets R835 Lucan Road with a two-way carriageway approximately 12.5m in width. This width increases towards the mouth of the junction on the northbound approach as two arms split to offer left and right-hand turns. Each of these turning lanes are approximately 3.5m in width and are influenced by toucan crossings at the signalised junction.

From the perspective of the eastbound approach to this junction, there is a three-arm entry to the junction. The central lane is approximately 2.5m in width and provides a continuation eastbound. The right-turn lane is also 2.5m in width and is a feeder lane approximately 20m in length. The northern-most lane is a bus lane which surpasses the aforementioned junction along its own alignment by approximately 20m and is controlled by a separate signal and toucan crossing.

On the westbound approach to this junction, the approximately 3.5m wide single-lane carriageway provides left-turn access to R136 Ballyowen Road via a slip lane approximately 4.0m in width, adjacent to a 1.5m cycle lane. The surrounding approaches to this junction are subject to 50km/h speed limits.

The existing junction layouts surrounding Lucan Retail Park are illustrated in Image 6.4.

Image 6.4: R136 Ballyowen Road / R835 Lucan Road Junction

R835 Lucan Road / Lucan Retail Park priority roundabout: R835 Lucan Road has a two-lane approach to the roundabout, with the Retail Park arm and public road arm to the east (which provides access to Hermitage Golf Club) each comprising a single lane on approach. The eastbound off-slip to the N4 forms the eastern arm of the roundabout, and is a one-way exit. This junction is shown in Image 6.5.

Image 6.5 R835 Lucan Road / Lucan Retail Park Priority Roundabout Junction

R835 Lucan Road / N4 Lucan Road: The R835 Lucan Road enters the N4 Lucan Road eastbound carriageway via an approximately 5.0m wide slip lane. A merging lane severs the preceding bus lane for a length of approximately 160m before returning to bus lane.

The N4 Lucan Road then assumes a three-lane carriageway in addition to a bus lane in both directions, with a total width of 13.0m to 14.0m in width. Along the westbound side of the carriageway, there is an additional lane segregated from the main N4 Lucan Road carriageway by bollards, which continues south-west, ending at the

Junction 3 exit from the N4 Lucan Road onto R136 Ballyowen Road. The N4 Lucan Road carriageway is subject to a speed limit of 80 km/h.

The existing layout of this junction is illustrated in Image 6.6.

Image 6.6: R835 Lucan Road / N4 Lucan Road Junction

N4 Lucan Road / Liffey Valley: Following the eastbound alignment of this section, there are four points of entrance and exit to provide access to Liffey Valley and Fonthill to the south. On the eastbound approach, there is an approximately 260m slip exit, comprising of a single-lane carriageway in addition to bus and cycle lane, to a total width of approximately 7.0m. Upon re-entry to the N4 Lucan Road alignment on the eastbound approach, a single-lane carriageway of approximately 4.0m in width severs the preceding bus lane for approximately 170m before returning to bus lane.

These junctions are illustrated in Image 6.7 and Image 6.8.

Image 6.7: N4 Lucan Road and Liffey Valley Eastbound Junctions, West Section

Image 6.8: N4 Lucan Road and Liffey Valley Eastbound Junctions, East Section

On the westbound approach, a single-lane exit of approximately 3.5m splits into two arms to provide left and right-hand turns via the subsequent roundabout. Upon re-entry to the N4 Lucan Road along the westbound alignment, a 4.0m lane merges with the carriageway following a relatively short slip lane of approximately 50m. This severs the bus lane for a distance of 140m.

These junctions are illustrated in Image 6.9 and Image 6.10.

Image 6.9: N4 Lucan Road and Liffey Valley Westbound Junctions, East Section

Image 6.10: N4 Lucan Road and Liffey Valley Westbound Junctions, West Section

N4 Lucan Road / M50 Junction 7: Along the final extent of this section, the radial alignment of the N4 Lucan Road traverses the M50 to become the R148 Palmerstown/Chapelizod Bypass. On the eastbound approach, the typical three-lane and bus lane carriageway splits into a four-arm and bus lane entry to Junction 7. The two right-most of these lanes provide southbound access to the M50, while the two left-most lanes provide cross-carriageway access to the R148 Chapelizod Bypass. This two-lane carriageway is approximately 7.5m in width, widening to approximately 11m along the 140m merging area from M50 northbound traffic.

This junction is illustrated in Image 6.11.

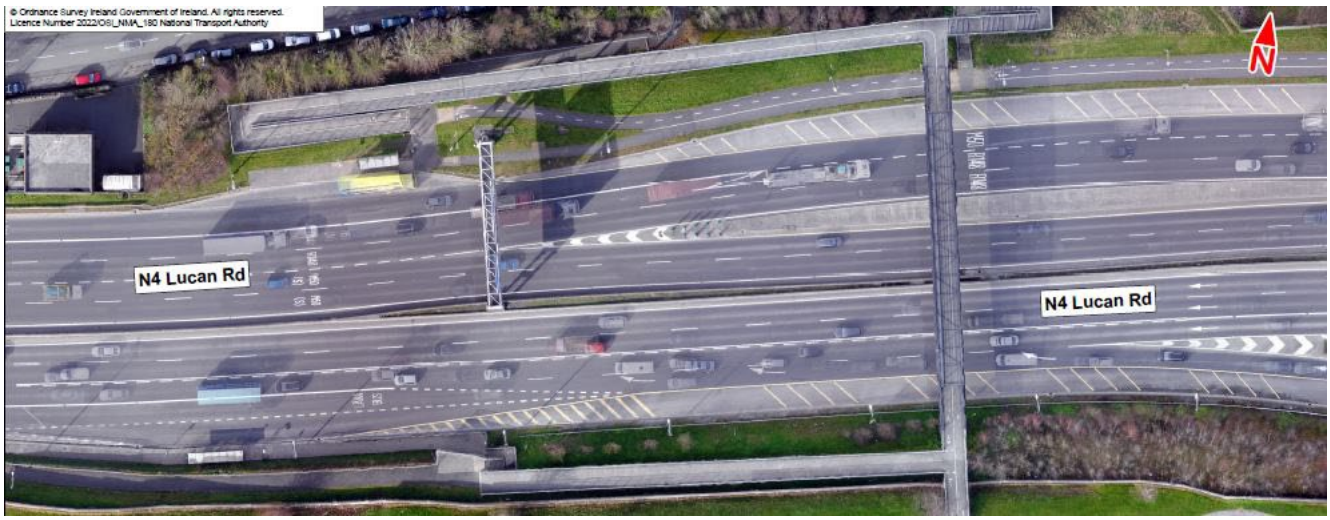


Image 6.11: N4 Lucan Road / M50 Junction 7 Eastbound Junctions

On the westbound approach a two-lane carriageway crosses the M50 carriageway at Junction 7 from R148 Chapelizod Bypass. This widens to approximately 11m when M50 southbound traffic merges with its alignment. From this merge point, three lanes are maintained for a distance of 285m, before the left-most lane is given bus priority. Following this westbound crossing of the M50, its northbound traffic merges with the N4 Lucan Road westbound alignment, breaking the preceding bus lane for a distance of 115m before it is resumed.

The existing layouts of these junctions are illustrated in Image 6.12 and Image 6.13.

Image 6.12: N4 Lucan Road / M50 Junction 7 Westbound Junctions, East Section

Image 6.13: N4 Lucan Road / M50 Junction 7 Westbound Junctions, West Section

6.3.2.5 Existing Car Parking / Loading

There is no parking or loading directly on the N4 Lucan Road. On Hermitage Road, there is informal residential parking along the kerb, however, most residential properties have private off-street parking in driveways.

On Old Lucan Road between the R113 Fonthill Road North and the M50 Interchange, there is currently the following parking provision:

- There are currently approximately 78 informal, unmarked parking spaces on the south side of Lucan Old Road in the vicinity of the Deadman's Inn. The parked cars in this location appear to comprise primarily of customers accessing the nearby commercial / restaurant land uses, but also include commuters either parking to use bus services, or to car share with other drivers.
- Approximately 50 parking spaces in the car park at The Deadman's Inn.
- A further 81 informal, unmarked, parking spaces are located on both sides of the Old Lucan Road, between the roundabout at Junction 2 of the N4 and the King's Hospital School. Observations suggest that parked vehicles appear to relate to either commuters using the bus services on the N4, or customers accessing the Liffey Valley Shopping Centre via the footbridge.

6.3.3 Section 2 – M50 Junction 7 to R148 Con Colbert Road – Palmerstown bypass and Chapelizod bypass

This section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 2 of the Proposed Scheme, between Junction 7 of the M50 and its junction with the R148 Con Colbert Road, in the vicinity of Kilmainham. This section is approximately 4.8km in length and runs along R148 Palmerstown Bypass and Chapelizod Bypass, traversing the M50 and passing through Palmerstown, which lies to the north and south. The route then bypasses Chapelizod to the north, as well as Ballyfermot, and Inchicore to the south, before ending at the R833 Con Colbert Road junction to Kilmainham / Inchicore.

6.3.3.1 Pedestrian Infrastructure

In relation to the surrounding land use, the pedestrian facilities along Section 2 of the Proposed Scheme are considered to be adequate and reflect the inter-urban nature of much of the route. Eastbound from the M50, there is no footpath provision along the R148 Palmerstown Bypass until the road meets Kennelsfort Road Upper / Lower, where it provides access to the northern and southern portions of Palmerstown Village. Eastbound from Kennelsfort Road Upper / Lower, there is a footpath on the southern side of the R148 Chapelizod Bypass up to The Oval.

Between The Oval and the R112 Lucan Road off-slip, there are footpaths of approximately 2.0m wide on both sides of the road. Beyond which, there are no further footpath facilities directly alongside the R148 Chapelizod Bypass for the remainder of Section 2 of the Proposed Scheme.

Along Old Lucan Road which runs parallel to the R148 Palmerstown Bypass on the northern side, there are footpaths of approximately 2.0m on both sides of the road.

The section of footpath on the northern side of the carriageway between Old Lucan Road at the eastern end of Palmerstown Village and the R112 Lucan Road is approximately 3.0m wide and is a shared facility for pedestrians and cyclists.

There are several pedestrian crossings along Section 2 of the Proposed Scheme, both signalised and uncontrolled. Controlled or grade-separated crossing facilities can be found at the following locations:

- There is a cross-carriageway shared pedestrian / cycle bridge over the M50 to the north of the M50 interchange, connecting Old Lucan Road. It has a compliant usable width of 3m.
- Another cross-carriageway pedestrian bridge provides north-south movement from Palmerstown Village to the residential areas south of the R148 Palmerstown Bypass, perpendicular to the Kennelsfort Road Upper / Lower Junction;
- At the R148 Palmerstown Bypass / Kennelsfort Road Lower junction, signalised pedestrian crossing facilities are provided across Kennelsfort Road Lower, and the eastern arm of the R148.
- At the R148 Palmerstown Bypass / The Oval junction, signalised pedestrian crossing facilities are provided across the eastern arm of the R148. Crossings across Old Lucan Road and The Oval are uncontrolled.
- There is a cross-carriageway pedestrian bridge over the R148 Chapelizod Bypass approximately 400m west of the R833 Con Colbert Road, linking the Liffey Valley Tow Path with the Liffey Gaels Park and residential / commercial amenities of Ballyfermot and Inchicore.

There are also several uncontrolled pedestrian crossings along Section 2 of the Proposed Scheme which benefit from tactile paving and dropped kerbs.

The location of controlled and uncontrolled pedestrian crossings along Section 2 of the Proposed Scheme are shown in Figure 6.3b in Volume 3 of this EIAR.

6.3.3.2 Cycling Infrastructure

Continuous shared bus / cycle lanes commence approximately 520m to the east of the M50 interchange and continue along the R148 Palmerstown / Chapelizod Bypass for the full length of Section 2 of the Proposed

Scheme. For a section of approximately 350m along the northern side of the R148 there is an off-road shared facility for pedestrians and cyclists between the eastern end of the Palmerstown Bypass and the western end of the Chapelizod Bypass.

There are no cycle facilities along Old Lucan Road or Kennelsfort Road Lower. There is a cycle lane on Kennelsfort Road Upper on the approach to the R148 junction. There are no cycle parking nor designated cycle hire scheme parking racks within Section 2 of the Proposed Scheme.

The existing cycle facilities along Section 2 of the Proposed Scheme are illustrated in Figure 6.4b in Volume 3 of this EIAR.

6.3.3.3 Bus Infrastructure

6.3.3.3.1 Bus Priority Measures

The following bus priority measures are present:

- Dedicated bus lanes on the R148 Palmerstown / Chapelizod Bypass eastbound, commencing at a point 170.0m west of Kennelsfort Road Lower, and continuing to the R833 Con Colbert Road; and
- Dedicated bus lanes on the R148 Palmerstown / Chapelizod Bypass westbound, commencing at R833 Con Colbert Road, and continuing to a point 170.0m west of Kennelsfort Road Upper.

6.3.3.3.2 Bus Stop Facilities

There are currently five bus stops along Section 2 of the Proposed Scheme. The inbound stops are:

- Stop 2241 on R148 Palmerstown Bypass, 75m to the east of Kennelsfort Road Lower; and
- Stop 2242 on R148 Palmerstown Bypass, 60m to the east of the Lucan Road junction.

The outbound stops are:

- Stop 2201 on R148 Palmerstown Bypass, 50m to the west of the Parkway West filling station;
- Stop 7239 on R148 Palmerstown Bypass, 80m to the west of The Oval; and
- Stop 4401 on R148 Palmerstown Bypass, 60m to the east of Kennelsfort Road Upper.

Bus stops along Old Lucan Road (which runs parallel to R148 Palmerstown Bypass), and Kennelsfort Road Lower are as follows:

- Stop 4361 on Kennelsfort Road Lower, 80m to the north of R148 Palmerstown Bypass;
- Stop 2212 on Kennelsfort Road Lower, 120m to the north of R148 Palmerstown Bypass;
- Stop 4360 on Lucan Road, 10m to the west of Robin Villas;
- Stop 7165 on Lucan Road, 70m to the west of Robin Villas,
- Stop 4359 on Lucan Road, 30m to the west of Hollyville Lawn.
- Stop 4357 on Lucan Road, 140m to the west of Hollyville Lawn.

The level of facilities is detailed in **Table 6.8**.

Table 6.8: Section 2 – Availability of Bus Stop Facilities (of a Total Eleven Bus Stops)

Bus Stop Facility	Number of Bus Stops in Baseline with Facility	Percentage of Bus Stops in Baseline with Facility
RTPI	2	18%
Weekly Timetable information	9	82%
Shelter	4	36%

Bus Stop Facility	Number of Bus Stops in Baseline with Facility	Percentage of Bus Stops in Baseline with Facility
Seating	4	36%
Accessible Kerbs	5	45%
Indented Drop Off Area	0	0%

The level of facilities found at each bus stop is considered to be poor. Only 36% of stops have a shelter and / or seating, and less than 20% have real-time information.

The existing bus facilities along Section 2 of the Proposed Scheme are shown Figure 6.5b in Volume 3 of this EIAR. The bus services that operate along Section 2 are outlined in Table 6.9.

Table 6.9: Section 2 – Bus Service Frequency

Service	Route	Typical Service Frequency	
		Weekday	Weekend
C1	Sandymount, Lucan, Ballyowen, Adamstown	20 minutes	30 minutes
C2	Sandymount, Palmerstown, Lucan, Ballyowen, Adamstown	20 minutes	30 minutes
C3	Ringsend, Palmerstown, Lucan, Lexlip, Maynooth, Davidstown	30 minutes	30 minutes
C4	Ringsend, Palmerstown, Lucan, Celbridge, Maynooth	30 minutes	30 minutes
C5	Ringsend, Chapelizod, Lucan, Leixlip, Dodstown	5 services (all between 0:35 and 4:35)	5 services (all between 0:35 and 4:35)
C6	Ringsend, Chapelizod, Lucan, Cellbridge, Maynooth	5 services (all between 0:05 and 4:05)	5 services (all between 0:05 and 4:05)
18	Palmerstown, Ballyfermot, Crumlin, Ballsbridge, Sandymount	20 minutes	30 minutes
26	Merrion Square, Phoenix Park, Islandbridge, Chapelizod, Palmerstown, Liffey Valley	15 minutes	20 minutes
P29	Ringsend, Palmerstown, Ballyowen, Lucan, Adamstown	4 Services	No Services
D51	Dublin City, Ronanstown, Nangor, Clondalkin	1 Service	No Services
52	Ballina, Castlebar, Tuam, Eyre Square	3 hours	3 hours
A76	Tallaght, Clondalkin, Ronanstown, Palmerstown, Ballyfermont, Blanchardstown	7 Services	7 Services

The bus stops in this section serve Dublin Bus, Bus Éireann, and BÉ Expressway routes, providing access to Heuston Station, Merrion Square, Sandymount and express access to University College Dublin (UCD). There are regional services also available, linking this section to Mullingar, Ballina, and Sligo.

6.3.3.4 General Traffic

The existing major junctions along Section 2 of the Proposed Scheme comprise the following:

- M50 Junction 7 / R148 Palmerstown Bypass;
- R148 Palmerstown Bypass / Kennelsfort Road;
- Kennelsfort Road Lower / Old Lucan Road;
- R148 Palmerstown Bypass / The Oval;

- R148 Chapelizod Bypass / R112 Lucan Road;
- R148 Chapelizod Bypass / R112 Kylemore Road (Ballyfermot); and
- R148 Chapelizod Road / R833 Con Colbert Road.

The characteristics of each major junction is described in turn below, alongside satellite images which are extracts from Figure 6.6 in Volume 3 of this EIAR.

M50 Junction 7 / R148 Palmerstown Bypass: On the eastbound approach, the M50 provides access from the north via a single-lane, which is approximately 4.0m in width. From the south and western routes (M50 and N4, respectively), access is provided via a two-lane carriageway, approximately 6.5m in width. On the westbound approach, these dimensions and alignments are mirrored. This portion of the section is subject to 60km/h speed limits in both directions. The M50 Junction 7 / R148 Palmerstown Bypass is illustrated in Image 6.14.

Image 6.14: M50 Junction 7 / R148 Palmerstown Bypass Junction

R148 Palmerstown Bypass / Kennelsfort Road: The R148 Palmerstown Bypass intersection with Kennelsfort Road represents the most complex of junctions along this section. On the eastbound approach, Kennelsfort Road provides access to Palmerstown Village through a left-turn in the north, and the residential core of Palmerstown via right-turn in the south.

This access is facilitated by a four-arm carriageway on the eastbound side. With a total carriageway width of 15.0m on this side, the central two lanes provide onwards eastward movement at the signalised junction. The left-turn into Palmerstown Village is provided via one lane which severs the bus lane 50.0m prior to the junction. The traffic is signalised at a recess of 20.0m before the junction entrance.

The right-turn into south Palmerstown is facilitated by a feeder lane of 130.0m in length and is signalised separately from the left turn lanes.

The westbound approach turns onto Kennelsfort Road mirror that of the eastbound. Access to R148 Palmerstown Bypass from Kennelsfort Road is facilitated by a 3.0m wide slip lane from the south (adjacent to a 3.0m wide north-south lane along Kennelsfort Road). From the north, access to the R148 Palmerstown Bypass is facilitated by a two-arm carriageway, providing eastbound and westbound access via signalised junction. The Kennelsfort Road Junction is illustrated in Image 6.15.

Image 6.15: R148 Palmerstown Bypass / Kennelsfort Road Upper and Lower Junction

Kennelsfort Road Lower / Old Lucan Road: This is a simple priority junction, located 160m to the north east of the R148 Palmerstown Bypass / Kennelsfort Road junction. Kennelsfort Road Lower forms the minor arm. Each of the roads has a single lane approach, and yellow box markings are present across the whole junction. The Kennelsfort Road Junction is illustrated in Image 6.16.

Image 6.16: Kennelsfort Road Lower / Old Lucan Road Junction

R148 Palmerstown Bypass / The Oval: This junction on the eastbound progression of this section is located at the access to The Oval / Palmerstown Drive to the south and Lucan Road to the north. From the R148 Palmerstown Bypass, the right-turn to The Oval from the eastbound side is facilitated by a four-arm junction (including bus lane) approximately 14.0m in width. A right-turn signalised feeder lane approximately 100.0m in length provides flows into a single-lane entrance to The Oval and Palmerstown Drive. There is no entry to Lucan Road from the R148 Palmerstown Bypass as it is one-way.

From The Oval / Palmerstown Drive, left and right-hand turns are permitted through lanes approximately 3m in width. Both turns are signalised and influenced by the staggered toucan crossings on the eastern arm of the junction.

On the westbound approach of the section, left-turn access to The Oval is facilitated by a 3.5m width lane which forms part of a three-arm approach to the junction, severing a bus lane approximately 100m prior to the junction entrance. There is also a feeder lane approximately 30m in length. The Oval Junction is illustrated in Image 6.17.

Image 6.17: R148 Palmerstown Bypass / The Oval Junction

R148 Chapelizod Bypass / R112 Lucan Road: The R148 Chapelizod Bypass provides access to Chapelizod Village via a left-turn arm of approximately 70m on its eastbound approach. This arm is approximately 3.5m in width. This junction is shown in Image 6.18.

Image 6.18 R148 Chapelizod Bypass / R112 Lucan Road Junction

This portion of R148 Chapelizod Bypass is characterised by the express nature of the radial route, whereby there are few entrance / exits points, and no mid-point junctions or interruptions.

The carriageway is two-lane in both directions, in addition to a bus lane on both the eastbound and westbound carriageways. Both directions average 9.5m to 10.0m in carriageway width and are subject to an 80km/h speed limit and 60km/h in areas adjacent to junctions, detailed below.

R148 Chapelizod Bypass / R112 Kylemore Road (Ballyfermot): There is a single-lane carriageway in addition to a bus lane which merges with the R148 Chapelizod Bypass on its westbound direction. This is approximately 6.5m in width, and the entry lanes are provided with a 2m buffer upon merging with R148 Chapelizod Bypass to protect adjacent traffic against the out-swing of bus traffic. The westbound junction from Ballyfermot is illustrated in Image 6.19.

Image 6.19: Ballyfermot Junction (Westbound)

R148 Chapelizod Road / R833 Con Colbert Road: The remaining segment of the R148 Chapelizod Bypass along this section is comprised by two junctions providing access to and from R833 Con Colbert Road. On the eastbound approach, R833 Con Colbert Road feeds the R148 Chapelizod Bypass via a right-turn two-lane carriageway, approximately 7.5m in width and a signalised junction. On the westbound approach, the R148 Chapelizod Bypass provides left-turn access to R833 Con Colbert Road from the bus lane, which is severed at a 12m recess to the turn entrance. The R833 Con Colbert Road provides a left-turn access point to the R148 Chapelizod Bypass from a 4m wide feeder lane at a signalised junction. The junction with R833 Con Colbert Road is shown in Image 6.20 and Image 6.21.

Image 6.20: R833 Con Colbert Road Junction (West)

Image 6.21: R833 Con Colbert Road Junction (East)

6.3.3.5 Existing Parking and Loading

There is no parking or loading directly along the R148 Chapelizod Bypass.

On Old Lucan Road between the M50 Interchange and the R148 Chapelizod Bypass / Lucan Road junction, and on Kennelsfort Road Lower, between Old Lucan Road and R148 Chapelizod Bypass, the existing conditions for parking and loading are as follows:

- There is currently space for approximately 194 vehicles to park informally on Old Lucan Road between the M50 interchange and Palmerstown Village (Kennelsfort Road Lower) in unmarked, kerbside locations. Just over half of this space is on the north side of the road, where there is space for approximately 106 vehicles;
- There are currently 18 permit / pay & display spaces and one disabled space on Kennelsfort Road Lower; and
- Between Palmerstown Village and R148 Palmerstown Bypass, there are currently 62 permit / pay & display spaces on Lucan Old Road, which are located in parallel bays to both the north and south of the road. There are also two disabled spaces on the north kerb in this section.

6.3.4 Section 3 – R148 Con Colbert Road to City Centre (Frank Sherwin Bridge) – Con Colbert Road and St John's Road West

This Section outlines the baseline environment for walking, cycling, bus services, general traffic and parking / loading facilities along Section 3 of the Proposed Scheme, between the junction with the R148 Con Colbert Road and Frank Sherwin Bridge.

This section of the Proposed Scheme is approximately 2.0km in length and comprises the final segment of the R148 Con Colbert Road, and St John's Road West passing through Kilmainham and Islandbridge, ending adjacent Heuston Station at Frank Sherwin Bridge, where it will join the prevailing traffic management regime on the South Quays.

6.3.4.1 Pedestrian Infrastructure

There are considered to be adequate pedestrian facilities along this section as there are footpaths on either side of the carriageway of approximately 1.8m wide and street lighting throughout.

On the southern side of the R148 Con Colbert Road / St John's Road West, the surrounding land use is predominantly residential while the area to the north is characterised by public amenities such as Heuston Station and the Irish National War Memorial Gardens. The railway line runs parallel to the road between the R148 Con

Colbert and the residential areas to the south, before running underneath the R148 Con Colbert Road / R111 South Circular Road / R148 So John's West Road junction to continue along the northern side of the R148 St John's Road West.

There are several pedestrian crossings along Section 3 of the Proposed Scheme, both signalised and uncontrolled. Controlled or grade-separated crossing facilities can be found at the following locations:

- At the R148 Con Colbert Road / R839 Memorial Road signalised junction, there are signalised crossings on the western arm of R148 Con Colbert Road and the R839 Memorial Road arm, The R148 Con Colbert Road crossing is staggered in two stages and with refuge island and guardrails;
- At the R148 Con Colbert Road / R111 South Circular Road signalised junction, signalised pedestrian crossings are present across all arms. The crossing of the R111 South Circular Road South arm is staggered in two stages. The R148 Con Colbert Road West arm and R111 South Circular Road North arm crossings are three stages. The R148 Con Colbert Road East crossing is in four stages;
- At the R148 St John's Road West / Heuston South Quarter (HSQ) Car Park signalised junction, there are signalised pedestrian crossings provided on the eastern arm of the R148 St John's Road West which is staggered in three stages with two guardrails, and the HSQ access staggered in two stages with a traffic island;
- At the R148 St John's Road West / Military Road signalised junction, signalised pedestrian crossings are provided on the eastern arm of the R148 St John's Road West, which is staggered in two stages with and guardrails, and on the HSQ access (direct crossing);
- There are two pelican crossings of the R148 St John's Road West at Heuston Station. The first is opposite the southern entrance to the station, the second provides access to the main entrance on the east side of the building. Both crossings are staggered in two stages and have a central refuge island with guardrails; and
- At the R148 St John's Road West / Victoria Quay / Frank Sherwin Bridge where the Proposed Scheme ends, there is a signalised crossing of R148 St John's Road which is staggered in two stages with guardrails. The crossing of the R148 St Johns Road left turn lane (onto Victoria Quay) is uncontrolled, as is the crossing of the Victoria Quay arm.

The location of controlled and uncontrolled pedestrian crossings along Section 1 of the Proposed Scheme are shown in Figure 6.3c in Volume 3 of this EIAR.

6.3.4.2 Cycling Infrastructure

Between R148 Con Colbert Road and the R111 South Circular Road junction, there are shared bus / cycle lanes in both directions on R148 Con Colbert Road, apart from a short westbound section to the west of Con Colbert Road, where an on-road cycle lane is present.

At the R148 St John's Road / R111 South Circular Road junction, there is an on-road cycle lane on the R148 which travels eastbound through the junction and continues for approximately 100m beyond the junction where the shared bus / cycle lane recommences. The shared bus / cycle lane continues eastbound until Military Road, after which. a 1.5m wide cycle lane begins and runs for the remainder of Section 3 of the Proposed Scheme. On the R111, cycle lanes through the junction in both directions are present, separated from the vehicle lanes by bollards.

Travelling westbound from Heuston Station there is a 1.5m wide cycle lane that runs as far as the HSQ Access junction, which then becomes a shared bus / cycle lane, terminating approximately 110.0m west of the R148 St John's Road / R111 South Circular Road junction. The shared bus / cycle lane then begins again approximately 75m to the west of the junction and continues westbound to the R148 Con Colbert Road (the beginning of Section 3 of the Proposed Scheme).

Cycle parking is present at Heuston Station with five Sheffield stands (accommodating 10 bicycles) on the south side of the R148 St. John's Road West, and eight Sheffield stands (accommodating 16 bicycles) on the north side of the carriageway. There are also approximately 18 Sheffield stands (accommodating 36 bicycles) to the rear of the station near to the River Liffey, and a Dublin Bike stand of 24 bicycles on the south quay, immediately west of Seán Heuston Bridge.

The existing cycle facilities along Section 3 of the Proposed Scheme are illustrated in Figure 6.4c in Volume 3 of this EIAR.

6.3.4.3 Bus Infrastructure

6.3.4.3.1 Bus Priority Measures

The following bus priority measures are present:

- Dedicated bus lanes on the R148 Con Colbert Road eastbound from the R148 Con Colbert Road, breaking as the R148 passes through the R111 South Circular Road junction, then recommencing along the R148 St John's Road West, to the east of the junction, and continuing to Heuston Station; and
- Dedicated bus lanes on the R148 St John's Road West westbound from the HSQ access, breaking as the R148 passes through the R111 South Circular Road junction, then recommencing along the R148 Con Colbert Road, to the west of the junction, and running continuously to the R148 Con Colbert Road.

6.3.4.3.2 Bus Stop Facilities

There are currently six bus stops between R148 Con Colbert Road and Frank Sherwin Bridge. Three of these stops are located on the eastbound direction inbound, and three on the westbound direction, outbound.

The inbound stops are:

- Stop 7435, on R148 Con Colbert Road, 100m to the east of R839 Memorial Road;
- Stop 2722 on R148 Con Colbert Road, 230m to the west of South Circular; and
- Stop 4413 / 135421 at Heuston Station.

The outbound stops are:

- Stop 2637 / 135401 at Heuston Station.
- Stop 2721 on R148 Con Colbert Road, 165m to the west of R111 South Circular; and
- Stop 7012 on R148 Con Colbert Road, 100m to the east of R839 Memorial Road.

Table 6.10 outlines the availability of bus stop facilities at the existing six bus stops along Section 3 of the Proposed Scheme.

Table 6.10: Section 3 – Availability of Bus Stop Facilities (of a Total Six Bus Stops)

Bus Stop Facility	Number of Bus Stops in Baseline with Facility	Percentage of Bus Stops in Baseline with Facility
RTPI	2	33%
Weekly Timetable information	2	33%
Shelter	2	33%
Seating	2	33%
Accessible Kerbs	2	33%
Indented Drop Off Area	0	0%

There is considered to be a poor level of passenger facilities at the existing bus stops along this section as only a third of stops have seating, shelters and timetable information.

The existing bus facilities along Section 3 of the Proposed Scheme are illustrated in Figure 6.5c in Volume 3 of this EIAR. The bus services that operate along Section 3 are outlined in Table 6.11.

Table 6.11: Section 3 – Bus Service Frequency

Service Route	Route	Typical Service Frequency	
		Weekday	Weekend
C1	Sandymount, Lucan, Ballyowen, Adamstown	20 minutes	30 minutes
C2	Sandymount, Palmerstown, Lucan, Ballyowen, Adamstown	20 minutes	30 minutes
C3	Ringsend, Palmerstown, Lucan, Leixlip, Maynooth	30 minutes	30 minutes
C4	Ringsend, Palmerstown, Lucan, Celbridge, Maynooth	30 minutes	30 minutes
X25	Bellfield, Donnybrook, Lucan, Maynooth	3-5 services	No Services
X27	Bellfield, Ballsbridge, Coolock, Darndale, Clare Hall	1-2 services	No Services
X28	Bellfield, Donnybrook, Lucan, Celbridge	5 services	No Services
P29	Ringsend, Palmerston, Ballyowen, Lucan, Adamstown	4 services	No Services
X30	Bellfield, Donnybrook, Ballyowen, Lucan, Hillcrest	2 services	No Services
X31	Dublin City South, Palmerstown, Lucan, Leixlip, Louisa Valley	3 services	No Services
X32	Malahide, Portmarnock, Fairview, Dublin Square South, Donnybrook, Bellfield	1 service	No Services
40	Charlestown, Finglas, Glasnevin, Phibsborough, Dublin City South, Ballyfermot, Liffey Valley	15 minutes	20-30 minutes
D51	Dublin City, Ronanstown, Nangor, Clondalkin	1 service	No Services
52	Ballina, Castlebar, Tuam, Eyre Square	3 hours	3 hours
X69	Dublin City South, Tallaght, Rathcoole	1 service	No Services
79	Dublin City, Ballyfermot, Parkwest, Ballyfermot	20-30 minutes	30 minutes
A79	Dublin City, Ballyfermot, Parkwest	30 minutes	30 minutes
845	Birr, Kilcormac, Tullamore, Lucan, Donnybrook, Bellfield	4 services	No Services
847	Portumna, Mucklagh, Maynooth, Lucan, Dublin, Donnybrook, Bellfield	1 service	1 service
860	Temple Bar, Dublin City, Islandbridge, Parkwest	30 minutes	No Services

6.3.4.4 General Traffic

The existing major junction arrangements along Section 3 of the Proposed Scheme comprises the following:

- R148 Con Colbert Road / Memorial Road;
- R148 Con Colbert Road / R111 South Circular Road;
- R148 St John's Road West / HSQ Entrance;
- R148 St John's Road West / Military Road; and
- R148 St John's Road West / Heuston Station / Frank Sherwin Bridge.

The characteristics of each major junction is described in turn below, alongside satellite images which are extracts from Figure 6.6 in Volume 3 of this EIAR.

R148 Con Colbert Road / Memorial Road three-arm signalised junction: The first junction encountered on the eastbound approach of this section is at Memorial Road. This one-way, two-lane carriageway is bounded by the R148 Con Colbert Road and Inchicore Road to the south and is 5m in width. Northbound movement only is permitted along this road, with two-lane right-turn access onto the R148 Con Colbert Road provided while the left-turn is permitted from one lane.

The Memorial Road junction is illustrated in Image 6.22.

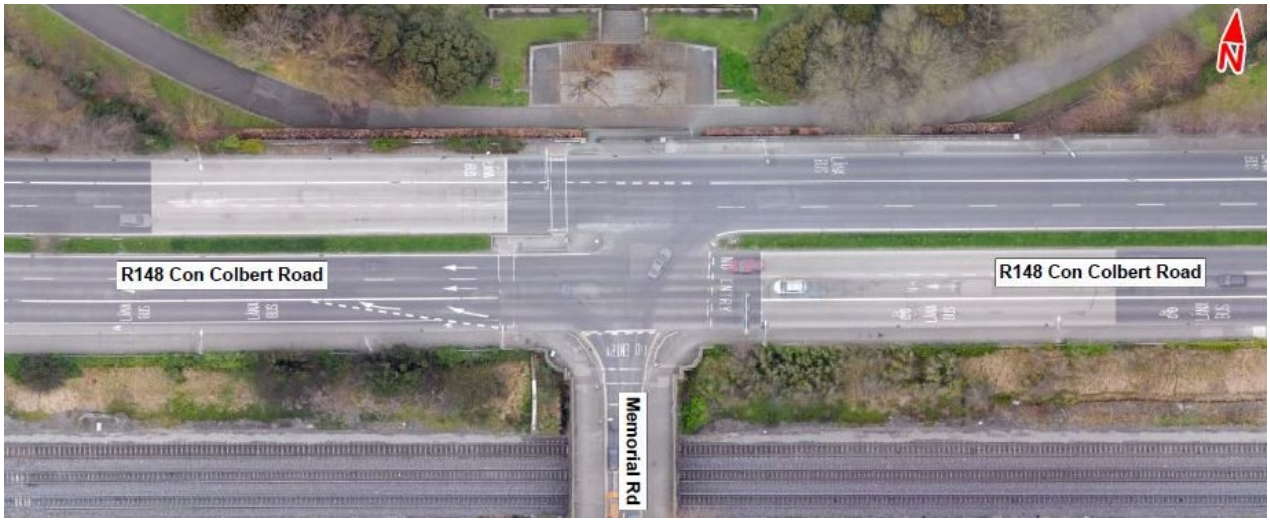


Image 6.22: R148 Con Colbert Road / Memorial Road Junction

R148 Con Colbert Road / R111 South Circular Road four-arm signalised junction: On the eastbound approach, the R148 Con Colbert Road intersects the R111 South Circular Road with a three-lane carriageway, offering southbound merging with R111 South Circular Road via three signalised junctions along its rotation.

Right-turn access is not permitted from R111 South Circular Road onto the R148 Con Colbert Road. This movement can only be made in the westbound direction via left-turn from the south, and via three signalised junctions from the north.

The R148 Con Colbert Road and R111 South Circular Road intersection is illustrated in Image 6.23

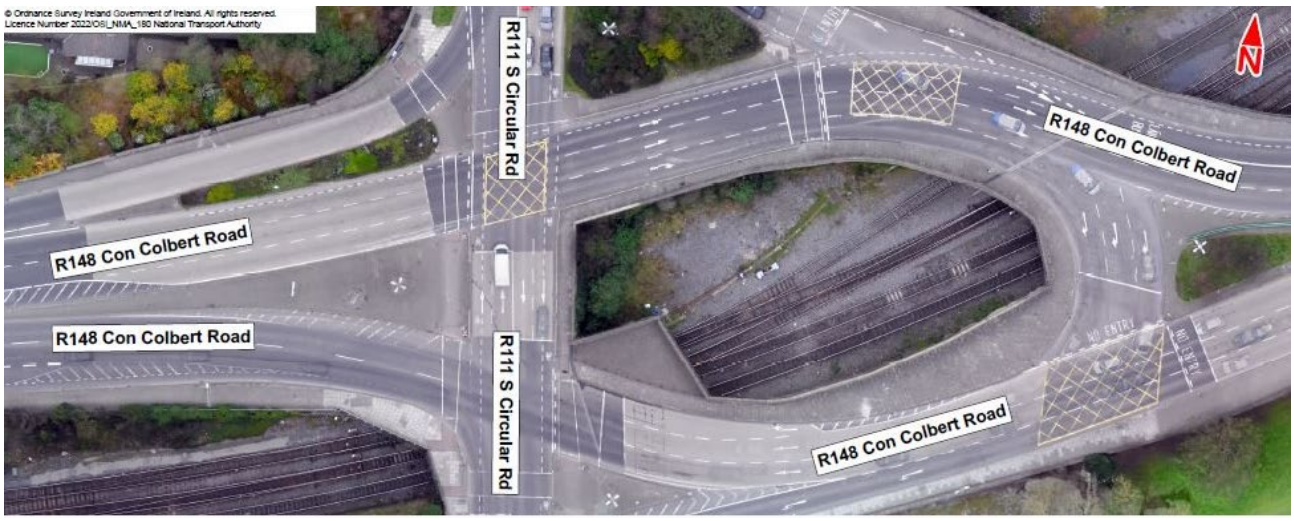


Image 6.23: R148 Con Colbert Road / South Circular Road Junction

R148 St John's Road West / HSQ Entrance three-arm signalised junction: Beyond the R111 South Circular Road on the eastbound approach, the R148 St John's Road West assumes a one-lane carriageway alongside a

bus lane, at 8.5m in total width. On the westbound side, there is a two-lane carriageway in addition to a bus lane, with a total width of 9.0m. An additional arm is provided for the right-turn signalised entrance to the HSQ complex, while the left-turn option is accessed via a slip lane approximately 13.0m in length.

The characteristics of this junction are illustrated in Image 6.24.

Image 6.24: R148 St John's Road West / HSQ Entrance

R148 St John's Road West / Military Road three-arm signalised junction: The signalised junction with Military Road is accessed from both directions. It feeds into the R148 St John's Road West from the south via two-lane carriageway approximately 6m in width and has a southbound single-lane carriageway of approximately 3.0m in width. The northbound traffic from Military Road at this location is recessed at a depth of 10.0m from the mouth of the junction to allow for the appropriate movement of larger vehicles.

There is a yellow box in the centre of the junction across the R148 St John's Road West two eastbound traffic lanes. The R148 St John's Road West / Military Road Junction is illustrated in Image 6.25.

Image 6.25: R148 St John's Road West / Military Road Junction

R148 St John's Road West / Victoria Quay / Frank Sherwin Bridge four-arm signalised junction: The R148 St John's Road West has two lanes approaching the junction, for straight ahead and left turn movements, and a mandatory cycle lane segregated from the vehicular lanes by bollards. There is no right turn from this arm

onto the R148 Victoria Quay (eastern arm) which travels in the westbound direction only. From the R148 Victoria Quay, there are two vehicular lanes and a cycle lane segregated by bollards existing the junction onto the R148 St John's Road West arm. No other arms of the junction allow turning movements onto this arm.

The R148 Victoria Quay eastern arm of the junction has three approach lanes, the left of which is a bus lane alongside a segregated cycle lane. There is a designated cycle lane and priority signals from this arm that routes across the junction to facilitate right turn cycle movements to Frank Sherwin Bridge.

The Victoria Quay western arm has one vehicular lane approaching and existing the junction and cycle lanes in both directions, albeit only the westbound cycle lane is segregated from vehicles. All traffic is only permitted to turn left onto Frank Sherwin Bridge from Victoria Quay.

The Frank Sherwin Bridge arm is one-way for northbound movements and comprises two wide vehicular lanes and a cycle lane segregated by bollards.

The characteristics of this junction are illustrated in Image 6.26. It is noted that the junction was upgraded in August 2021 and the satellite imagery was taken prior to this, therefore the image below reflects the previous junction layout.

Image 6.26: R148 St John's Road West / Victoria Quay / Frank Sherwin Bridge

6.3.4.5 Existing Parking and Loading

There is currently the following parking provision on Section 3 of the Proposed Scheme:

- Three Permit parking / Pay and Display spaces, and two EV charging spaces on the south side of St John's Road at Heuston Station;
- Two separate lengths of taxi queuing lanes on the eastbound approach to Heuston Station. The first begins opposite the Royal Hospital Kilmainham Gardens and has space for 20 taxis to queue. The second taxi queuing lane begins after the right-turn entrance to the HSQ complex and has space for 23 taxis. There is also a taxi stand off-road and contained within a continuous bay next to Heuston Station which has space for 18 taxis; and
- There are 10 informal, general, parking spaces on St John's Road, comprising eight spaces at Military Road, and two spaces immediately north of the gardens at the Royal Kilmainham Hospital (RKH).

6.4 Potential Impacts

This section presents potential impacts that may occur due to the Construction and Operation of the Proposed Scheme, taking into account the Proposed Scheme design in the absence of any further mitigation. This informs

the need for mitigation or monitoring to be proposed (refer to Section 6.5). Predicted 'residual' impacts taking into account any proposed mitigation is then presented in Section 6.6.

6.4.1 Characteristics of the Proposed Scheme

The characteristics of the Proposed Scheme are described in detail in Chapter 4 (Proposed Scheme Description) of this EIAR.

6.4.2 'Do Nothing' Scenario

With regards to this Traffic and Transport chapter, the 'Do Nothing' scenario means there would be no changes to existing transport infrastructure, and hence, infrastructure provision for buses, pedestrians and cyclists would remain the same. The streetscape would continue to be based around the movement and parking requirements of private cars instead of people. High levels of traffic are associated with discouraging pedestrian and cyclist activity and this activity would be further discouraged as traffic congestion remains the same or increases. The baseline situation of congestion and journey time reliability issues for buses would also continue, and potentially be exacerbated over time as traffic congestion increases in line with travel demand growth.

6.4.3 'Do Minimum' Scenario

The 'Do Minimum' scenario represents the likely traffic and transport conditions of the direct and indirect study areas **without** the Proposed Scheme in place. This scenario forms the reference case by which to compare the Proposed Scheme ('Do Something'). The opening year for the Proposed Scheme is assumed to be 2028, with a design assessment year (opening + 15 years) assumed to be 2043.

For the qualitative analysis the assessment is undertaken in relation to the conditions of the existing transport network, which have been outlined in Section 6.3 (Baseline Environment) corresponding with a Do Nothing scenario. As a result of the COVID-19 pandemic a number of temporary transport mobility measures have been implemented. Due to their temporary status, the measures are not considered a permanent long-term feature of the receiving environment and as such have not been considered in the impact assessments.

For the quantitative analysis (i.e. the transport modelling elements of the impact assessment), the Do Minimum scenario is based on the 'likely' conditions of the transport network and includes any known permanent improvements or changes to the road or public transport network that have taken place, been approved or are planned for implementation. The transport schemes and demand assumptions within the Do Minimum scenario are detailed below.

6.4.3.1 Do Minimum Transport Schemes

The core reference case (Do Minimum) modelling scenarios (Opening year - 2028 and Design year - 2043) are based on the progressive roll-out of the Greater Dublin Area (GDA) Transport Strategy 2016-2035 (GDA Strategy), with a partial implementation by 2028, in line with National Development Plan (NDP) investment priorities and the full implementation by 2043.

The GDA Strategy provides an appropriate transport receiving environment for the assessment of the Proposed Scheme for the following reasons:

- The GDA Strategy is the approved statutory transportation plan for the region, providing a framework for investment in transport within the region up to 2035;
- The GDA Strategy provides a consistent basis for the 'likely' future receiving environment that is consistent with Government plans and Policies National Planning Framework (NPF) and National Development Plan (NDP); and
- Schemes within the GDA Strategy are a means to deliver the set of objectives of the GDA Strategy. The sequencing and delivery of the strategy is defined by the implementation plan, but the optimal outcome of aiming to accommodate all future growth in travel demand on sustainable modes underpins the Strategy.

The Do Minimum scenarios (in both 2028 and 2043) include all other elements of the BusConnects Programme of projects (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 CBC elements). As outlined above, the 2043 Do Minimum scenario assumes the full implementation of the GDA Strategy schemes, so therefore assumes that proposed major transport schemes such as MetroLink, DART+ Tunnel, Luas line extensions to Lucan, Finglas and Bray are all fully operational.

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

6.4.3.2 Do Minimum Transport Demand

The transport demand changes for the 2028 and 2043 assessment years have been included in the analysis contained within this chapter, using travel demand forecasting, which accounts for increases in population and economic activity, in line with planned growth contained within the NPF, Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland region and the local development plans for the GDA local authorities.

It is envisaged that the population will grow by 11% up to 2028 and 25% by 2043 (above 2016 census data levels). Similarly, employment growth is due to increase by 22% by 2028 and 49% by 2043 (Source: NTA Reference Case Planning Sheets 2028, 2043). The assessment also assumes that goods vehicles (HGVs and LGVs) continue to grow in line with forecasted economic activity with patterns of travel remaining the same. For example, the assessment assumes a 45% and 77% increase in goods traffic versus the base year in 2028 and 2043 respectively.

The GDA Strategy (along with existing supply side capacity constraints e.g., parking availability, road capacity etc.) has the effect of limiting the growth in car demand on the road network into the future. This is shown diagrammatically in Diagram 6.4. Total trip demand (indicated by the dashed line) will increase into the future in line with demographic growth (population and employment levels etc.). To limit the growth in car traffic and to ensure that this demand growth is catered for predominantly by sustainable modes, a number of measures will be required, that include improved sustainable infrastructure and priority measures delivered as part of the NDP/GDA Strategy. In addition to this, demand management measures will play a role in limiting the growth in transport demand, predominantly to sustainable modes only. The result will be only limited or no increases in overall demand for travel by private car. The Proposed Scheme will play a key role in this as part of the wider package of GDA Strategy measures.

In general, total trip demand (combining all transport modes) will increase into the future in line with population and employment growth. A greater share of the demand will be by sustainable modes (Public Transport (PT), Walking, Cycling). Private car demand may still grow in some areas but not linearly in line with demographics, as may have occurred in the past.

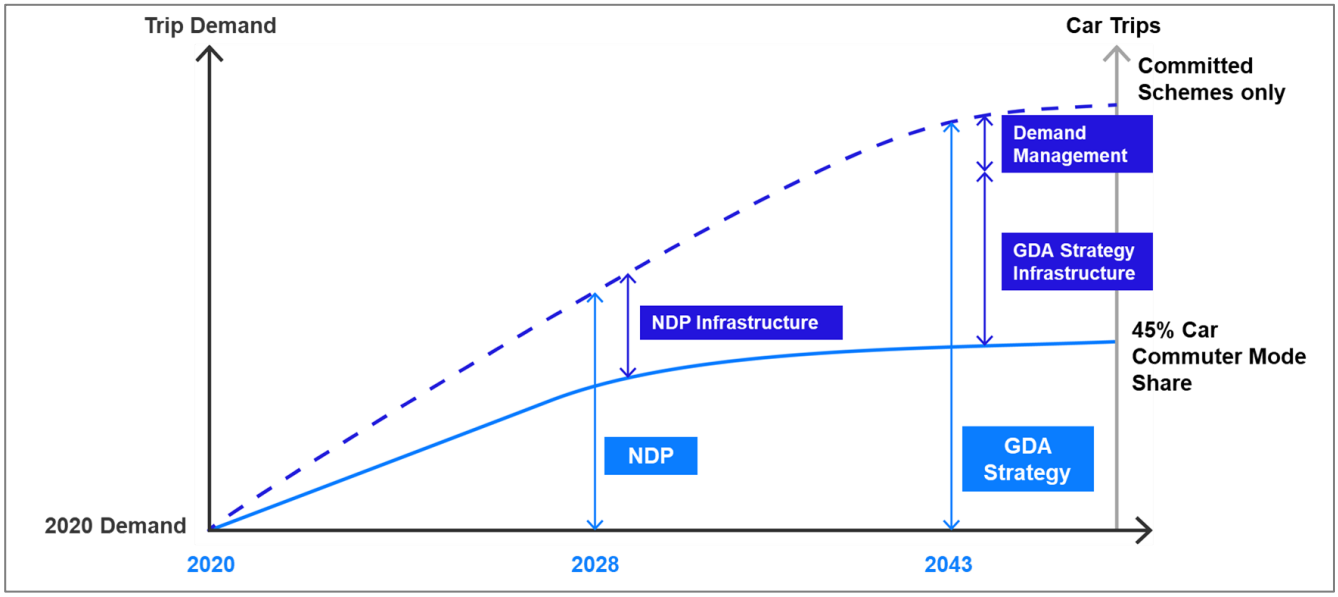


Diagram 6.4: Trip Demand Growth and the GDA Strategy

In terms of the transport modelling scenarios for the traffic and transport assessment, as per the Strategy proposals, there are no specific demand management measures included in the Do Minimum scenario in the 2028 Opening year, other than constraining parking availability in Dublin at existing levels. For the design year, 2043 scenario, a proxy for a suite of demand management measures is included in the Do Minimum in line with the target to achieve a maximum 45% car driver commuter mode share target, across the GDA, as outlined in the Strategy.

6.4.4 'Do Something' Scenario

The Do Something scenario represents the likely conditions of the direct and indirect study areas with the Proposed Scheme in place. The traffic and transport elements of the Proposed Scheme are presented in detail in Chapter 4 (Proposed Project Description).

6.4.5 Construction Phase

This section considers the potential temporary traffic and transport impacts that construction of the Proposed Scheme will have on the direct and indirect study areas during the construction phase.

Chapter 5 (Construction) has been prepared to demonstrate the likely approach that will be taken to construct the Proposed Scheme, while it also provides an overview of the construction activities necessary to undertake the works, including information on proposed Construction Compounds, construction plant and equipment. This assessment, as outlined herein, provides an overview of the potential traffic and transport impacts of the Construction Phase based on the information set out in Chapter 5 (Construction).

A Construction Environmental Management Plan (CEMP) has also been prepared and is included as Appendix A5.1 in Volume 4 of this EIAR. The CEMP will be updated by the NTA prior to the commencement of the Construction Phase, so as to include any additional measures required pursuant to conditions attached to any decision to grant approval. The CEMP has regard to the guidance contained in the TII Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan, and the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).

All of the content provided in the CEMP will be implemented in full by the appointed contractor and its finalisation will not affect the robustness and adequacy of the information presented and relied upon in this EIAR.

As with any construction project, the appointed contractor will be obliged to prepare a comprehensive Construction Traffic Management Plan (CTMP). In preparing the CTMP for the proposed works, the appointed contractor will be required to give consideration where practicable to facilitate and identify opportunities for the maximum movement of people during the construction period through implementing the following hierarchy of transport mode users:

- Pedestrians;
- Cyclists;
- Public Transport; and
- General Traffic.

Access will be maintained for emergency vehicles along the Proposed Scheme, throughout the Construction Phase.

6.4.5.1 Description of Construction Works

The Proposed Scheme has been divided into three principal sections. The division line between sections has been determined by grouping similar carriageway types together. These sections have been further subdivided into seven sub-sections, according to the types of construction works required. The sections / sub-sections are the following (as shown in Diagram 6.5: Locations of Proposed Construction Subsections):

Table 6.12 Proposed Construction Subsections

Proposed Scheme Sections	Construction Phase Subsections	Extent of Works
N4 Junction 3 to M50 Junction 7 – N4 Lucan Road	Section 1a – R136 Ballyowen Road	400m
	Section 1b – R835 Lucan Road	250m
	Section 1c – Hermitage Road and Hermitage Park, Lucan	600m
	Section 1d - N4 Junction 3 to Junction 2	1,400m
	Section 1e – Old Lucan Road (west of M50)	750m
	Section 1f – N4 Junction 2 to M50 Junction 7	2000m
M50 Junction 7 to R148 Con Colbert Road – Palmerstown bypass and Chapelizod bypass	Section 2a – Old Lucan Road (east of M50) and Kennelsfort Road Lower	1,100m
	Section 2b – R148 Palmerstown Bypass	500m
	Section 2c – R148 Chapelizod Bypass Bus Stops and Chapelizod Hill Road Bridge	Structure
	Section 2d – Remainder of R148 Chapelizod Bypass	Road Marking and Signage
R148 Con Colbert Road to City Centre (Frank Sherwin Bridge)	Section 3a – R148 Con Colbert Road	1,000m
	Section 3b – R148 Con Colbert Road / South Circular Road junction	Junction
	Section 3c – R148 St John's Road West (excluding Heuston Station)	1,000m
	Section 3d – R148 St John's Road West (including Heuston Station)	150m

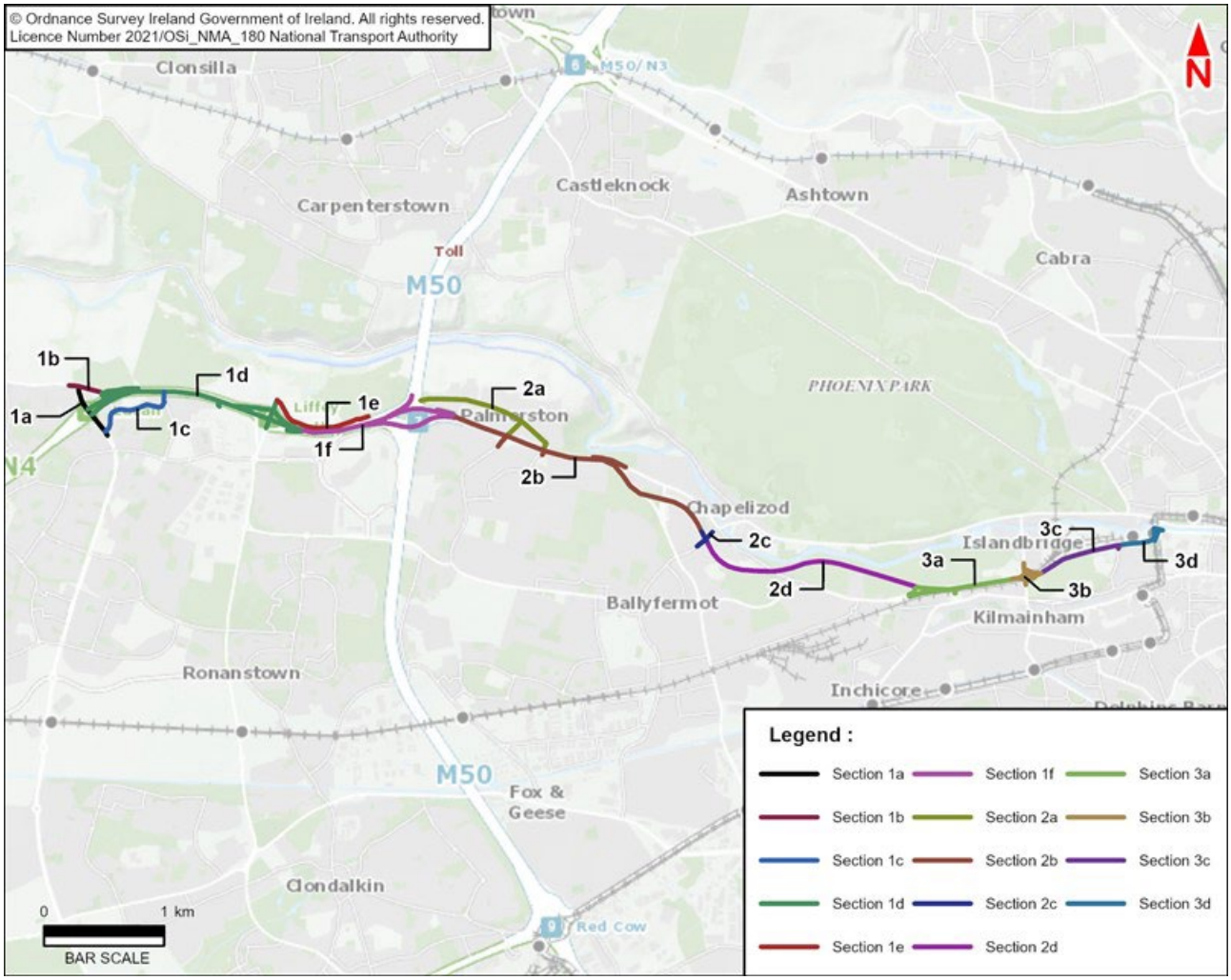


Diagram 6.5: Locations of Proposed Construction Subsections

6.4.5.2 Construction Programme

An outline, indicative programme for the Proposed Scheme is provided in Chapter 5 (Construction) of this report. The Proposed Scheme is estimated to require some 24 months (approximately) to complete. However, individual activities will have shorter durations. Works are envisaged to proceed concurrently on multiple work-fronts to minimise the overall construction duration.

6.4.5.3 Construction Route

In order to construct the Proposed Scheme, the appointed contractor will require Construction Compounds from which they can manage the delivery of the Proposed Scheme, the locations of which are shown in Diagram 6.6. Access to and egress from the Construction Compounds is envisaged to be along dedicated construction vehicle routes. It is assumed that all national roads and regional roads in the immediate vicinity of the Proposed Scheme would be used by construction vehicles. The following National Roads and Regional Roads will be utilised as construction vehicle routes during the construction period (as shown in Diagram 6.6):

- National Road Network;
  - M50 Motorway;
  - N4 Lucan Road;

The following regional roads will be utilised as construction vehicle routes during the construction period (as shown in Diagram 6.6).

- Regional Road Network;
  - R111
  - R112
  - R113
  - R136
  - R148
  - R833
  - R835

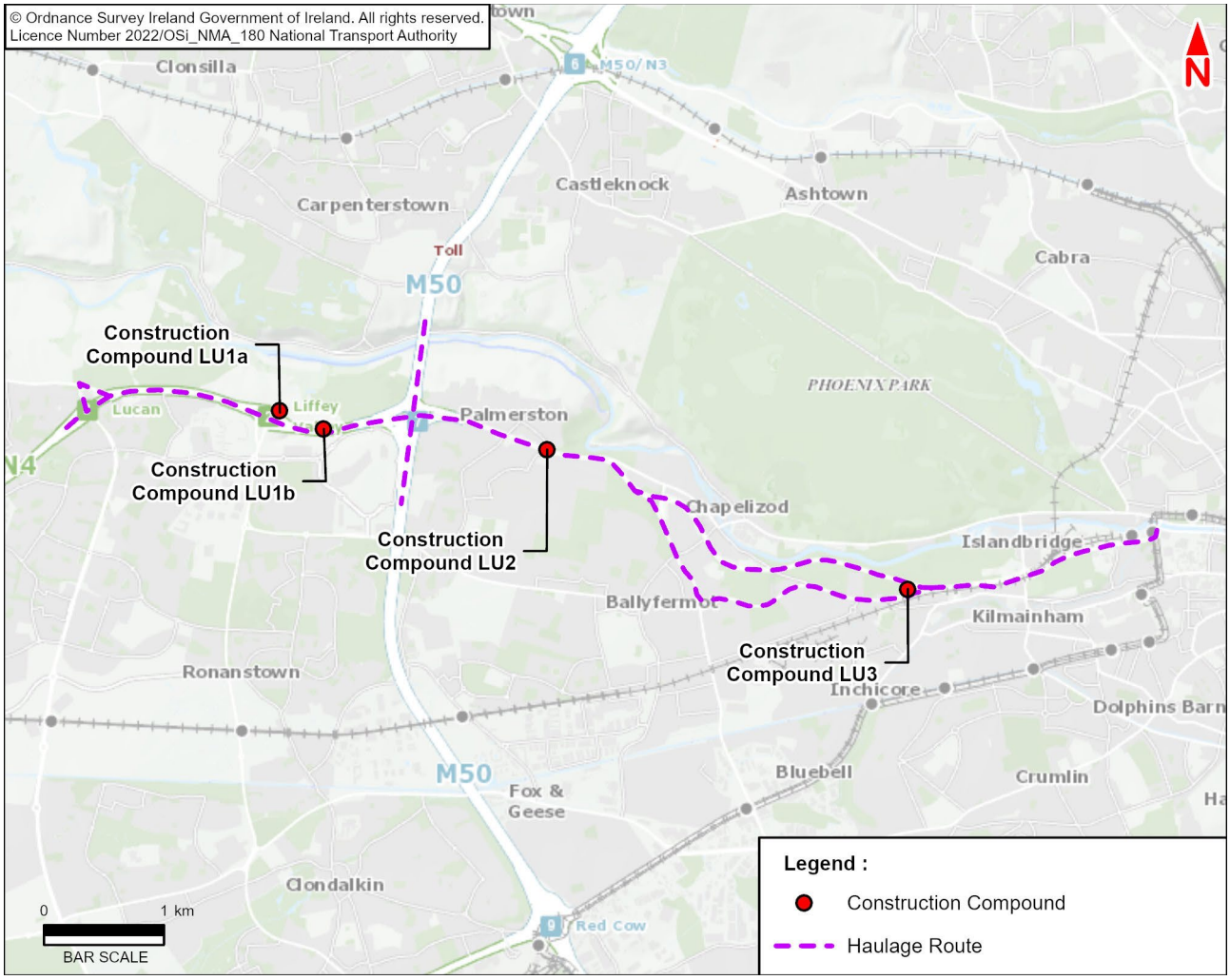


Diagram 6.6: Proposed Construction Routes and Potential Construction Compounds

6.4.5.4 Potential Construction Impact

6.4.5.4.1 Overview

Construction of the Proposed Scheme has the potential to impact people's day-to-day activities along the corridor while the works are underway. Chapter 5 (Construction) and the CEMP (Appendix A5.1 of Volume 4 of this EIAR), identify impactful activities, considers their effect, and identifies mitigation measures to reduce or remove their impact insofar as practicably possible.

For construction activities on or adjacent to public roads, all works will be undertaken in accordance with Department of Transport's 'Traffic Signs Manual, Chapter 8 Temporary Traffic Measures and Signs for Roadworks' and associated guidance. Chapter 5 (Construction) contains temporary traffic management proposals for the Proposed Scheme. These proposals maintain safe distance between road users and road workers,

depending on the type of construction activities taking place and existing site constraints. Temporary diversions, and in some instances temporary road closures, may be required where a safe distance cannot be maintained to undertake works necessary to complete the Proposed Scheme. All road closures and diversions will be determined by the NTA, who may liaise with the local authority and An Garda Siochana, as necessary. The need for temporary access restrictions will be confirmed with residents and businesses prior to their implementation.

6.4.5.4.2 Pedestrian Provisions

As described in Chapter 5 (Construction), pedestrians may be temporarily impacted by construction activities along the Proposed Scheme corridor. Pedestrian diversions and temporary surface footpaths will be used to facilitate pedestrian movements around work areas. Access to local amenities, such as to bus stops, traffic crossings, private dwellings, and businesses, may be temporarily altered but access will be maintained.

Due consideration will be given to pedestrian provisions in accordance with Section 8.2.8 of the DTTS Chapter 8, Temporary Traffic Measures and Signs for Roadworks of the Traffic Signs Manual (DTTS 2019a) and the DTTS Temporary Traffic Management Design Guidance (DTTS 2019b), to ensure the safety of all road users, in particular pedestrians (including able-bodied pedestrians, wheel-chair users, mobility impaired pedestrians, pushchair users etc.). Therefore, where footpaths are affected by construction, a safe route will be provided past the works area, and where practicable, this provision will match existing facilities for pedestrians. Due consideration will also be given to the need for temporary ramps, and measures for accessible users, where changes in elevation are temporarily introduced to facilitate works and footpath diversions. Entrance points to the construction zone will be controlled as required. The impact is considered to have **a Negative, Slight and Temporary effect** to pedestrians.

6.4.5.4.3 Cycling Provisions

Cyclists may be temporarily impacted by construction activities along the Proposed Scheme corridor. As part of Temporary Traffic Management arrangements, the appointed Contractor will give due consideration to cyclist provision in accordance with Section 8.2.8 of the DTTS Chapter 8, Temporary Traffic Measures and Signs for Roadworks of the Traffic Signs Manual (DTTS 2019a) and the DTTS Temporary Traffic Management Design Guidance (DTTS 2019b), including the use of site-based risk assessments. Therefore, where 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 cyclists will be made. The impact is considered to have **a Negative, Moderate and Temporary effect** to cyclists.

6.4.5.4.4 Public Transport Provisions

Existing public transport routes will be maintained throughout the duration of the Construction Phase of the Proposed Scheme (notwithstanding potential for occasional road closures / diversions as described in Chapter 5 (Construction) of this EIAR. Wherever practicable, bus services will be prioritised over general traffic. However, the temporary closure of sections of existing dedicated bus lanes may be required to facilitate the construction of new bus priority infrastructure that is being developed as part of the Proposed Scheme. Some existing bus stop locations will need to be temporarily relocated to accommodate the works. In such cases, bus stops will be safely accessible to all users and all temporary impacts on bus services will be determined in consultation with the NTA and the service providers. The impact is considered to have **a Negative, Slight and Temporary effect** to public transport users.

6.4.5.4.5 Parking and Loading

Parking and loading locations may be temporarily impacted by construction activities along the Proposed Scheme corridor. There may be temporary restrictions to on-street parking and loading facilities. The appointed contractor will discuss temporary traffic management measures with the road authority and directly affected residents/business with the aim of minimising disruption. The impact is considered to have **a Negative, Slight and Temporary effect** to parking and loading.

6.4.5.4.6 General Traffic

The Proposed Scheme will be constructed to ensure the mitigation of disturbance to residents, businesses and existing traffic. Localised temporary lane or road closures may be required for short periods. Details of indicative

temporary traffic management measures to facilitate construction of the Proposed Scheme are included in Chapter 5 (Construction). All road closures and diversions will be determined by the NTA, who may liaise with the local authority and An Garda Siochana, as necessary. It should be noted that access will be maintained for emergency vehicles along the Proposed Scheme, throughout the Construction Phase.

6.4.5.4.6.1 General Traffic Redistribution

Significant impacts due to general traffic redistribution away from the direct study area are not anticipated during the Construction Phase based on the intended nature of the progressive works along the corridor whereby traffic flows are to be maintained in both directions. There may be a requirement for some localised temporary lane closures for short durations of the day, which will involve consultation between the appointed contractor and relevant authorities. A temporary 3month restriction on through traffic on Chapelizod Hill Road will be required, however, which will be managed with localised diversion routes. Access for general traffic to existing residential and commercial units immediately adjacent to the Proposed Scheme is to be accommodated throughout the Construction Phase.

The appointed contractor will develop a CTMP that gives due consideration to provision of local access requirements and designates appropriate diversion routes in the case where localised temporary closures are required. Overall, for these reasons, the impact on general traffic redistribution is anticipated to be **Negative, Moderate and temporary** due to the temporary nature of any restrictions. The anticipated lane closures, road closures, and diversions that may be required during the Construction Phase of the Proposed Scheme are detailed in Chapter 5 (Construction).

For the purpose of Air Quality (Chapter 7), Climate (Chapter 8) and Noise & Vibration (Chapter 9) impacts assessments, a worst-case scenario for construction activities was considered for assessment purposes and has been modelled in the LAM based on a notional stage of construction whereby Sections 1a, 1b, 2a, 2b, 2d, 3b and 3d were under construction concurrently. Further details on the impacts assessment can be found within these chapters.

6.4.5.4.6.2 Construction Traffic Generation

Site Operatives: As described in Chapter 5 (Construction) of this EIAR, it is expected that there will be 250 to 270 staff directly employed across the Proposed Scheme, rising to 300 staff at peak construction.

Typical work hours on site are between 07:00 and 23:00 with staff working across early and late shifts. The adopted shift patterns help minimise travel by personnel during the peak hour periods of 08:00 to 09:00 and 17:00 to 18:00.

The appointed contractor will prepare a Construction Stage Mobility Management Plan (CSMMP) which will be developed prior to construction, as described in Appendix A5.1 CEMP in Volume 4 of this EIAR, to actively discourage personnel from using private vehicles to travel to site. The CSMMP will promote the use of public transport, cycling and walking by personnel. Private parking at the Construction Compounds will be limited. Vehicle-sharing will be encouraged, subject to public health guidelines, where travel by private vehicle is a necessity e.g. for transporting heavy equipment. A combination of CSMMP measures, as well as work shift patterns, means that fewer than 10 trips by private vehicle are envisaged to and from site during peak periods.

Heavy Goods Vehicles (HGVs): Additional construction traffic will be generated during the Construction Phase of the Proposed Scheme, for the purpose of the following:

- Clearance of existing site material and waste;
- Deliveries of construction material; and
- Removal of construction waste material.

Chapter 5 (Construction) of this EIAR provides a breakdown of the expected operation for the construction of the Proposed Scheme during each subsection. It should be noted that the CTMP will control vehicular movement along the construction route, including restrictions on the number of HGVs accessing and egressing the construction works throughout the day to mitigate the impacts to general traffic on the surrounding road network.

Based on construction activities associated with the Proposed Scheme, a maximum of 19 HGV trips are estimated to access / egress the construction works during the AM and PM Peak Hours.

Overall Peak Hour Impacts: The contents of Table 6.13 outline the anticipated maximum construction traffic generation by site operatives and HGVs during the AM and PM Peak Hours.

Table 6.13: Anticipated Maximum Construction Traffic Generation during Construction Phase

Peak Hour	Arrivals		Departures		Total Two-Way Traffic Flows (Vehicles)	Total Two-Way Traffic Flows (PCUs)
	Car / Van (1 PCU)	HGV (2.3 PCUs)	Car / Van (1 PCU)	HGV (2.3 PCUs)		
AM Peak Hour	10	19	0	19	48	98
PM Peak Hour	0	19	10	19	48	98

Given that the above impacts are minimal and comfortably below the vehicle thresholds set out in TII's Guidelines for Transport Assessments, it is considered appropriate to define the general traffic impacts of the Construction Phase to have a **Negative, Slight and Temporary effect**. Therefore, no further analysis is required for the purpose of this assessment.

6.4.5.5 Construction Phase Summary

The contents of Table 6.14 present a summary of the potential impacts of the Proposed Scheme during Construction Phase.

Table 6.14: Summary of Construction Phase Potential Impacts

Assessment Topic	Effect	Predicted Impact
Walking	Restrictions to pedestrians along Proposed Scheme.	Negative, Slight and Temporary
Cycling	Restrictions to cyclists along Proposed Scheme	Negative, Moderate and Temporary
Bus	Restrictions to public transport along Proposed Scheme.	Negative, Slight and Temporary
Parking and Loading	Restrictions to parking / loading along Proposed Scheme.	Negative, Slight and Temporary
General Traffic	Restrictions to general traffic along Proposed Scheme	Negative, Moderate and Temporary
	Additional construction traffic flows upon surrounding road network	Negative, Slight and Temporary

6.4.6 Operational Phase

The impact assessment for the Operational Phase has been outlined in terms of a qualitative (walking, cycling, bus infrastructure and parking / loading) and quantitative (bus journey times / reliability, general traffic and people movement) impact analysis, which are outlined in the following sections.

6.4.6.1 Qualitative Assessment

6.4.6.1.1 Qualitative Assessment Methodology

The structure of the qualitative assessment is consistent with the Baseline Environment (Section 15) where the Proposed Scheme has been split into five sections. This has allowed for a more detailed analysis of the quality of the infrastructure proposals per section. The approach for each qualitative assessment is outlined below.

6.4.6.1.1.1 Pedestrian Infrastructure

The impacts to the quality of the Pedestrian Infrastructure as a result of the Proposed Scheme have been considered with reference to any changes to the existing pedestrian facilities along footpaths and crossing

locations within the direct study area. Reference has been made to the overall changes along the full length of the Proposed Scheme and the impact assessment primarily focuses only on the pedestrian facilities at junctions to provide a direct comparison between the Do Minimum and Do Something scenarios.

Where the Proposed Scheme introduces a change to a junction layout, the impact on pedestrians has been assessed using a set of criteria, which has been derived from guidance listed in Section 6.7. The contents of Table 6.15 outline the assessment criteria for each junction.

Table 6.15: Pedestrian Junction Assessment Criteria

Aspect	Indicator
Routing	Are pedestrian crossings (signalised or uncontrolled) available on all arms?
Directness	Where crossings are available, do they offer direct movements which do not require diversions or staggered crossings i.e., no or little delay required for pedestrians to cross in one direct movement?
Vehicular speeds	Are there measures in place to promote low vehicular speeds, such as minimally sized corner radii and narrow carriageway lane widths?
Accessibility	Where crossings exist, are there adequate tactile paving, dropped kerbs (or raised table treatment) and road markings for pedestrians (including able-bodied, wheelchair users, mobility impaired and pushchairs)?
Widths	Are there adequate footpath and crossing widths in accordance with national standards?

The LoS rating demonstrated in Table 6.16 has been applied to each junction for both the Do Minimum and Do Something scenarios based on whether the above indicators have been met.

Table 6.16: Pedestrian Junction Assessment LoS

LoS	Indicators Met (of a Total of 5)
A	5
B	4
C	3
D	2
E	1
F	0

When comparing the Do Minimum and Do Something scenarios for pedestrians, the terms outlined in Table 6.17 have been used to describe the impact, based on the changes in the Qualitative Pedestrian LoS rating.

Table 6.17: Description of Impact for Pedestrian Qualitative Assessment

Magnitude of Impact	Change in LoS Rating
High	4 to 5
Medium	2 to 3
Low	1
Negligible	0

To establish the Significance of Effect for the impacts of the Pedestrian Infrastructure, as a result of the Proposed Scheme, a sensitivity rating has been applied to each junction in accordance with the methodology set out in Section 6.2.4.

6.4.6.1.1.2 Cycling Infrastructure

The impacts to the quality of the cycling infrastructure as a result of the Proposed Scheme have been considered with reference to the changes in physical provision for cyclists provided during the Do Minimum and Do Something scenarios. The NTA's National Cycle Manual's Quality of Service (QoS) Evaluation criteria have been adapted for use in assessing the cycling qualitative impact along the Proposed Scheme. The refined cycling facilities criteria are as follows:

- **Segregation:** a measure of the separation between vehicular traffic and cycling facilities;
- **Number of adjacent cyclists / width:** the capacity for cycling two abreast and / or overtaking ('2+1' accommodates two abreast plus one overtaking); and
- **Junction Treatment:** a measure of the treatment of cyclist traffic at existing junctions.

The contents of Table 6.18 outline the assessment criteria with reference to the corresponding LoS ratings.

Table 6.18: Cycling Assessment Criteria

LoS	Segregation	No. of adjacent cyclists / width		Junction treatment
A+	High degree of separation. Minimal delay	2+1	2.5m	Cyclists get green signal priority at signalised junctions / has priority across uncontrolled junctions
A	Well separated at mid-link with some conflict at intersections	1+1	2.0m	Toucan crossings at signalised junctions for cyclists along CBC / Protected junctions not already classified as A+ for junction treatment
B	On-road cycle lanes or carriageway designated as 'quiet cycle routes'	1+1	1.75m	Cyclists share green time with general traffic and cycle lanes continue through the junction, for junctions not already classified as A or A+ for junction treatment
C	Bicycle share traffic or bus lanes	1+0	1.25m	Cyclists share green time with general traffic with cycle facilities (advanced stacking locations / cycle lanes) available up to the junction but do not continue through
D	No specific bicycle facilities	1+0	0.75m	No specific bicycle facilities

As the cycle provision varies along the corridor, each section of the Proposed Scheme has been further separated into smaller subsections in order to apply the cycling assessment criteria appropriately.

When comparing the Do Minimum and Do Something scenarios for cyclists, the terms outlined in Table 6.19 have been used to describe the impact, based on the changes in the Qualitative Cycling LoS rating.

Table 6.19 Description of Impact for Cycling Qualitative Assessment

Magnitude of Impact	Change in LoS Rating
High	3 to 4
Medium	2
Low	1
Negligible	0

To establish the Significance of Effect for the impacts of the cycling infrastructure, as a result of the Proposed Scheme, a sensitivity rating has been applied to each assessed section in accordance with the methodology set out in Section 6.2.

6.4.6.1.1.3 Bus Infrastructure

The implementation of the Proposed Scheme will result in changes in the quality of bus infrastructure provision along the route, including dedicated bus lanes and bus stop upgrades / relocations. Improvement in bus priority measures will reduce the interaction between buses and general traffic and reduce the likelihood of delays.

The qualitative impact assessment has been undertaken based on the following factors:

- Provision of bus lanes;
- Bus stop provision; and
- Changes to the existing bus stop facilities:
- Real-time information;
- Timetable information;
- Shelters;
- Seating;
- Accessible kerbs (containment Kassel kerbs); and
- Removal of indented drop off areas, where appropriate.

The magnitude of impact of the Proposed Scheme, applied to the qualitative review of the above factors, is set out in Table 6.20.

Table 6.20: Magnitude of Impact for Bus Users Qualitative Assessment

Impact	Description of Impact / Proposed Changes
High positive	Significant benefit for bus users with no disbenefits
Medium positive	Positive impact for bus stop users with benefits outweighing any minor disbenefits.
Low positive	Slight benefit for users with benefits outweighing any disbenefits.
Negligible impact	Marginal impact to user buses where any benefits or disbenefits are offset.
Low negative	Slight negative impact for users with disbenefits marginally outweighing benefits.
Medium negative	Negative impact for bus users with benefits not outweighing any disbenefits.
High negative	Complete removal of provision.

To establish the Significance of Effect for the impacts of the bus infrastructure, as a result of the Proposed Scheme, a sensitivity rating has been applied to each assessed section in accordance with the methodology set out in Section 6.2.4

6.4.6.1.1.4 Parking and Loading

The impacts of the Proposed Scheme on parking and loading provision have been assessed through a comparison of the availability of spaces or lengths of bay in the Do Minimum (baseline environment) and Do Something scenarios. The assessment has taken the parking information and considers the impact of any changes on the general availability of parking and loading in the vicinity of the Proposed Scheme. It classifies parking into the following categories:

- Designated Paid Parking;
- Permit Parking;
- Disabled Permit Parking;
- Loading / Unloading (in designated Loading Bays);
- Loading / Unloading (outside designated Loading Bays);
- Taxi Parking (Taxi Ranks);
- Commercial vehicles parked for display (car sales); and
- Informal Parking (i.e. parking alongside the kerb which is unrestricted).

This qualitative assessment has also taken account of adjacent parking on side streets which is defined as alternative parking locations along side roads within 200 – 250m of the Proposed Scheme.

Significance ratings for the impacts of any changes in parking provision have been generated for each specific instance of change and for each section of the Proposed Scheme. The ratings are based upon professional judgement and experience and consider:

- The magnitude of change in parking availability;
- The availability of alternative parking; and
- Nearby land uses, such as businesses.

Note that the parking and loading assessment has been undertaken as a qualitative analysis based on the above criteria and does not generate a resulting LoS rating.

6.4.6.1.2 Section 1 – N4 Junction 3 to M50 Junction 7 – N4 Lucan Road

6.4.6.1.2.1 Pedestrian Infrastructure

The key infrastructural changes to the pedestrian link along Section 1 of the Proposed Scheme are the following:

- Provision of a new bridge over the N4 at Junction 3 delivering a separate cycle track and footway, replacing the existing structure;
- Provision of a new uncontrolled raised table crossing at the access to Hermitage Golf Club;
- Proposed resurfacing and upgrade to the footways on Old Lucan Road, and provision of regular raised tables as part of traffic calming measures covering a 670m section in total (Chainage: G50 – H200);
- Provision of a new raised table pedestrian crossing to the east of roundabout which provides access to the Hermitage Medical Clinic;
- A new footbridge (Chainage A2200) which will provide access between Liffey Valley Shopping Centre and the proposed eastbound bus stops on N4 Lucan Road and provision of a new uncontrolled raised table pedestrian crossing of Old Lucan Road linking to the footbridge; and
- Provision of a new raised table pedestrian crossing linking to the existing shared foot / cycle bridge over the N4 Lucan Road to Liffey Valley Shopping Centre which will be retained.

The assessment of the qualitative impacts on the pedestrian infrastructure changes along Section 1 of the Proposed Scheme are summarised in Table 6.21, along with the accompanying sensitivity for each junction and the resultant Significance of Impact. A detailed breakdown of the assessment at each junction can be found in Appendix A6.4.1 (Pedestrian Infrastructure Assessment) of Volume 4 of this EIAR.

Table 6.21: Section 1 – Significance of Effects for Pedestrian Impact during Operational Phase

Junction	Chainage	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
N4 westbound on/off-slips /R136 Ballyowen Road	N368	D	C	Low	Medium	Positive Moderate
R136 Ballyowen Road / R835 Lucan Road	B254	D	B	Medium	Medium	Positive Significant
N4 / Ballyowen Lane	A700	C	B	Low	Medium	Positive Moderate
N4 / Saint Loman's Hospital Access	A1175	C	B	Low	Low	Positive Slight
N4 Lucan Road / Liffey Valley junction (eastbound on / off northern dumb-bell)	A305	E	C	Medium	Low	Positive Moderate
Section Summary		**D**	**B**	**Medium**	**Medium**	**Positive Significant**

The results in Table 6.21 demonstrate that the Proposed Scheme will have a long-term positive impact on the quality of the pedestrian infrastructure at road junctions within Section 1.

The Do Minimum LoS range between C and E. In the Do Something scenario, three of the five junctions have been assessed as B, as a result of improvements such as the provision of more direct crossings and the incorporation of features which will reduce vehicle speeds. The Proposed Scheme will improve pedestrian facilities at five of the eight junctions assessed.

Overall, a potential **Positive, Significant and Long-term** effect is anticipated along Section 1 of the Proposed Scheme, during the operational phase.

6.4.6.1.2.2 Cycling Infrastructure

The following section sets out the qualitative impacts on the cycling receptor for Section 1 of the Proposed Scheme. The results are summarised in Table 6.22, along with the accompanying sensitivity for each section and the resultant significance of impact.

The key cycling improvements along Section 1 of the Proposed Scheme can be summarised as follows:

- Provision of a 3.25m wide two-way cycle track over a new bridge structure on the eastern side of R136 Ballyowen Road between the R835 Lucan Road and Hermitage Road where there is currently a 1.2m cycle lane on both sides of the road between the N4 overbridge and R835 Lucan Road, and no provision between the N4 overbridge and Hermitage Road. This will allow continuous two-way cycling, where cyclists currently either use the road, or share with pedestrians.
- Provision of separate and segregated crossing facilities for cyclists and pedestrians at the R136 Ballyowen Road / R835 Lucan Road junction;
- Continuous cycle lanes through the junction at the R136 Ballyowen Road / Hermitage Road junction, including a right turn lane for cyclists travelling northbound along the R136 Ballyowen Road South to link to the two-way cycle lane on the eastern side of the R136 Ballyowen Road;
- A proposed continuous 3.0m wide two-way cycle track on the north side of the R835 Lucan Road between R136 Ballyowen Road and N4 Lucan Road, where there is currently no cycle provision. There is a short on-road section along the public road which provides access to Hermitage Golf Club road;
- Heading eastbound, a proposed continuous 3.5m wide two-way cycle track on the north side of N4 Lucan Road between Lucan Bypass and N4 Junction 2
- Heading eastbound, a proposed continuous 3.0m wide two-way cycle track on the south side of the Old Lucan Road between N4 Junction 2 and the existing cycle track that crosses the M50 via an existing overbridge just north of M50 Junction 7. This will include a new toucan crossing of Fonthill Road North at Junction 2 of the N4, linking the two sections of new two-way cycle tracks.
- Currently there is an eastbound shared cycle / pedestrian facility as far as the overbridge near St Andrews Court, and then either a shared bus / cycle lane to M50 Junction 7, or use of the quieter (in terms of traffic levels) Old Lucan Road as an alternative route. The new cycle track will link into the existing N4 pedestrian / cycle bridge that serves the Liffey Valley shopping centre, with ramps providing a step-free link from Old Lucan Road to the N4 Liffey Valley overbridge for cyclists.
- Heading westbound, a proposed 3.5m wide two-way cycle track will be provided on the northern side of the N4 Lucan Road, between Fonthill Road North and the N4 Junction 3. Cyclists will have a choice to stay on the two-way cycle track all the way to the N4 Junction 3, or to go as far as Hermitage Bridge and use the existing shared foot / cycle bridge (St Lomans Footbridge) over the N4 at the Mount Andrews Estate. From the Mount Andrews Estate, cyclists can reach Ballyowen Lane (and the Quiet Street along Hermitage Way) via the network of residential streets and a pedestrian priority link at Mount Andrew Place.
- Formalising a ‘Quiet Street’ cycle route of 700m in length between the N4 and R136 Ballyowen Road along Ballyowen Lane and Hermitage Road, as an alternative to the N4 westbound off slip. ‘Quiet’ in this respect refers to streets with lower traffic volumes.

The contents of Table 6.22 provide a summary of the cycling qualitative assessment along Section 1 of the Proposed Scheme. A detailed breakdown of the assessment along each link can be found in Appendix A6.4.2 (Cycling Infrastructure Assessment) of Volume 4 of this EIAR.

Table 6.22: Section 1 – Cycling Impact during Operational Phase

Location	Chainage	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
R136 Ballyowen Road: Hermitage Road to N4 overbridge	B0 – B250	C	A+	High	Medium	Positive Very Significant
Lucan Road: R136 Ballyowen Road to N4	C0 – D300	C	A	Medium	Medium	Positive Significant
N4 Lucan Road: Lucan Bypass to Fonthill Road	A550 – F0	B	A+	Medium	Low	Positive Moderate
Old Lucan Road: Fonthill Road North to M50 J7	F0 – I500	C	A	Medium	Low	Positive Moderate
Hermitage Road: R136 Ballyowen Road to Ballyowen Lane	-	C	B	Low	Low	Positive Slight
Section Summary		**C**	**A**	**Medium**	**Low**	**Positive Moderate**

The LoS for four of the five sub-sections in the Do Minimum scenario has been assessed as C, indicating that the existing facilities are generally adequate, but not of a particularly high standard. The LoS in the Do Something scenario show improvements on every sub-section, with all sub-sections (with the exception of the 'Quiet Street' on Hermitage Road) being brought up to an LoS of A or A+ by the Proposed Scheme, primarily as the result of the introduction of dedicated off-road cycle tracks along the majority of Section 1. These ratings have been determined using the previously referenced assessment criteria set out in Table 6.18.

Overall, a potential **Positive, Moderate and Long-term** effect is anticipated along Section 1 of the Proposed Scheme, during the operational phase.

6.4.6.1.2.3 Bus Infrastructure

This assessment outlines the changes to bus stop infrastructure along Section 1 of the Proposed Scheme. It assesses any changes in the number or location of stops, and any changes to bus stop facilities.

There are currently nine bus stops throughout the extent of this section. Four of these stops are located along the N4 Lucan Road eastbound, inbound to the City Centre and five are located on the westbound / outbound side.

Under the proposals, the existing nine stops, four inbound and five outbound, will be retained.

Double-length bus stops will be provided at Lucan Retail Park (Stop 2234), and at the westbound stop at St Loman's Hospital (Stop 2215). Single bays currently exist at both of these locations.

Triple-length bus stops will be provided on both the eastbound (Stop 2239) and westbound (Stop 2213) carriageways at the stops that serve LVSC, which will be moved some 150m further to the west, and will be adjacent to the proposed new footbridge across the N4. This will provide a more direct route to the shopping centre than the existing footbridge and ramps, and a direct route to the proposed bus interchange at LVSC.

Table 6.23 summarises the proposed changes to bus stop facilities in Section 1 of the Proposed Scheme.

Table 6.23: Section 1 – Overview of Changes in Bus Stop Facilities

Bus Stop Facility	Do Minimum		Do Something		Comment
	No. of Stops	Percentage of Stops	No. of Stops	Percentage of Stops	
RTPI	3	33%	9	100%	RTPI added to all bus stops.
Timetable information	8	89%	9	100%	Timetable information added to be provided at all bus stops.
Shelter	7	78%	9	100%	Shelters to be provided at all bus stops.
Seating	5	56%	9	100%	Seating to be provided at all bus stops.
Accessible Kerbs	8	89%	9	100%	Accessible kerbs added to all bus stops.
Indented Drop Off Area	5	56%	6	67%	Stops on the N4 will be located in lay-bys, allowing buses to pull in from this busy route. The remaining stops will be located in-line within bus lanes.
Total Stops	9		9		

All of the stops on the Proposed Scheme route will have real-time information, shelters, seating and accessible kerbs. Six stops will be located in indented drop-off areas. The remaining three stops are inline within the bus lane.

The lengthening of bus stops at four locations, and improvements in the provision of real-time information, shelters, seating and accessible kerbs throughout Section 1 of the Proposed Scheme is assessed as providing an overall positive impact for bus passengers, particularly those accessing Liffey Valley.

Taking into account the provision of bus lanes, pedestrian accessibility and bus stop facilities outlined within this section, Table 6.24 below outlines the bus qualitative assessment along Section 1 of the Proposed Scheme.

Table 6.24: Section 1 – Bus Qualitative Impact during Operational Phase

Section	Chainage	Description of Impact	Impact	Sensitivity	Significance of Effect
N4 Junction 3 to M50 Junction 7 – N4 Lucan Road	A000 - A2850	Existing stops either retained or slightly relocated. Improvements in the quality of bus stop facilities in this section, particularly in increased provision of real-time information.	Medium positive	High	Positive Very Significant

The improvement of bus facilities, primarily real-time information and seating, throughout Section 1 of the Proposed Scheme is assessed as providing a Medium positive impact for bus passengers. The sensitivity of environment rating is predominately categorised as High, which results in a potential **Positive, Very Significant and Long-term** effect on Section 2 of the Proposed Scheme.

6.4.6.1.2.4 Parking and Loading

The Proposed Scheme will impact on existing parking along Section 1. The areas of parking changes are as follows:

- There are currently approximately 78 informal, unmarked parking spaces on the south side of Lucan Old Road in the vicinity of the Deadman's Inn. The parked cars in this location appear to comprise primarily of customers accessing the nearby commercial / restaurant land uses, but also include commuters either parking to use bus services, or to car share with other drivers.
- A further 81 informal, unmarked, parking spaces are located on both sides of the Old Lucan Road, between the roundabout at Junction 2 of the N4 and the King's Hospital School. Observations

suggest that parked vehicles appear to relate to either commuters using the bus services on the N4, or customers accessing the Liffey Valley Shopping Centre via the footbridge.

- Under the proposals, all of the informal spaces on the south side of Lucan Old Road will be removed to allow the provision of a continuous 3m-wide, two-way, cycle track, with the exception of 14 spaces at the eastern end of the road. Parking will be prohibited along the full length of the southern section of the road adjacent to the two-way cycle way to ensure there are no conflicts between parked cars and cycle users. Of the 45 spaces on the north side of the road, 37 will remain. There are 3,600 free parking spaces available at the Liffey Valley Shopping Centre, which is approximately 300m-500m away. Approximately 50 parking spaces in the car park at The Deadman's Inn remain unaffected. These locations represent an alternative option for some of the vehicles parked in the east section of Lucan Old Road. Although the spaces that are lost on Old Lucan Road are not associated within a particular property or commercial business, the number of spaces that are being removed is considered to result in a **Moderate** impact.

Table 6.25 presents a summary of the parking and loading spaces during the Do Minimum / Do Something scenarios and the resulting change in parking along Section 1.

Table 6.25: Section 1– Change in Parking Provision

Street	Parking Type	Number of Parking Spaces		
		Do Minimum	Do Something	Change
Lucan Old Road *(between N4 Junction 2 and M50 interchange)*	Informal	159	51	-108
Total		159	51	-108

As shown in Table 6.24, 159 parking spaces along Section 1 of the Proposed Scheme will be affected, of which 108 spaces will be removed. This is assessed as a **Negative, Moderate and Long-term** effect.

6.4.6.1.3 Section 2 – M50 Junction 7 to R148 Con Colbert Road – Palmerstown bypass and Chapelizod bypass

6.4.6.1.3.1 Pedestrian Infrastructure

The key infrastructure improvements to pedestrian links along Section 2 of the Proposed Scheme are summarised as follows:

- Proposed new signalised crossing of the R148 Palmerstown Bypass on the east side of the Kennelsfort Road Lower junction; currently pedestrians have to use the footbridge, which will be retained;
- Proposed resurfacing and upgrade to the footways on Old Lucan Road, and provision of regular raised tables across both Old Lucan Road and side roads as part of traffic calming measures, covering an 800m section in total (Chainage: J100 - J900);
- Provision of three new uncontrolled raised table crossings of Old Lucan Road between the M50 and Riversdale Avenue (Chainage: J250 – J500); one to the east of the existing pedestrian and cycle bridge over the M50 which is to be retained, a second to the west of Hollyville Lawn, and the third to the west of Riverside Drive;
- Provision of two new raised table crossings between Riversdale Avenue and Waterstown Avenue (Chainage: J500 – J750);
- Proposed resurfacing and upgrade to the footways on Old Lucan Road in the vicinity of Kennelsfort Road Lower, covering a 350m section in total (Chainage: K0 – L50);
- A proposed new raised table and toucan crossing of the Old Lucan Road East arm at the priority junction with Kennelsfort Road Lower;
- Provision of a raised table crossing of Old Lucan Road to the west of Mill Lane;
- Proposed resurfacing and upgrade to the footways on the R112 Lucan Road, and provision of regular raised tables as part of traffic calming measures, covering an 300m section (Chainage: A4450 – A4700); and

- A proposed new toucan crossing with a raised table on the R112 Lucan Road approximately 280m east of the R148 Chapelizod Bypass;

The results of the junction assessment are summarised in Table 6.26 along with the accompanying sensitivity for each junction and the resultant significance of impact. A detailed breakdown of the assessment at each impacted junction, including a list of the junctions which experience no change, can be found in Appendix A6.5.1 (Pedestrian Infrastructure Assessment).

Table 6.26: Section 2 – Significance of Effects for Pedestrian Impact during Operational Phase

Junction	Chainage	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
Old Lucan Road / Hollyville Lawn	J325	D	B	Medium	Low	Positive Moderate
Old Lucan Road / Riverside Drive	J430	D	B	Medium	Low	Positive Moderate
Old Lucan Road / Riversdale Avenue	J500	D	A	Medium	Low	Positive Moderate
Old Lucan Road / Rose View	J710	D	B	Medium	Low	Positive Moderate
Old Lucan Road / Waterstown Avenue	J770	D	A	Medium	Low	Positive Moderate
Old Lucan Road / Kennelsfort Road Lower	J886	C	A	Medium	Low	Positive Moderate
R148 Palmerstown Bypass / Kennelsfort Road Upper / Lower	A3660	E	B	Medium	High	Positive Very Significant
Old Lucan Road / Mill Lane	K150	D	B	Medium	Low	Positive Moderate
R148 Palmerstown Bypass / Old Lucan Road / The Oval	A4000	E	B	Medium	High	Positive Very Significant
Section Summary		**D**	**B**	**Medium**	**Low**	**Positive Moderate**

The results in Table 6.26 demonstrate that the Proposed Scheme will have a long-term positive impact on the quality of the pedestrian infrastructure at road junctions within Section 2.

The Do Minimum LoS range between C and E, with eight of the ten junctions being assessed as C or D. In the Do Something scenario, the Proposed Scheme will improve pedestrian facilities at each of the ten junctions assessed., with all having an assessed LoS of either A or B. This is a result of substantial improvements in the provision of dropped kerbs and tactile paving, compliant footpath and crossing widths and features which will reduce vehicle speeds, such as raised tables.

Overall, a potential **Positive, Moderate and Long-term** effect is anticipated along Section 2 of the Proposed Scheme, during the operational phase, which aligns with the overarching aim to provide enhanced walking infrastructure on the corridor.

6.4.6.1.3.2 Cycling Infrastructure

The key cycling improvements along Section 2 of the Proposed Scheme can be summarised as follows:

- Proposed 3.0m wide two-way cycle tracks along the northern side of Old Lucan Road and the eastern side of Kennelsfort Road Lower and Upper (2.5m-3.0m wide) in the vicinity of the N4 Lucan Road where currently no cycling facilities exist;

- A proposed 2.5m-3.0m wide, two-way cycle track along the northern side of Old Lucan Road between Kennelsfort Road Lower and R112 Lucan Road which connects with Primary Cycle Route 6.
- Provision of toucan crossings at the following locations:
- On the Old Lucan Road East arm of the junction with Kennelsfort Road Lower; and
- On Kennelsfort Road Upper immediately south of the junction with the N4 Lucan Road.
- Provision of a two-way signalised cycle crossing alongside (but separate from) the signalised pedestrian crossing on the N4 Lucan Road East arm of the N4 / Kennelsfort Road Upper and Lower four-arm signalised junction;
- Proposed 1.5m-wide contraflow cycle lane travelling eastbound for a section of approximately 135m along the Chapelizod Hill Road which routes underneath the R148 Chapelizod Bypass overbridge; and
- Proposed 2.0m wide cycle tracks in both directions along the R148 Con Colbert Road, leading to the junction with the R148 Chapelizod Road. A cycle lane will be provided through the junction to facilitate right turns for cyclists onto the R148 Chapelizod Road travelling eastbound with a request button for cycle signal.

Table 6.27 presents the key impact results for the cycling infrastructure assessment along Section 2, with reference to the accompanying sensitivity for each section and the resultant Significance of Impact. Appendix A6.5.2, provides further detail on the assessed LoS ratings.

Table 6.27: Section 2 – Cycling Impact during Operational Phase

Location	Chainage	Do Minimum LoS	Do Something LoS	Impact	Sensitivity	Significance of Effect
Old Lucan Road / N4: M50 Junction 7 to The Oval.	I500 – K275	C	A	Medium	Low	Positive Moderate
Section Summary		C	**A**	**Medium**	**Low**	**Positive Moderate**

The results in Table 6.27 demonstrate that between M50 J7 and The Oval junction, the Proposed Scheme will improve the LoS from C to A, introducing cycle facilities where none currently exists. Between The Oval and Con Colbert Road, cyclists will not be permitted to use the Chapelizod Bypass, with no corresponding cycling infrastructure proposed. The primary east-west cycle route in this area is through Chapelizod Village itself.

Overall, a potential **Positive, Moderate and Long-term** effect is anticipated along Section 2 of the Proposed Scheme, during the operational phase.

6.4.6.1.3.3 Bus Infrastructure

There are currently five bus stops along this section, two inbound and three outbound. Heading outbound from the City Centre, Stop 2201 on R148 Chapelizod Bypass, 50m to the west of the Parkway West filling station, will be removed. This will result in a slight local disbenefit for residents of the area around Palmerstown Drive, for whom the nearest westbound bus stop will be at The Oval, approximately 200m to the west.

Two new double-length stops will be added on R148 Chapelizod Bypass close to Chapelizod Hill Road (which routes underneath the bypass). Ramps and steps will be constructed to link the bus stops with Chapelizod Hill Road to enable pedestrian access. These stops will help provide greater access for residents and businesses from the Chapelizod area to the Proposed Scheme.

The existing bus stops on the R148 Palmerstown Bypass at Kennelsfort Road and The Oval are to be lengthened and relocated to allow the provision of bus lay-bys.

Table 6.28 summarises the proposed changes to bus stop facilities in Section 2 of the Proposed Scheme.

Table 6.28: Section 2 – Overview of Changes in Bus Stop Facilities

Bus Stop Facility	Do Minimum		Do Something		Comment
	No. of Stops	Percentage of Stops	No. of Stops	Percentage of Stops	
RTPI	2	40%	6	100%	RTPI added to all bus stops.
Timetable information	5	100%	6	100%	Timetable information to be provided at all bus stops.
Shelter	4	80%	6	100%	Shelters to be provided at all bus stops.
Seating	4	80%	6	100%	Seating to be provided at all bus stops.
Accessible Kerbs	5	100%	6	100%	Accessible kerbs added to all bus stops.
Indented Drop Off Area	0	0%	6	100%	All stops on the R148 will be located in lay-bys, allowing buses to pull in from this busy route.
Total Stops	5		6		One more bus stop in total along R148 Chapelizod Bypass.

All of the bus stops on the Proposed Scheme will incorporate shelters, seating, real-time information and have accessible kerb, and all will have indented drop-off areas.

In addition to the changes presented above, there will also be changes on Old Lucan Road, which runs parallel to R148 Palmerstown Bypass, and Kennelsfort Road Lower. The bus stops on Old Lucan Road (Stops 4357, 4359, 4360 and 7165) to the west of Kennelsfort Lower will be rationalised into one eastbound and one westbound stop (both inline) that will be located centrally between Mill Lane and Waterstown Avenue.

The two existing stops on Kennelsfort Road Lower (Stops 2212 and Stop 4361) will also be removed as part of the rationalisation of bus stops along the corridor.

Taking into account the provision of bus lanes, pedestrian accessibility and bus stop facilities outlined within this section, Table 6.29 below outlines the bus qualitative assessment along Section 2 of the Proposed Scheme.

Table 6.29: Section 2 – Bus Qualitative Impact during Operational Phase

Section	Chainage	Description of Impact	Impact	Sensitivity of Environment	Significance of Effect
M50 Junction 7 to Con Colbert Road	A2850 - A7550	New pair of bus stops provided on R148 Chapelizod Bypass close to Chapelizod Hill Road. Improvements in the quality of bus stop facilities in this section. Bus stops on Old Lucan Road and Kennelsfort Road Lower rationalized.	Medium Positive	High	Positive Very Significant

The provision of the new stops close to Chapelizod Hill Road, along with the improvements to facilities at the existing stops in Section 2 of the Proposed Scheme is assessed as providing an overall Medium positive impact for bus passengers, which takes into account the rationalization of stops on Old Lucan Road and Kennelsfort Road.

The sensitivity of environment rating is predominately categorised as High, which results in a potential **Positive, Very Significant and Long-term** effect on Section 2 of the Proposed Scheme.

6.4.6.1.3.4 Parking and Loading

The Proposed Scheme will impact on existing parking along Section 2. The areas of parking changes are as follows:

- There is currently space for approximately 194 vehicles to park informally on Old Lucan Road between the M50 interchange and Palmerstown Village (Kennelsfort Road Lower). All of the 108 spaces on the north side of the road will be removed to accommodate a proposed 3m-wide, 2-way, cycle track to the north of the road. Double-yellow lines will be introduced to prevent any vehicles parking on the kerb and partially blocking the cycle track. All of the existing informal and paid parking spaces on the south of the road will be retained. The residential properties in this area all have private driveways, and the spaces that will be lost are not associated with any specific residential or commercial properties. The overall impact at this location is considered to be **Slight**.
- There are currently 18 permit / pay & display spaces and one disabled space on Kennelsfort Road Lower. The 16 spaces on the west side of the road will be retained. The three pay and display spaces, and one disabled space on the east side of the road will be removed to allow provision of a 3.0m wide, two-way, cycle track running from Lucan Old Road across R148 Palmerstown Bypass, to Kennelsfort Road Upper. The overall impact at this location is considered to be **Slight**.
- Between Palmerstown Village and R148 Palmerstown Bypass, there are currently 62 permit / pay & display spaces on Lucan Old Road, which are located in parallel bays to both the north and south of the road. There are also two disabled spaces on the north kerb in this section. These spaces are likely to be used by local residents, and those accessing local businesses. Under the proposals, all of the 29 spaces on the north side of Old Lucan Road would be removed to allow provision of a 3.0m wide, two-way, cycle track alongside the northern footpath. Private properties and business on the north side of the road, between Kennelsfort Road Lower and Mill Lane, have off-street parking available, comprising approximately seven parking spaces. All but one of these residential properties has a private driveway, and the two businesses (Ulster Bank and the Coach House) have private car parks. 14 additional spaces, including one disabled space, are proposed to be created on the south side of the road by converting some of the existing parallel parking to perpendicular spaces, and narrowing the footway. In total this would allow for the provision of 47 spaces, plus two accessible spaces. The overall loss of parking in this location would be 15 permit / pay & display spaces. The overall impact at this location is considered to be **Slight.**

Table 6.30 presents a summary of the parking and loading spaces during the Do Minimum / Do Something scenarios and the resulting change in parking along Section 2.

Table 6.30: Section 2 – Change in Parking Provision

Street	Parking Type	Number of Parking Spaces		
		Do Minimum	Do Something	Change
Old Lucan Road *(between M50 interchange and Kennelsfort Road Lower)*	Informal	194*	88	-106
Kennelsfort Road Lower *(between Old Lucan Road and R148 Palmerstown Bypass)*	Permit / Pay & Display	18	16	-2
	Disabled	1	0	-1
Old Lucan Road *(between Kennelsfort Road Lower and Palmerstown Bypass)*	Permit / Pay & Display	62	47	-15
	Disabled	2	2	0
Total		**277**	**153**	**-124**

*Total capacity of unmarked, kerbside space

The proposed amendments to parking / loading result in a loss of 124 spaces along Section 2. This is assessed as a potential **Negative, Slight and Long-term** effect.

6.4.6.1.4 Section 3 – R148 Con Colbert Road to City Centre (Frank Sherwin Bridge) – Con Colbert Road and St John's Road West

6.4.6.1.4.1 Pedestrian Infrastructure

The key infrastructure improvements to pedestrian links along Section 3 of the Proposed Scheme are summarised as follows:

- Proposed conversion of the two-stage staggered pelican crossing of the R148 St John's Road West to the west of Heuston Station to a direct crossing with a raised table;
- Proposed conversion of the two-stage staggered pelican crossing of the R148 St John's Road West at the south-eastern corner of Heuston Station to a direct toucan crossing; and
- Significant pedestrian improvements at the R148 / R111 South Circular Road junction, where a more compact junction, with more direct crossings, is proposed.

The results of the junction assessment are summarised in Table 6.31, along with the accompanying sensitivity for each junction and the resultant significance of impact. A detailed breakdown of the assessment at each impacted junction, including a list of the junctions which experience no change, can be found in Appendix A6.5.1 (Pedestrian Infrastructure Assessment).

Table 6.31: Section 3 – Significance of Effects for Pedestrian Impact during Operational Phase

Junction	Chainage	Do Minimum LoS	Do Something LoS	Magnitude of Impact	Sensitivity	Significance of Effect
R148 Con Colbert Road / Memorial Road	A7850	C	B	Low	Low	Positive Slight
R148 Con Colbert Road / R111 South Circular Road / St R148 John's Road West	A8650	D	**A**	Medium	High	Positive Very Significant
R148 St John's Road West / Heuston South Quarter	A9100	D	B	Medium	High	Positive Very Significant
R148 St John's Road West / Military Road	A9300	D	B	Medium	Medium	Positive Significant
Section Summary		**D**	**B**	**Medium**	**Medium**	**Positive Significant**

The results in Table 6.31 demonstrate that the Proposed Scheme will have a long-term positive impact on the quality of the pedestrian infrastructure at road junctions within Section 3.

The Do Minimum LoS are either C or D, with three of the four junctions being assessed as D. In the Do Something scenario, pedestrian infrastructure at each of the junctions has been improved. The R148 Chapelizod Bypass / R111 South Circular / St R148 John's Road West signalised junction fulfils all of the LoS criteria and has been assessed as an 'A' rating, as a result of the provision of direct crossings, reductions in vehicle speeds, and improvements to footpath and crossing widths.

Overall, a potential **Positive, Significant and Long-term effect** is anticipated along Section 3 of the Proposed Scheme, during the operational phase.

6.4.6.1.4.2 Cycling Infrastructure

This assessment outlines the changes to the quality of cycling provision along Section 3 of the Proposed Scheme. The key cycling improvements can be summarised as follows:

- Provision of continuous 2.0m-wide cycle tracks in both directions between the R833 Con Colbert Road and R111 South Circular Road (reducing to 1.75m wide at junctions), which continue through signalised junctions, replacing shared bus / cycle lanes. The proposed improvements for cyclists at the South Circular Road junction are particularly beneficial.

- Proposed addition of a toucan crossing for cyclists across the R148 Con Colbert Road West at Memorial Road;
- Proposed addition of a toucan crossing for cyclists across R148 St John's Road West at HSQ (eastern arm) and Military Road respectively. Proposed addition of a cycle reservoir for cyclists turning onto R148 St John's Road West from Military Road; and
- Provision of continuous 2.0m wide cycle tracks in either direction between R111 South Circular Road and Frank Sherwin Bridge, replacing a combination of shared bus / cycle lanes and on-road cycle lanes; and
- Upgrade of the existing pedestrian crossing to a toucan crossing across St John's Road to the east of Heuston Station.

Table 6.32 presents the overall Do Minimum LoS and Do Something LoS ratings for each segment within Section 3 of the Proposed Scheme, along with the resultant Impact Assessments. Appendix A6.5.2, provides further detail on the assessed LoS ratings.

Table 6.32: Section 3 - Cycling Impact during Operational Phase

Location	Chainage	Do Minimum LoS	Do Something LoS	Description of Impact	Sensitivity	Significance of Effect
R148 Con Colbert Road: R148 Chapelizod Bypass to R111 South Circular Road.	Chainage A7600 – A8450	C	B	Low	Low	Positive Slight
R148 St John's Road West: R111 South Circular to Frank Sherwin Bridge.	Chainage A8450 – A9618	C	B	Low	High	Positive Moderate
Section Summary		C	B	**Low**	**Medium**	**Positive Moderate**

The results in Table 6.32 demonstrate that the Proposed Scheme will have an overall long-term positive impact on the quality of the cycling infrastructure along Section 3.

The LoS for each sub-section in the Do Minimum scenario has been assessed as C, indicating that the existing facilities are generally adequate, but not of a particularly high standard. The LoS in the Do Something scenario show improvements in both sub-sections as a result of the introduction of continuous off-road cycle tracks throughout Section 3.

Overall, a potential **Positive, Moderate and Long-term effect** is anticipated along Section 3 of the Proposed Scheme, during the operational phase.

6.4.6.1.4.3 Bus Infrastructure

This assessment outlines the changes to bus stop infrastructure along Section 3 of the Proposed Scheme. It assesses any changes in the number or location of stops, and any changes to bus stop facilities.

There are currently six bus stops between R833 Con Colbert Road and Frank Sherwin Bridge. Three of these stops are located on the eastbound direction inbound, and three on the westbound direction, outbound.

Under the proposals, all of the existing stops will be retained, with all but the existing inbound stop at Heuston Station being relocated closer to pedestrian crossing facilities. This stop will be extended to a triple length stop. In addition, a new double-length outbound stop will be provided at Heuston Station, 100m to the east of existing Stop 2637.

Table 6.33 summarises the proposed changes to bus stop facilities in Section 3 of the Proposed Scheme.

Table 6.33: Section 3 – Overview of Changes in Bus Stop Facilities

Bus Stop Facility	Do Minimum		Do Something		Comment
	No. of Stops	Percentage of Stops	No. of Stops	Percentage of Stops	
RTPI	2	33%	7	100%	RTPI added to all bus stops.
Timetable information	2	33%	7	100%	Timetable information to be provided at all bus stops.
Shelter	2	33%	7	100%	Shelters to be provided at all bus stops.
Seating	2	33%	7	100%	Seating to be provided at all bus stops.
Accessible Kerbs	2	33%	7	100%	Accessible kerbs added to all bus stops.
Indented Drop Off Area	0	0%	2	29%	Inbound stop and outbound stops at Heuston Station will be located in indented drop-off areas. Remaining stops located inline within bus lanes.
Total Stops	6		7		Existing stops retained / relocated. Additional outbound stop at Heuston Station.

Existing bus stop facilities are limited, with only a third of stops having real-time information, shelters and seating. All of the stops on the Proposed Scheme route will have real-time information, shelters, seating and accessible kerbs. Two stops (Stop 4413 and the new Stop to the east of Stop 2637) will be located in indented drop-off areas, with the remaining stops being located inline in bus lanes.

Taking into account the provision of bus lanes, pedestrian accessibility and bus stop facilities outlined within this section, Table 6.34 below outlines the bus qualitative assessment along Section 3 of the Proposed Scheme.

Table 6.34: Section 3 – Bus Qualitative Impact during Operational Phase

Section	Chainage	Description of Impact	Impact	Sensitivity of Environment	Significance of Effect
Con Colbert Road to Frank Sherwin Bridge	A7550 – A9709	Existing stops either retained or slightly relocated. Additional outbound stop at Heuston Station. Significant improvements in the quality of bus stop facilities in this section, particularly in increased provision of real-time information, shelters and seating.	High	High	Profound Positive

The lengthening of bus stops at four locations, the relocation of four stops closer to pedestrian crossing facilities and the new stop at Heuston Station, and improvements in the provision of real-time information, shelters, seating and accessible kerbs throughout Section 3 of the Proposed Scheme is assessed as providing an overall High positive impact for bus passengers on this section of the route.

The sensitivity of environment rating is predominately categorised as High, which results in a potential **Positive, Profound and Long-term effect** on Section 3 of the Proposed Scheme.

6.4.6.1.4.4 Parking and Loading

The Proposed Scheme will impact on existing parking along Section 3. The areas of parking changes are as follows:

- There are currently three Permit parking / Pay and Display spaces, and two EV charging spaces on the south side of St John's Road at Heuston Station. Under the proposals, these five spaces would be removed to allow the provision of a new, two stance bus-stop on the westbound carriageway. The two EV spaces would be relocated to the existing parking lay-by on the south side of St John's Road, between the Heuston South Quarter (HSQ) access and Military Road. The overall impact of this location is considered to be **Slight**.

- There are currently two separate lengths of taxi queuing lanes on the eastbound approach to Heuston Station. The first begins opposite the Royal Hospital Kilmainham Gardens and has space for 20 taxis to queue. The second taxi queuing lane begins after the right-turn entrance to the HSQ complex and has space for 23 taxis. These taxi queuing lanes are on-street within the bus lane and are approximately 1.5m wide defined by road markings. There is a taxi stand off-road and contained within a continuous bay next to Heuston Station which has space for 18 taxis. Under the proposals, the 20-space Kilmainham Gardens taxi queuing lane would be removed to allow provision of a 1.5m cycle track alongside the eastbound carriageway, and also to ensure that buses can run freely along the proposed Bus Lane. The removal of the taxi queuing lane will not affect the provision of 18 space taxi rank at the station in the area and given the continued presence of the remaining queuing lane, with capacity for 23 taxis, the overall impact at this location is considered to be **Slight**.
- There are 10 informal, general, parking spaces on St John's Road, comprising eight spaces at Military Road, and two spaces immediately north of the gardens at the Royal Kilmainham Hospital (RKH). The eight-space lay-by at Military Road will be reduced to a two-space lay-by and will contain the two electric vehicle charging points relocated from Heuston Station. The existing two-space lay-by at RKH will be removed, to allow the provision of a westbound 1.5m-wide cycle track to the south of St John's Road. The overall impact at these locations is considered to be **Slight**.

Table 6.35 presents a summary of the parking and loading spaces during the Do Minimum / Do Something scenarios and the resulting change in parking along Section 3.

Table 6.35: Section 3 – Change in Parking Provision

Street	Parking Type	Number of Parking Spaces		
		Do Minimum	Do Something	Change
R148 St John's Road at Heuston Station	Permit / Pay & Display	3	0	-3
	EV Charging	2	2*	0
R148 St John's Road *(between HSQ Access and Heuston Station)*	Taxi	61	41	-20
	Informal	10	0	-10
Total		**78**	**45**	**-33**

*relocated

The proposed amendments to parking / loading result in a loss of 33 spaces along Section 3. This is assessed as a potential **Negative, Slight and Long-term effect.**

6.4.6.1.5 Summary of Corridor-Wide Infrastructure Works

6.4.6.1.5.1 Pedestrian Infrastructure

The Proposed Scheme will increase the number of controlled pedestrian crossings from 20 in the Do Minimum to 28 in the Do Something scenario, equating to a 71% increase. Additionally, there will be an increase in the number of raised table crossings on side roads from 1 in the Do Minimum to 19 in the Do Something scenario, representing a significant increase.

6.4.6.1.5.2 Cycling Infrastructure

The Proposed Scheme will provide 6.45km inbound and 6.31km outbound of segregated cycle facilities which is an increase from only 0.73km in both directions in the Do Minimum scenario. In turn, there will be a decrease in non-segregated cycle facilities in the Do Something scenario compared to the Do Minimum as these facilities will be upgraded to segregated facilities in most cases.

Overall, total cycle facilities (segregated and non-segregated in both directions) will be increased from 3.83km to 13.44km as part of the Proposed Scheme. The proportion of cycle facilities which are segregated (including quiet street treatment) will increase from 38% in the Do Minimum to 95% in the Do Something scenario.

6.4.6.1.5.3 Bus Priority Infrastructure

The Proposed Scheme will provide 9.17km inbound and 8.6km outbound of bus lanes across the corridor. This is an increased from 7.45km inbound and 6.4km outbound in the Do Minimum scenario. This contributes to an increase of 28% in total bus priority measures in both directions in the Do Something scenario compared to the Do Minimum. Overall, the Proposed Scheme will provide bus priority measures along 93% of the corridor.

6.4.6.1.5.4 Parking & Loading

Total parking provision will be reduced by 265 spaces along the Proposed Scheme. The majority of this reduction is the removal of low use informal parking on sections of road where properties and businesses have off-street parking.

Aspects of the Proposed Scheme and network proposals are expected to mitigate the reduction in parking by reducing reliance on private cars due to availability of an improved bus network with journey reliability, by availability of improved cycling infrastructure, and by continued and managed use of private off-street parking.

Similarly, many properties along the Proposed Scheme have driveways, and residents should be encouraged to utilise their available off-road space for parking (rather than seek to park on-street). Improved compliance with parking and loading bay regulations, and management of loading activities will also assist in offsetting the reduction in on-street parking spaces. It is concluded that the overall impact of loss of parking space on these streets is limited and will be largely offset by the cumulative effect of mitigations.

6.4.6.2 Quantitative Analysis

This quantitative assessment has been prepared with reference to the modelling outputs obtained from the four-tiered modelling approach outlined in Section 6.2. The following assessment topics have been considered:

- People Movement
  - Peak Hour People Movement along the Proposed Scheme;
  - People Movement by Bus; and
  - Bus Boarding.
- Bus Network Performance Indicators:
  - Bus Journey Times; and
  - Bus Journey Time Reliability.
- General Traffic Network Performance Indicators:
  - Junction Capacity Outputs on the Direct Study Area; and
  - Redistributed flows and Junction Capacity Outputs on the Indirect Study Area.

6.4.6.2.1 People Movement Assessment

6.4.6.2.1.1 Overview

In order to understand the benefit of the Proposed Scheme with regards to the Movement of People following the implementation of the proposed infrastructure measures, a quantitative People Movement assessment has been undertaken using outputs from the NTA ERM and LAM and comparing the Do Minimum and Do Something peak hour scenarios for each forecast year (2028, 2043).

The assessment of People Movement includes the following metrics:

- The average number of people moved by each transport mode (i.e., Car, Bus, Walking and Cycling) along the corridor in the inbound and outbound direction. This metric is compared for the Do Minimum and Do Something scenarios in the AM and PM peak hours for each forecast year (2028, 2043). This metric provides an estimate of the modal share changes along the route as a result of the Proposed Scheme measures; and
- People Movement by Bus:

- AM and PM peak hour Bus Passenger Loadings along the Proposed Scheme for each forecast year (2028, 2043); and
- Total Passengers Boarding Buses on bus routes that use any part of the Proposed Scheme for each forecast year (2028, 2043).

6.4.6.2.2 Peak Hour People Movement along the Proposed Scheme

To determine the impact that the Proposed Scheme has on modal share in the direct study area as a result of its implementation, the weighted average number of people moved by each mode (Car, Bus, Active Modes) has been extracted from the ERM / LAM. The analysis compares the Do Minimum and Do Something scenarios both in the inbound and outbound direction in the AM and PM peak hours (8-9am, 5-6pm) for each forecast year (2028, 2043).

As outlined previously, the same demographic assumptions (population, employment levels) are included in both the Do Minimum and Do Something scenarios. The bus network and frequency assumptions are also the same in both scenarios and are in line with the BusConnects Network Redesign proposals. It is acknowledged, therefore, that the assessment is conservative in terms of the level of people movement that is predicted in the Do Something scenario. The Do Something scenario will facilitate opportunities to increase bus network capacity operating along the corridor due to the extensive priority provided. In addition to this, the significant segregation and safety improvements to walking and cycling infrastructure that are 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. In the absence of the delivery of the Proposed Scheme, growth along this key corridor would continue to contribute to increased congestion and operational issues on the road network. The Proposed Scheme delivers a reliable alternative to car-based travel that can support future sustainable growth and provide a positive contribution towards reducing carbon emissions.

6.4.6.2.2.1 2028 AM Peak Hour People Movement

Diagram 6.7 illustrates the People Movement by mode along the Proposed Scheme inbound towards the City Centre during the AM Peak Hour in 2028.

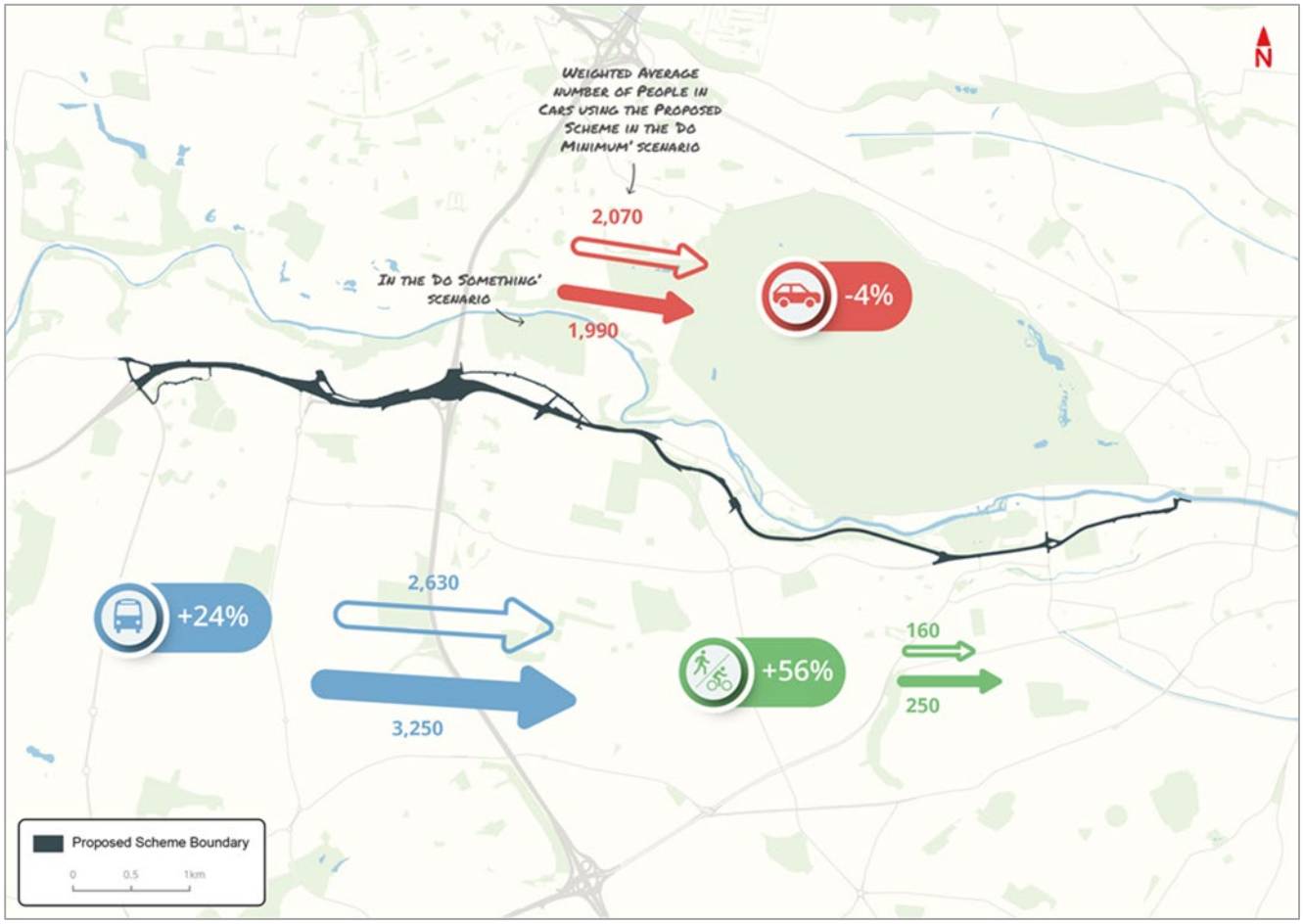


Diagram 6.7: Average People Movement by Mode during 2028 AM Peak Hour

As indicated in Diagram 6.7, there is a reduction of 4% in the number of people travelling via car, an increase of 24% in the number of people travelling via bus and an increase of 56% in the number of people walking or cycling along the Proposed Scheme during the AM Peak Hour.

It should be noted that the model predicts limited change in total walking trips between each scenario. This is due to the fact that growth in walk trips is offset by some walking trips in the Do Minimum scenario transferring to public transport and cycling as a result of the improved provision for these modes with any new pedestrians transferring from car replacing these trips.

The Proposed Scheme will facilitate a step change in the level of segregated cycling provision in comparison with existing conditions along the entire length of the corridor. The transport modelling is conservative in terms of the predicted cycling mode share. The Proposed Scheme has been designed to cater for much higher levels of cycling uptake than modelled outputs, to cater for long-term trends in travel behaviours as people make sustainable travel lifestyle choices, which would otherwise not be achievable in the absence of the Proposed Scheme.

Table 6.36 outlines the difference in modal split between the Do-Minimum and Do-Something scenarios for each mode of travel in an inbound direction towards the City Centre during the AM Peak Hour. The results indicate a 13% increase in people moved as a result of the Proposed Scheme and 25% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.36: Modal Shift of 2028 AM Peak Hour along Proposed Scheme

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Inbound towards the City Centre	AM Peak Period	General Traffic	2,070	43%	1,990	36%	-80	-4%
		Public Transport	2,630	54%	3,250	59%	620	24%
		Walking	140	3%	140	3%	0	0%
		Cycling	20	0%	110	2%	90	450%
		Combined Walk/Cycle	160	3%	250	5%	90	56%
		Tot. Sustainable Modes	**2,790**	**57%**	**3,500**	**64%**	**710**	**25%**
		Total	**4,860**	**100%**	**5,490**	**100%**	**630**	**13%**

6.4.6.2.2.2 2028 PM Peak Hour People Movement

Diagram 6.8 illustrates the People Movement by mode travelling outbound from the City Centre during the PM Peak Hour.

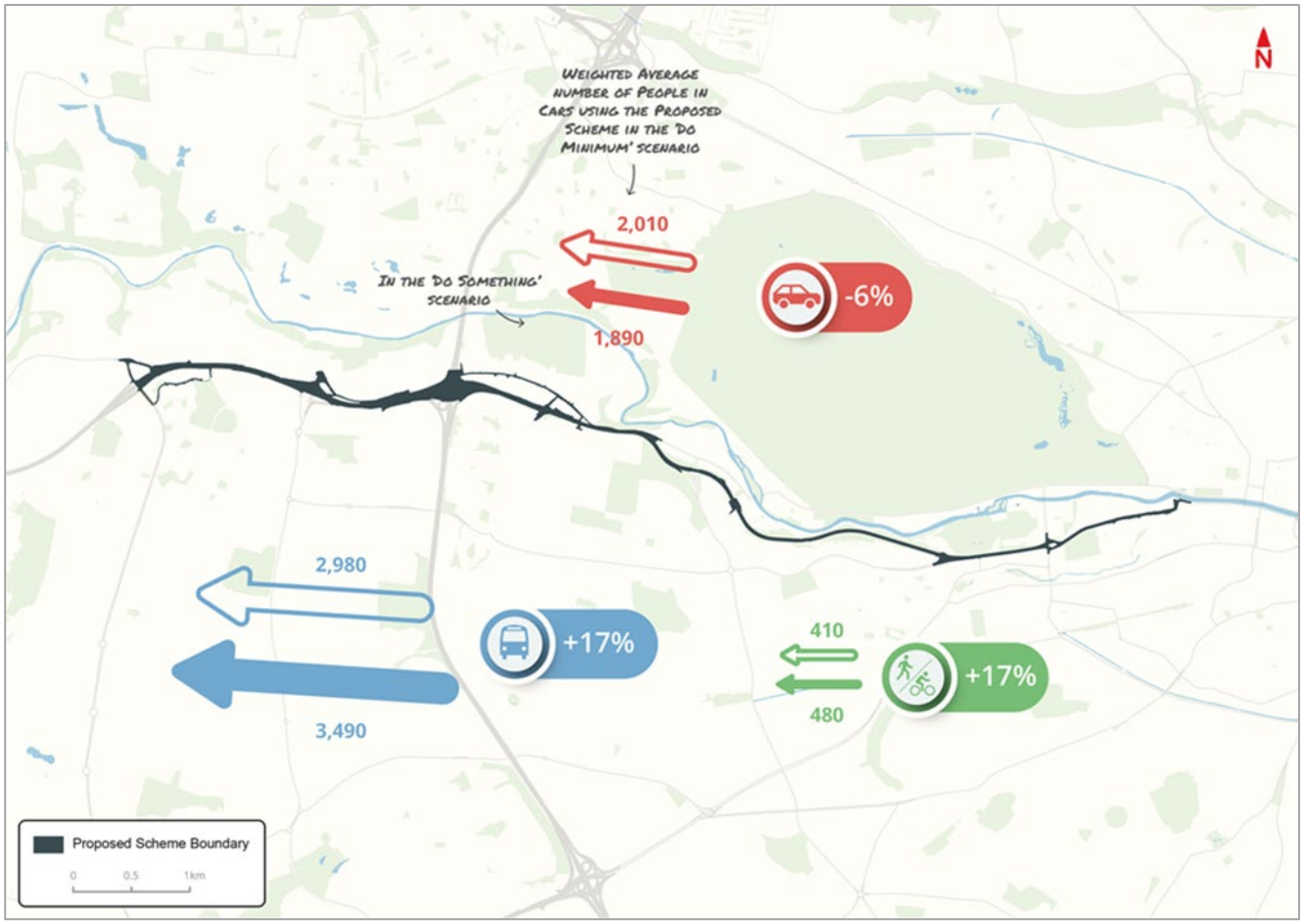


Diagram 6.8: Average People Movement by Mode during 2028 PM Peak Hour

As indicated in Diagram 6.8 there is a reduction of 6% in the number of people travelling via car, an increase of 17% in the number of people travelling via bus and an increase of 17% in the number of people walking or cycling along the Proposed Scheme during the PM Peak Hour.

Table 6.37 outlines the difference in modal split between the Do-Minimum and Do-Something scenarios for each mode of travel in an outbound direction from the City Centre during the PM Peak Hour. The results indicate an

9% increase in people moved as a result of the Proposed Scheme and 17% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.37: Modal Shift of 2028 PM Peak Hour along Proposed Scheme

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Outbound from the City Centre	PM Peak Period	General Traffic	2,010	37%	1,890	32%	-120	-6%
		Public Transport	2,980	55%	3,490	60%	510	17%
		Walking	400	7%	400	7%	0	0%
		Cycling	10	0%	80	1%	70	700%
		Combined Walk/Cycle	410	8%	480	8%	70	17%
		Tot. Sustainable Modes	**3,390**	**63%**	**3,970**	**68%**	**580**	**17%**
		Total	**5,400**	**100%**	**5,860**	**100%**	**460**	**9%**

6.4.6.2.2.3 2043 AM Peak Hour People Movement

Diagram 6.9 illustrates the People Movement by mode inbound towards the City Centre during the AM Peak Hour in 2043.

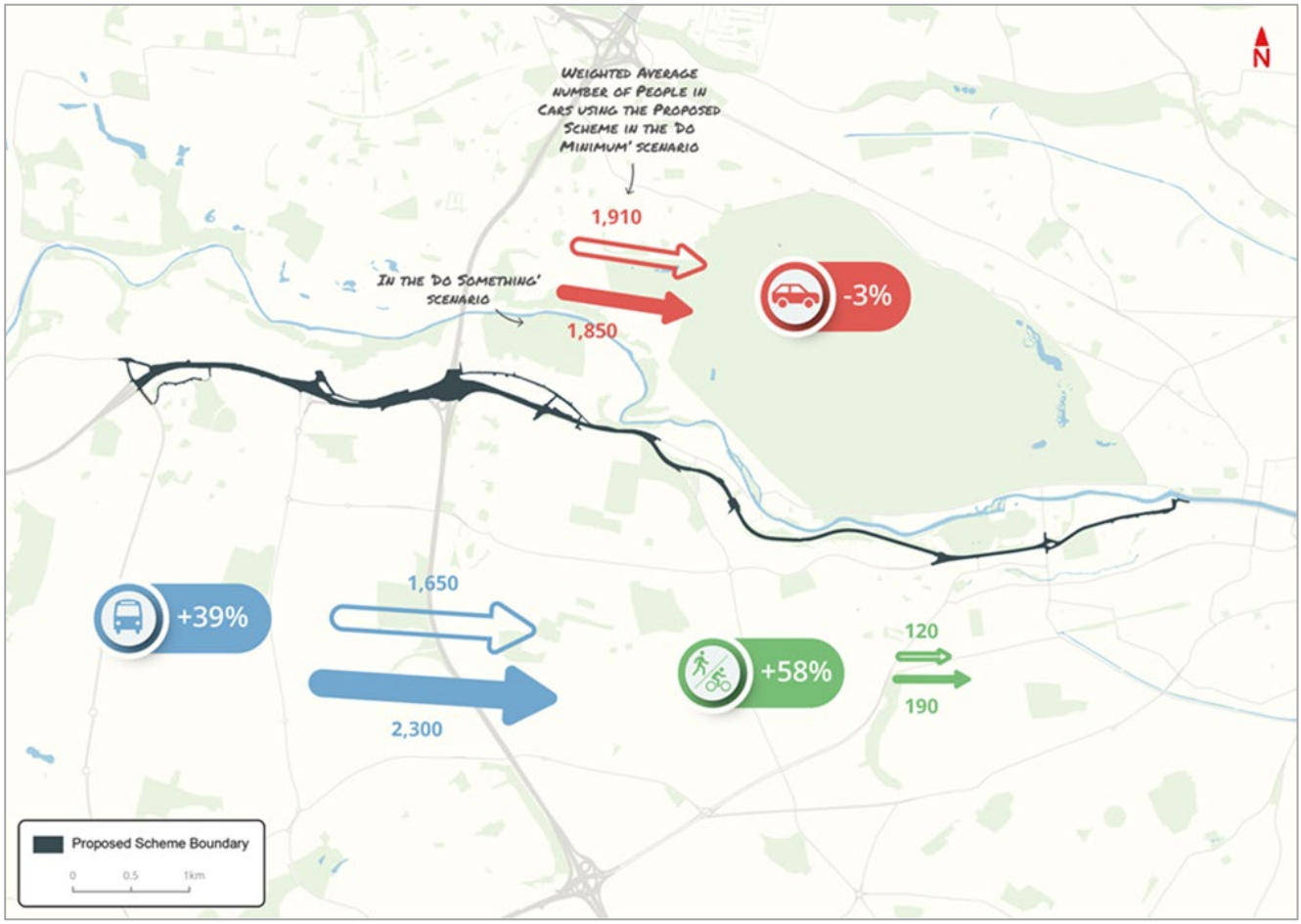


Diagram 6.9: Average People Movement by Mode during 2043 AM Peak Hour

As indicated in Diagram 6.9 there is a decrease of 3% in the number of people travelling via car, an increase of 39% in the number of people travelling via bus and an increase of 58% in the number of people walking and cycling along the Proposed Scheme during the AM Peak Hour. Table 6.38 outlines the difference in modal split between the Do-Minimum and Do-Something scenarios for each mode of travel in an inbound direction towards the City Centre during the AM Peak Hour. The results indicate a 18% increase in people moved as a result of the Proposed Scheme and a 41% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.38: Modal Shift of 2043 AM Peak Hour along Proposed Scheme

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Inbound towards the City Centre	AM Peak Period	General Traffic	1,910	52%	1,850	43%	-60	-3%
		Public Transport	1,650	45%	2,300	53%	650	39%
		Walking	100	3%	100	2%	0	0%
		Cycling	20	1%	90	2%	70	350%
		Combined Walk/Cycle	120	3%	190	4%	70	58%
		Tot. Sustainable Modes	**1,770**	**48%**	**2,490**	**57%**	**720**	**41%**
		Total	**3,680**	**100%**	**4,340**	**100%**	**660**	**18%**

6.4.6.2.2.4 2043 PM Peak Hour People Movement

Diagram 6.10 illustrates the People Movement by mode travelling outbound from the City Centre during the PM Peak Hour in 2043.

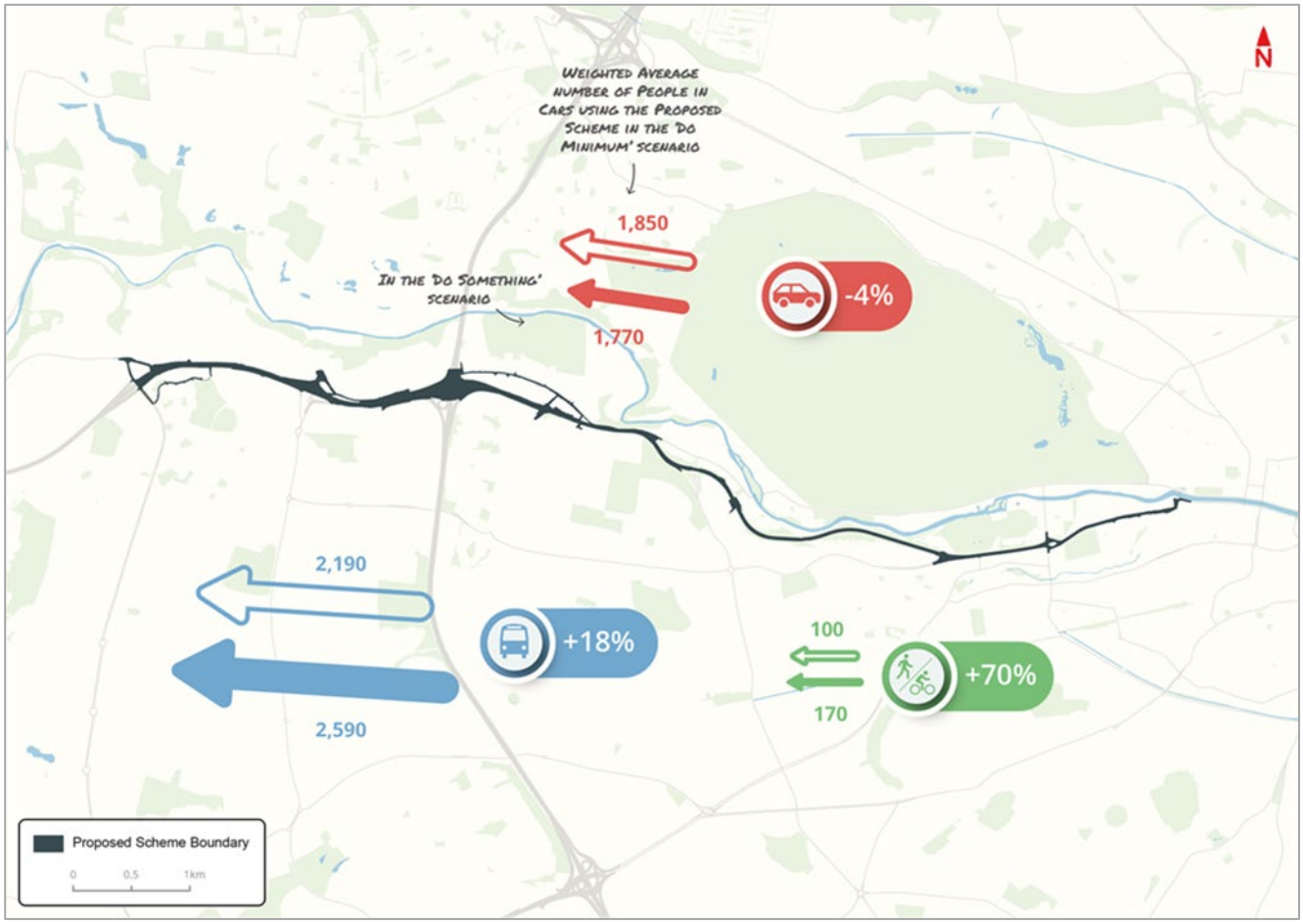


Diagram 6.10: Average People Movement by Mode during 2043 PM Peak Hour

As indicated in Diagram 6.10, there is a decrease of 4% in the number of people travelling via car, an increase of 18% in the number of people travelling via bus and an increase of 70% in the number of people walking and cycling along the Proposed Scheme during the PM Peak Hour. Table 6.39 outlines the difference in modal split between the Do-Minimum and Do-Something scenarios for each mode of travel in an outbound direction from the City Centre during the PM Peak Hour. The results indicate an 9% increase in people moved as a result of the Proposed Scheme and 21% increase in people moved by sustainable modes (Public Transport, Walk, Cycle).

Table 6.39: Modal Shift of 2043 PM Peak Hour along Proposed Scheme

Direction	Time Period	Mode of Transport	Do Minimum		Do Something		Difference	
			Hourly Trips	Modal Split (%)	Hourly Trips	Modal Split (%)	Hourly Trips	Difference (%)
Outbound from the City Centre	PM Peak Period	General Traffic	1,850	45%	1,770	39%	-80	-4%
		Public Transport	2,190	53%	2,590	57%	400	18%
		Walking	100	2%	110	2%	10	10%
		Cycling	10	0%	60	1%	50	500%
		Combined Walk/Cycle	100	2%	170	4%	70	70%
		Tot. Sustainable Modes	**2,290**	**55%**	**2,760**	**61%**	**470**	**21%**
		Total	**4,150**	**100%**	**4,530**	**100%**	**390**	**9%**

6.4.6.2.3 People Movement by Bus

The following section presents the ERM demand outputs for People Movement by Bus in terms of passenger loadings along the corridor. The results indicate that the improvements in bus priority infrastructure with the Proposed Scheme in place show a substantial increase in Bus patronage during the peak hours.

6.4.6.2.3.1 2028 AM Peak Hour Bus Passengers

Diagram 6.11 presents the passenger loading profile comparing the 'Do-Minimum' and 'Do-Something' scenarios in the AM Peak Hour in the inbound direction in 2028.

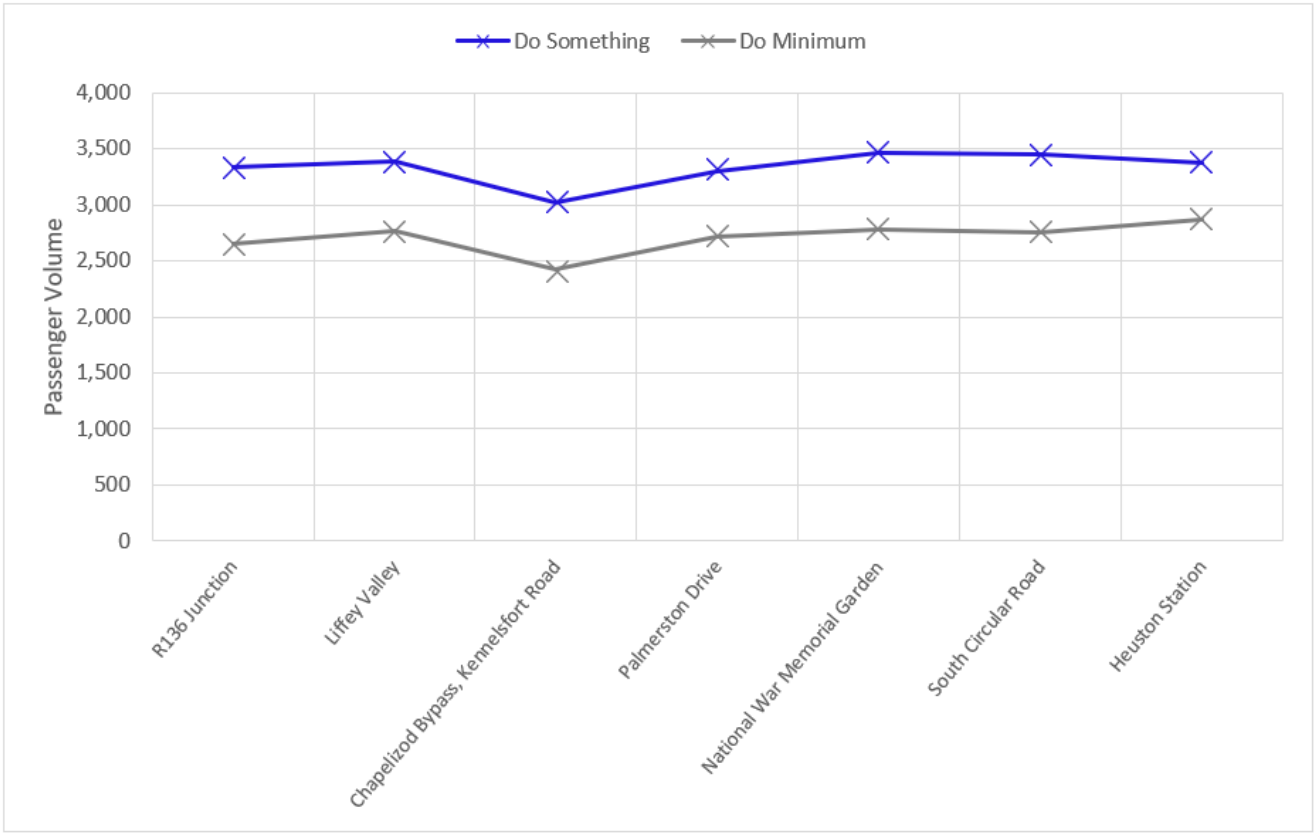


Diagram 6.11: 2028 AM Peak Hour Passenger Volume Along Proposed Scheme (inbound direction)

Diagram 6.11 shows higher levels of bus passenger loadings all along the Proposed Scheme with a peak loading at the National War Memorial Garden where the volume of passengers reaches 3,500 in the AM Peak hour, compared to approximately 2,800 in the 'Do-Minimum' scenario.

The increase in bus passenger is consistent all along the Proposed Scheme with an estimated 600 to 800 additional passengers on the corridor, compared to the 'Do-Minimum' scenario.

6.4.6.2.3.2 2028 PM Peak Hour Bus Passengers

Diagram 6.12 presents the passenger loading profile comparing the 'Do-Minimum' and 'Do-Something' scenarios in the PM Peak Hour in the outbound direction in 2028.

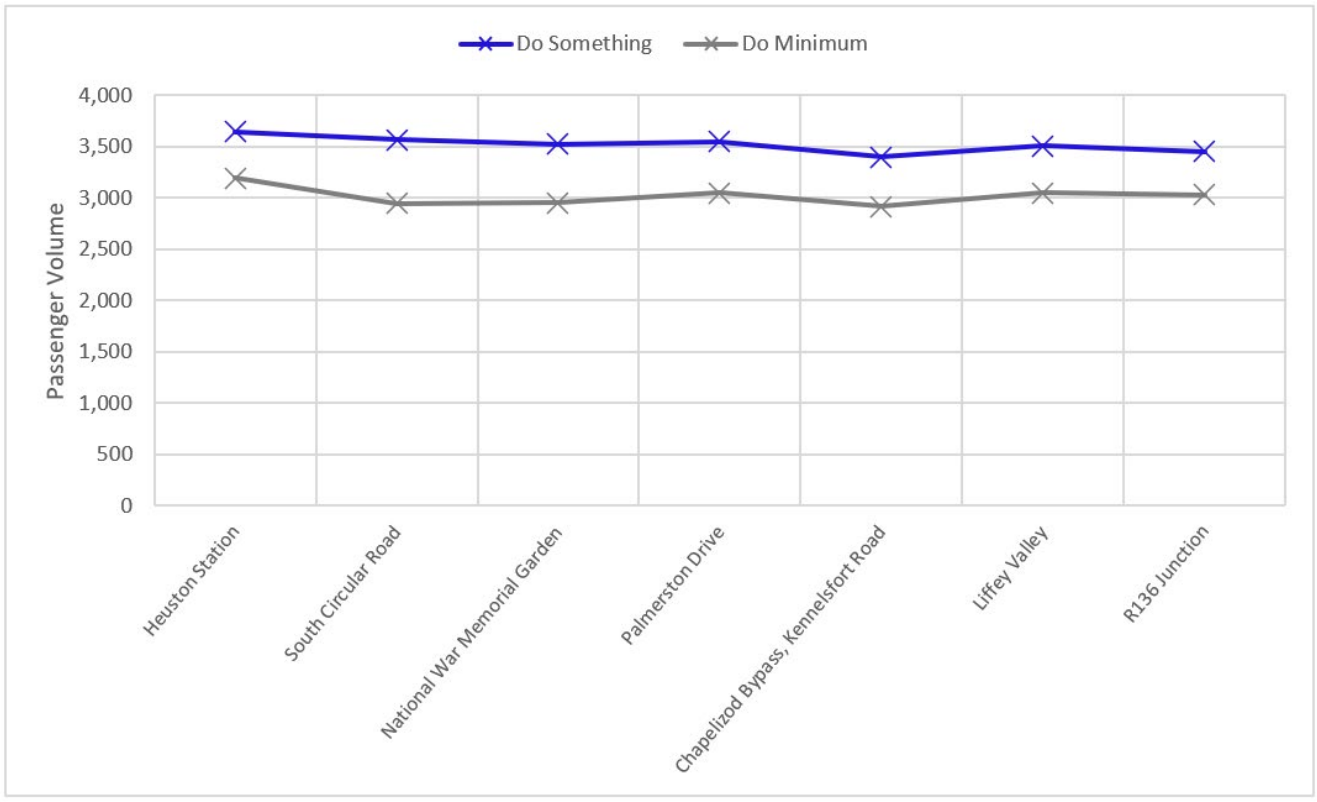


Diagram 6.12: 2028 PM Peak Hour Passenger Volume Along Proposed Scheme (outbound direction)

Diagram 6.12 shows higher levels of bus passenger loadings all along the Proposed Scheme with approximately 3,500 bus passengers in the 'Do-Something' scenario, compared to approximately 3,000 bus passengers in the 'Do-Minimum' scenarios.

6.4.6.2.3.3 2043 AM Peak Hour Bus Passengers

Diagram 6.13 presents the passenger loading profile comparing the 'Do-Minimum' and 'Do-Something' scenarios in the AM Peak Hour in the inbound direction in 2043.

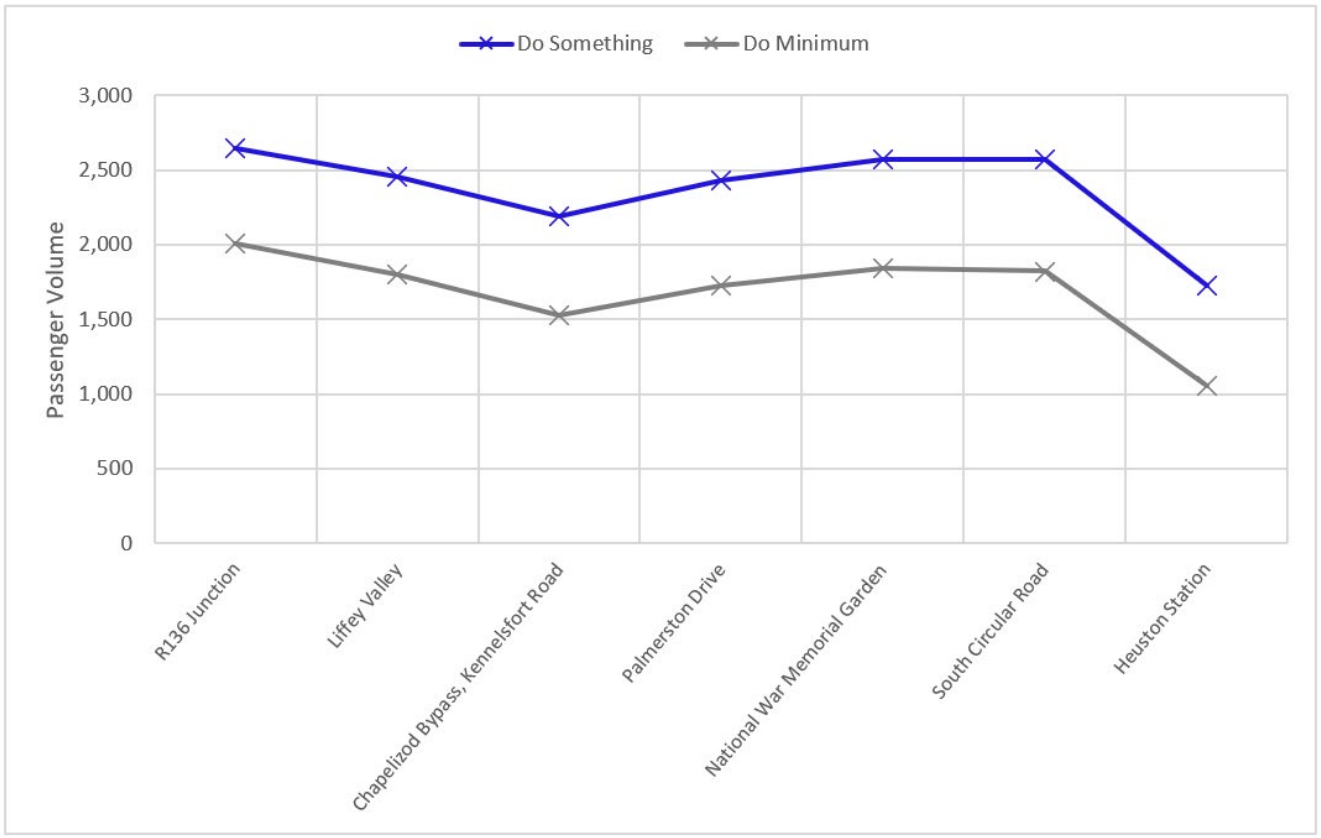


Diagram 6.13: 2043 AM Peak Hour Passenger Volume Along Proposed Scheme (inbound direction)

Diagram 6.13 shows higher levels of passenger loadings along the Proposed Scheme with a peak at the R136 Junction where the volume of passengers reaches 2,650 in the AM Peak hour, compared to approximately 2,000 in the 'Do-Minimum' scenario.

The increase in bus passengers remains at a high level along the Proposed Scheme with approximately 600 to 700 additional passengers on the corridor, compared to the 'Do-Minimum' scenario.

6.4.6.2.3.4 2043 PM Peak Hour Bus Passengers

Diagram 6.14 presents the passenger loading profile comparing the 'Do-Minimum' and 'Do-Something' scenarios in the PM Peak Hour in the outbound direction in 2043.

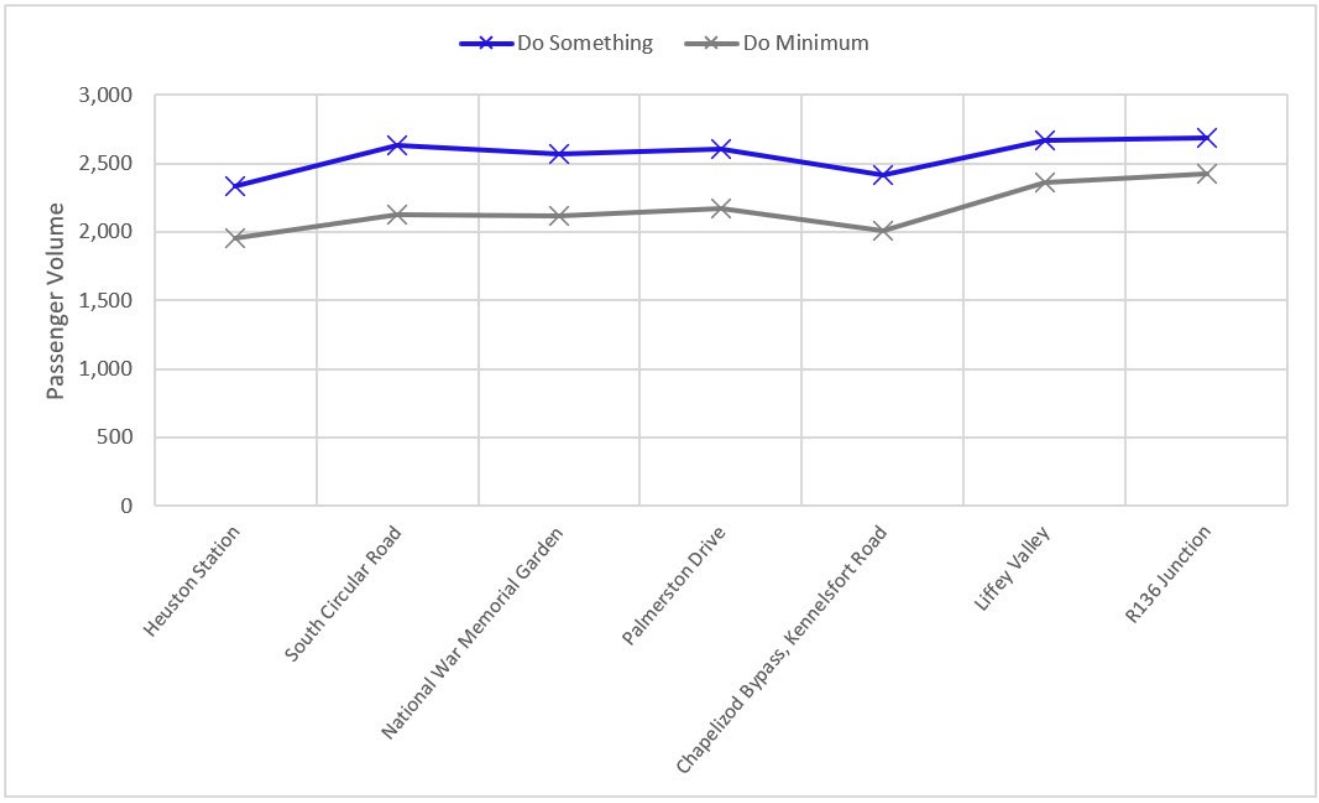


Diagram 6.14: 2043 PM Peak Hour Passenger Volume Along Proposed Scheme (outbound direction)

Diagram 6.14 shows a peak in the number of passengers at the R136 Junction, where the bus loadings reach approximately 2,700 passengers in the 'Do-Something' scenario, compared to 2,400 passengers in the 'Do-Minimum'.

The increase in bus passenger is consistent all along the Proposed Scheme with approximately 400 additional passengers on most of the corridor, compared to the 'Do-Minimum' scenario.

6.4.6.2.3.5 Bus Boardings

Since many bus services commence and end further away from the direct alignment of the Proposed Scheme, an additional assessment has been undertaken to compare the Do Minimum and Do Something total passengers boarding on bus routes that use any part of the Proposed Scheme (including those stops not directly on the Proposed Scheme) in both 2028 and 2043 forecast years. The results for the 2028 Opening Year scenario are indicated in Table 6.40.

Table 6.40: 2028 Peak Hour Bus Boardings on Routes using the Proposed Scheme (inc. boarding at stops outside Proposed Scheme)

Time Period	Do Minimum	Do Something	Difference in Boardings	Difference (%)
AM Peak Hour	14,710	15,380	670	4.6%
PM Peak Hour	13,800	14,530	730	5.3%

Table 6.40 shows that there will be a 4.6% increase in people boarding bus routes which use the Proposed Scheme during the AM Peak Hour. This represents an addition of 670 passengers in the AM Peak hour.

In the PM Peak hour, there will be a 5.3% increase in people boarding bus routes which use the Proposed Scheme, representing an additional 730 passengers.

The results for the 2043 Design Year scenario are indicated in Table 6.41.

Table 6.41: 2043 Peak Hour Bus Boardings on Routes using the Proposed Scheme (inc. boarding at stops outside Proposed Scheme)

Time Period	Do Minimum	Do Something	Difference in Boardings	Difference (%)
AM Peak Hour	13,410	14,260	850	6.3%
PM Peak Hour	12,820	13,440	620	4.8%

Table 6.41 shows that there will be a 6.3% increase in people boarding bus routes which use the Proposed Scheme during the AM Peak Hour. This represents an addition of 850 passengers in the AM Peak hour.

In the PM Peak hour, there will be a 4.8% increase in people boarding bus routes which use the Proposed Scheme, representing an additional 620 passengers.

6.4.6.2.4 People Movement - Significance of Impact

The significance of the effect on the movement of People by sustainable modes with the Proposed Scheme in place has been appraised qualitatively, taking into account the changes in mode share, demand changes by mode along the Proposed Scheme as well as bus usage presented above. The impact of the Proposed Scheme has been adjudged to deliver a **Positive, Very Significant and Long-term** effect in terms of People Movement by sustainable modes. The Proposed Scheme can be shown to deliver significant improvements in people movement by sustainable modes along the Proposed Scheme corridor with reductions in car mode share due to the enhanced sustainable mode provision.

The findings of the People Movement assessment demonstrate that the Proposed Scheme aligns fully with the aims and objectives of the CBC Infrastructure Works, to 'provide enhanced walking, cycling and bus infrastructure on this key access corridor in the Dublin region, that will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor'.

6.4.6.2.5 Operational Impacts for Bus Users

6.4.6.2.5.1 Overview

The impacts of the Proposed Scheme for Bus Users have been assessed based on journey times and reliability metrics extracted from the micro-simulation model of the Proposed Scheme corridor.

Due to the stochastic nature of the micro-simulation software, model outputs based on the average of 10 simulation seed runs (minimum of 5 recommended as per Transport for London (2010) Traffic Modelling Guidelines) have been calculated between the point of Proposed Scheme entry and exit and compared against the corresponding Do Minimum scenarios.

6.4.6.2.5.2 Bus Journey Time and Reliability changes as a result of the Proposed Scheme

To give an overview of how the Proposed Scheme will impact on bus journey times along the corridor, outputs for the C1 service, which traverses the entire length of the Proposed Scheme, have been extracted from the model. As outlined in Section 6.4.3.1, the assessment is based in the context of the full implementation of the BusConnects network re-design in both the Do Minimum and Do Something scenarios, with the Proposed Scheme servicing the C-Spine services.

Inbound Direction

Average journey times for the inbound C1 service in 2028 Opening Year and in 2043 Design Year can be seen in Table 6.42. A breakdown of the changes in average journey times for all other bus services using the Proposed Scheme can be found in Appendix A6.4.3 (Average Bus Journey Times).

Table 6.42: C1 Service Bus Average Journey Times (Inbound Direction)

Peak Hour	Do Minimum (minutes)	Do Something (minutes)	Difference (minutes)	% Difference
2028 AM	25.1	18.0	-7.1	-28%
2028 PM	20.4	17.4	-3.0	-15%
2043 AM	25.4	18.2	-7.1	-28%
2043 PM	20.6	17.4	-3.1	-15%

Additional information regarding the range of journey times (minimum, maximum, average and standard deviation) for inbound C1 buses in the Do Minimum (red) and Do Something (blue) can be seen in Table 6.43 and Diagram 6.15 below. Each dot in the diagram represents the journey time for each individual bus in each scenario. A larger range of journey times are an indication of lower levels of reliability in a given scenario.

Table 6.43: C1 Service – Range of Journey Times (Inbound Direction)

Peak Hour	Do Minimum				Do Something			
	MIN	MAX	AVG	STDEV	MIN	MAX	AVG	STDEV
2028 AM	20.2	33.4	25.1	2.6	15.3	20.5	18.0	1.1
2028 PM	17.2	25.6	20.4	1.3	15.1	19.5	17.4	1.1
2043 AM	19.0	31.9	25.4	2.6	15.0	22.1	18.2	1.1
2043 PM	17.9	24.4	20.6	1.4	14.9	20.6	17.4	1.1

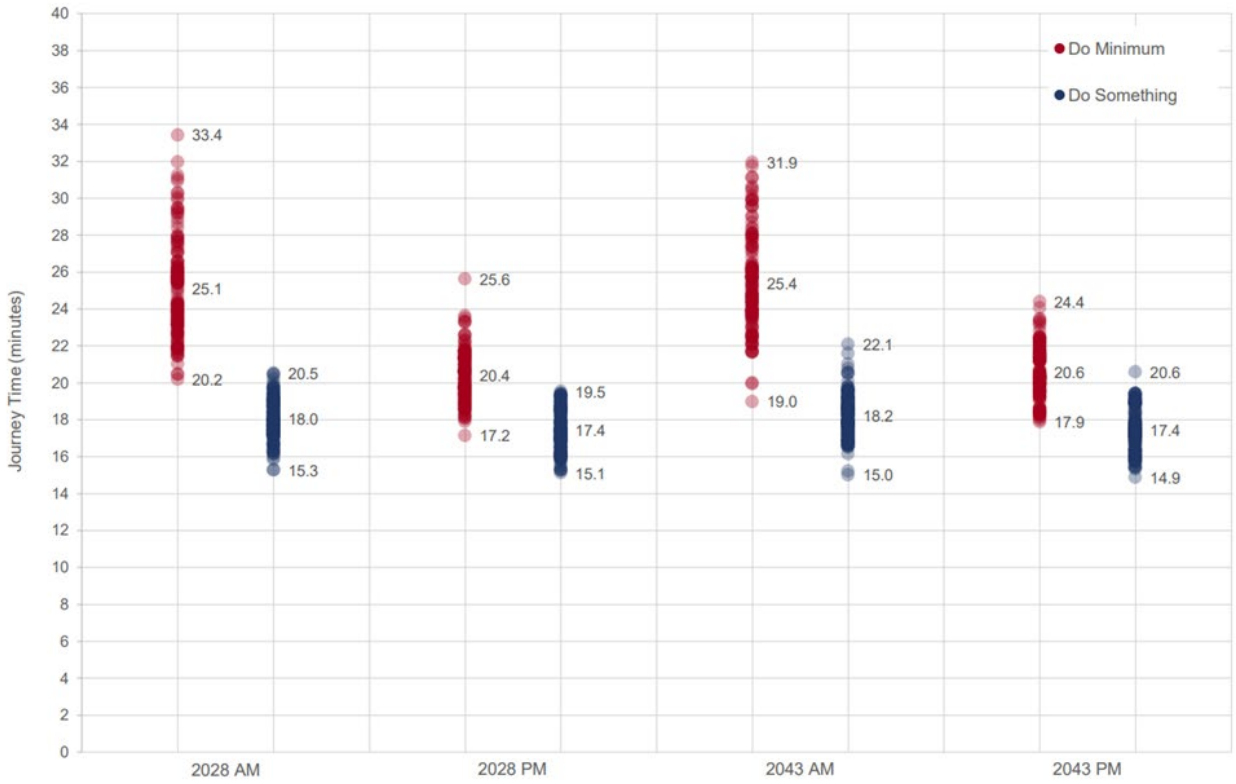


Diagram 6.15: C1 Bus Journey Times (Inbound Direction)

Based on the results presented in Table 6.42, the Proposed Scheme will deliver average inbound journey time savings for C1 service bus passengers of 7.1 minutes (28%) in 2028 and 2043. Furthermore, results presented in Diagram 6.15 suggest an improvement in bus journey time reliability in all four scenarios as indicated by the reduced ranges of journey times achieved with the individual durations focused much closer to the average journey times (lower standard deviation) in the Do Something scenario (blue dots) with the Proposed Scheme in place compared to the more dispersed range in the Do Minimum scenario (red dots).

Note that the variation in journey times shown above are based on one set of predicted flows for the Do Minimum and Do Something scenario. Traffic flows fluctuate daily which would mean that the variation in journey times would be much greater in the Do Minimum with any increases in traffic flows compared to the protection of journey time reliability provided by the bus priority measures that comprise the Proposed Scheme.

A comparison of average Do Minimum and Do Something journey times for the inbound C1 service are also illustrated in the cumulative time-distance graphs shown in Diagram to Diagram .

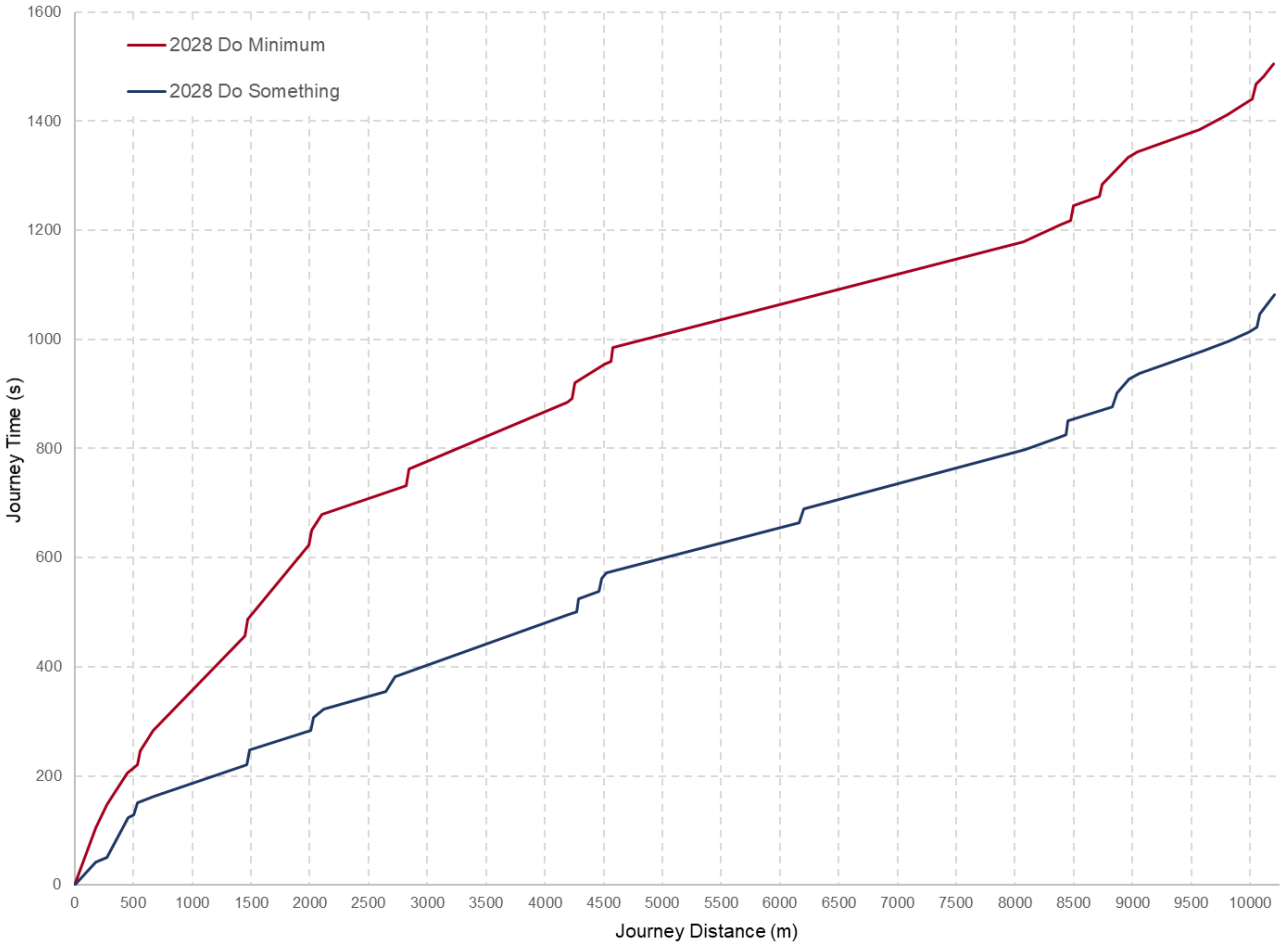


Diagram 6.16: C1 Bus Journey Time (2028 AM, Inbound)

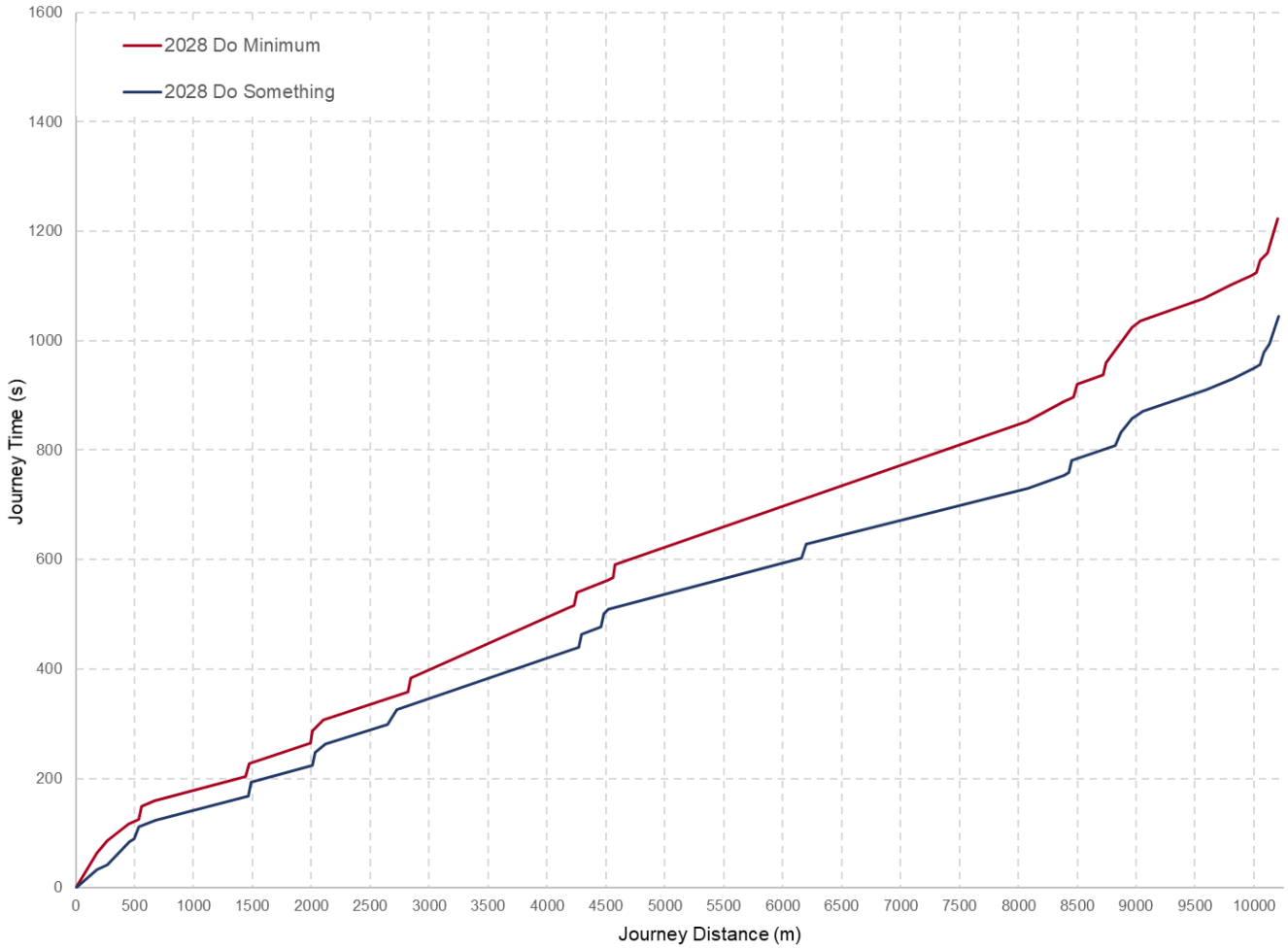


Diagram 6.17: C1 Bus Journey Time (2028 PM, Inbound)

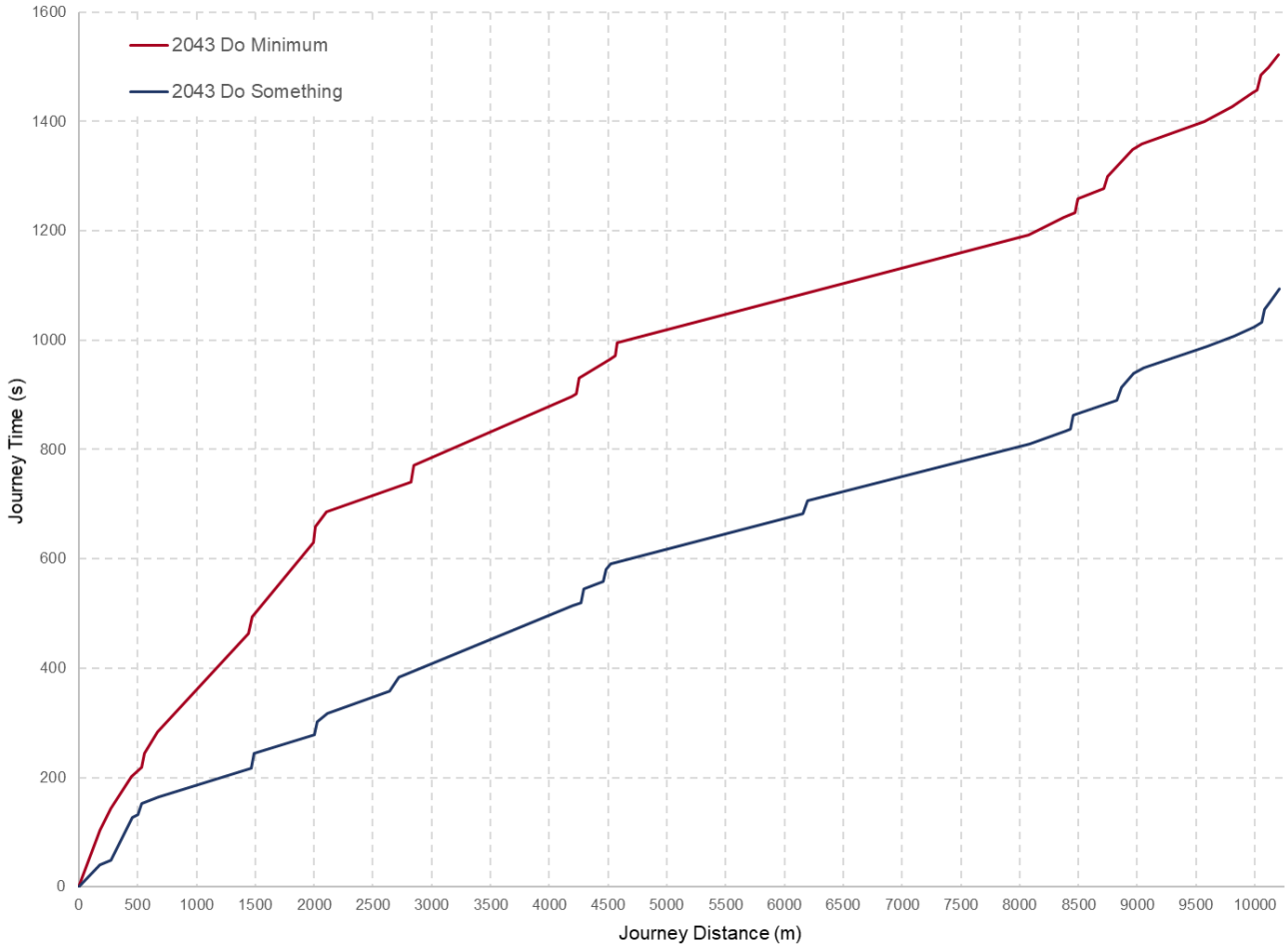


Diagram 6.18: C1 Bus Journey Time (2043 AM, Inbound)

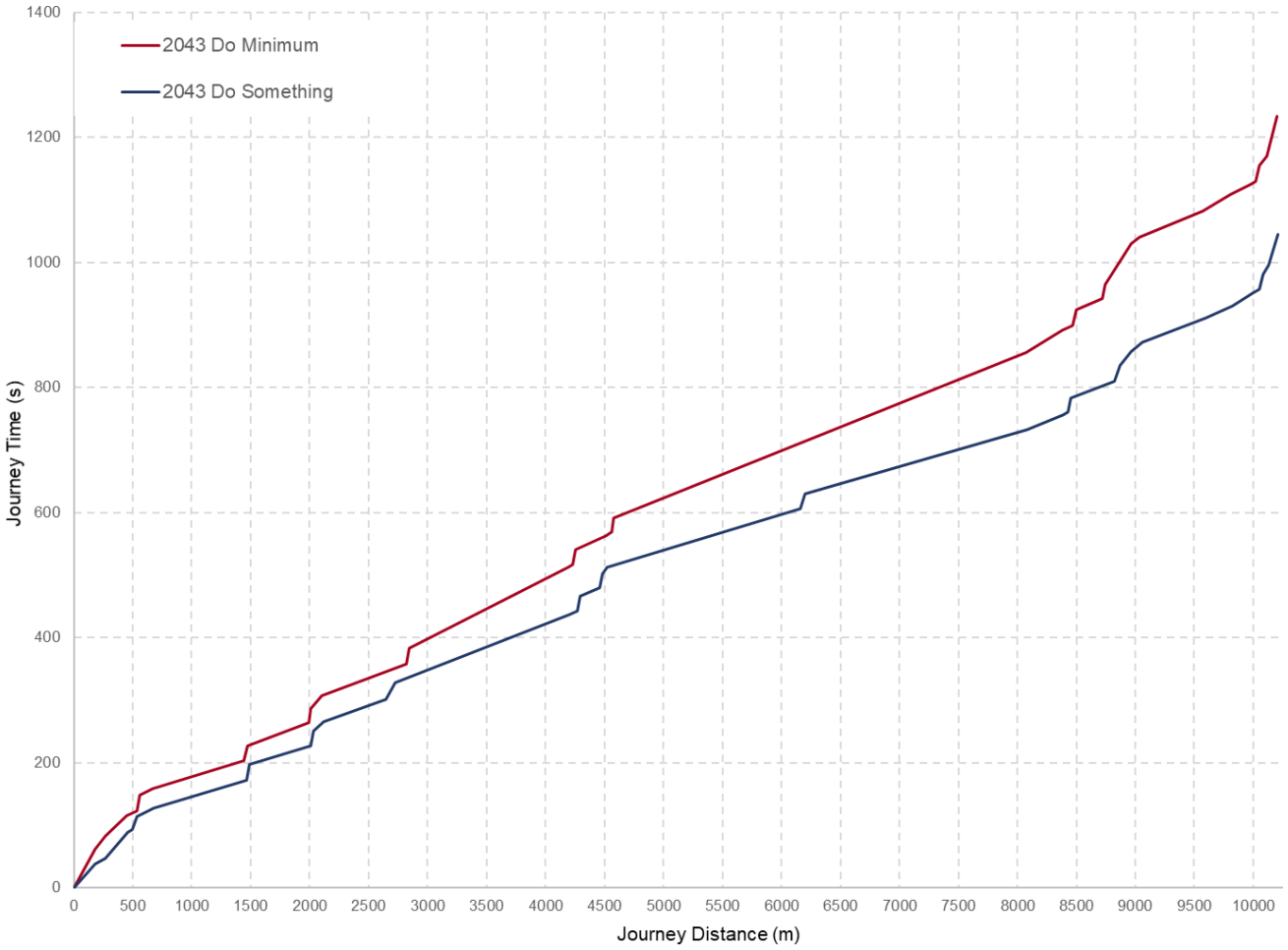


Diagram 6.19: C1 Bus Journey Time (2043 PM, Inbound)

Based on the results presented in Diagram to Diagram , the Proposed Scheme is expected to deliver bus journey time savings in both the AM and PM peaks. The most notable savings can be seen between the R835 Lucan Road and N4 Junction 2. This is due to the introduction of a segregated bus lane running adjacent to the N4 which bypasses delays at the Junction 3 merge and Junction 2 diverge. In the case of the AM peak, significant journey time and reliability savings are predicted in the Proposed Scheme versus the Do Minimum.

Outbound Direction

Average journey times for the outbound C1 service in 2028 Opening Year and in 2043 Design Year can be seen in Table 6.44. A breakdown of the changes in average journey times for all other bus services using the Proposed Scheme can be found in Appendix A6.4.3 (Average Bus Journey Times).

Table 6.44: C1 Service Bus Journey Times (Outbound Direction)

Peak Hour	Do Minimum (minutes)	Do Something (minutes)	Difference (minutes)	% Difference
2028 AM	18.3	17.5	-0.7	-4%
2028 PM	20.8	18.9	-1.9	-9%
2043 AM	18.4	17.4	-1.0	-6%
2043 PM	20.9	18.6	-2.4	-11%

Additional information regarding the range of journey times (minimum, maximum, average and standard deviation) for outbound C1 buses in the Do Minimum (red) and Do Something (blue) can be seen in Table 6.45 and Diagram

below. Each dot represents the journey time for each individual bus in each scenario. A larger range of journey times are an indication of lower levels of reliability.

Table 6.45: C1 Service – Range of Journey Times (Outbound Direction)

Peak Hour	Do Minimum				Do Something			
	MIN	MAX	AVG	STDEV	MIN	MAX	AVG	STDEV
2028 AM	15.1	21.2	18.3	1.2	15.8	20.0	17.5	0.9
2028 PM	17.7	23.6	20.8	1.2	16.2	21.5	18.9	1.0
2043 AM	15.9	22.6	18.4	1.2	15.9	19.8	17.4	0.8
2043 PM	16.7	24.6	20.9	1.3	15.8	21.3	18.6	1.1

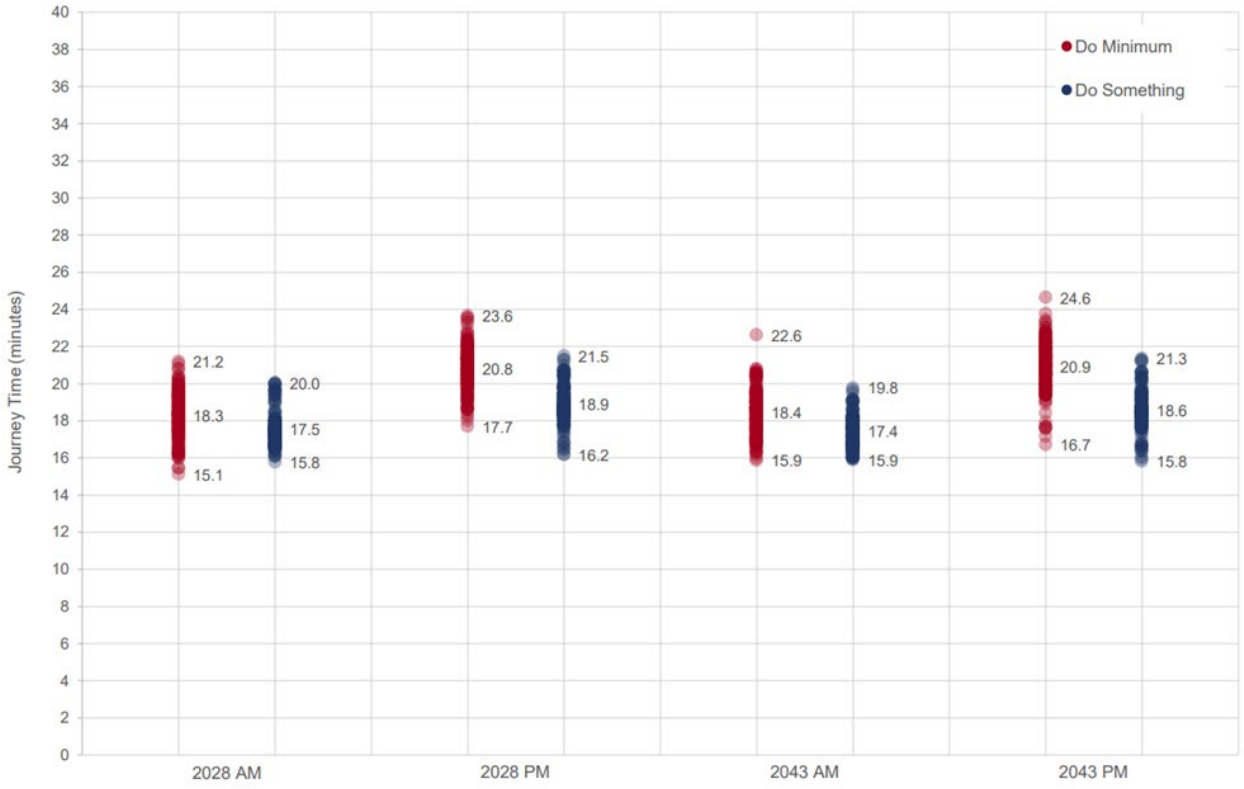


Diagram 6.20: C1 Bus Journey Times (Outbound Direction)

Based on the results presented in Table 6.44, the Proposed Scheme will deliver average outbound journey time savings for C1 service bus passengers of up to 1.9 minutes (9%) in 2028 (PM) and 2.4 minutes (11%) in 2043 (PM). Furthermore, results presented in Diagram 6 suggest an improvement in bus journey time reliability in all four scenarios as indicated by the reduced ranges of journey times achieved with the durations focused much closer to the average journey times (lower standard deviation) in the Do Something scenario (blue dots) with the Proposed Scheme in place compared to the more dispersed range in the Do Minimum scenario (red dots).Note that the variation in journey times shown above are based on one set of predicted flows for the Do Minimum and Do Something scenario. Traffic flows fluctuate daily which would mean that the variation in journey times would be much greater in the Do Minimum with any increases in traffic flows compared to the protection of journey time reliability provided by the bus priority measures that comprise the Proposed Scheme.

A comparison of average Do Minimum and Do Something journey times for the C1 service for the outbound direction of travel illustrated in the cumulative time-distance graphs shown in Diagram 6.21 to Diagram 6.24.

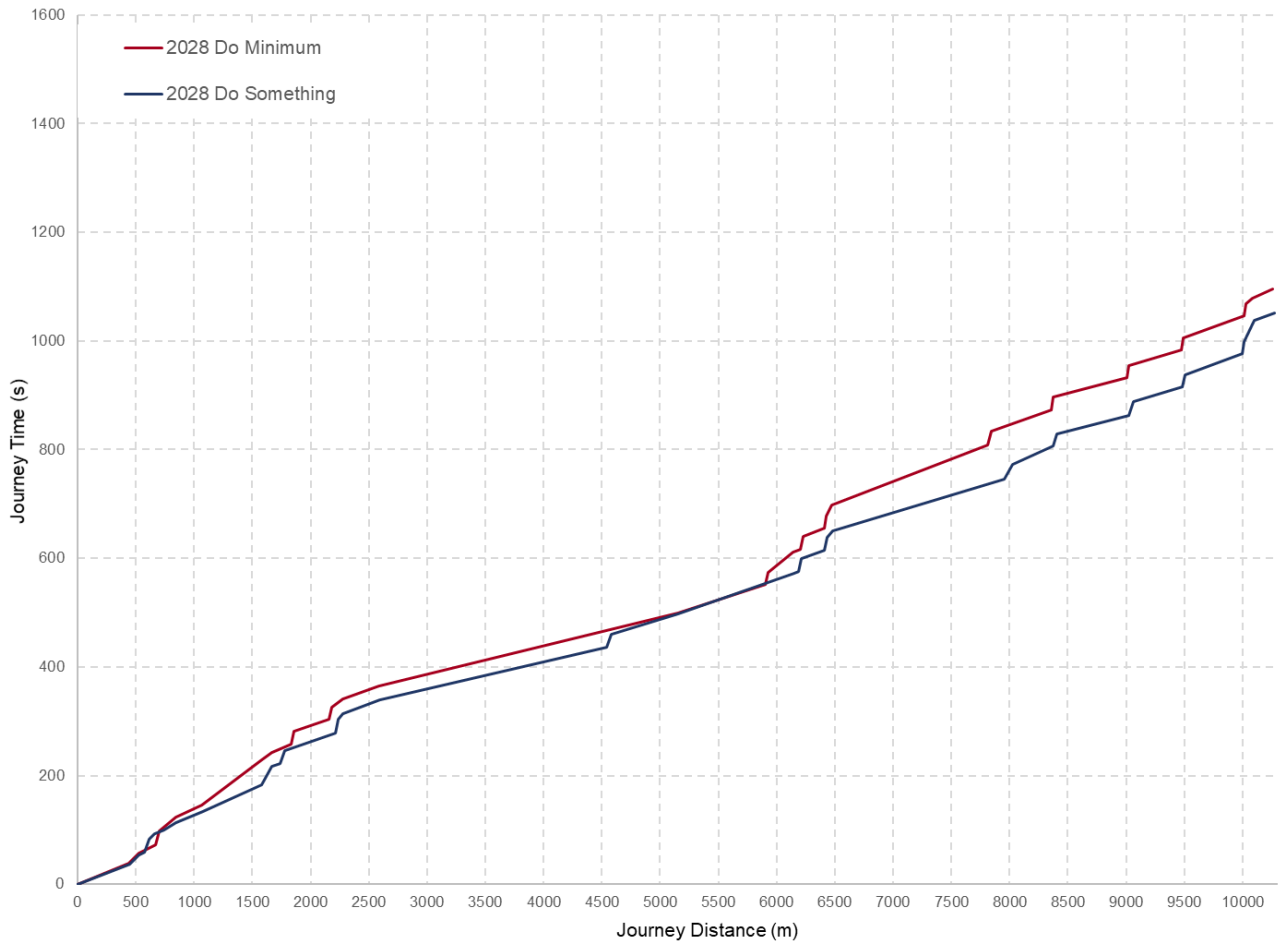


Diagram 6.21: C1 Bus Journey Time (2028 AM, Outbound)

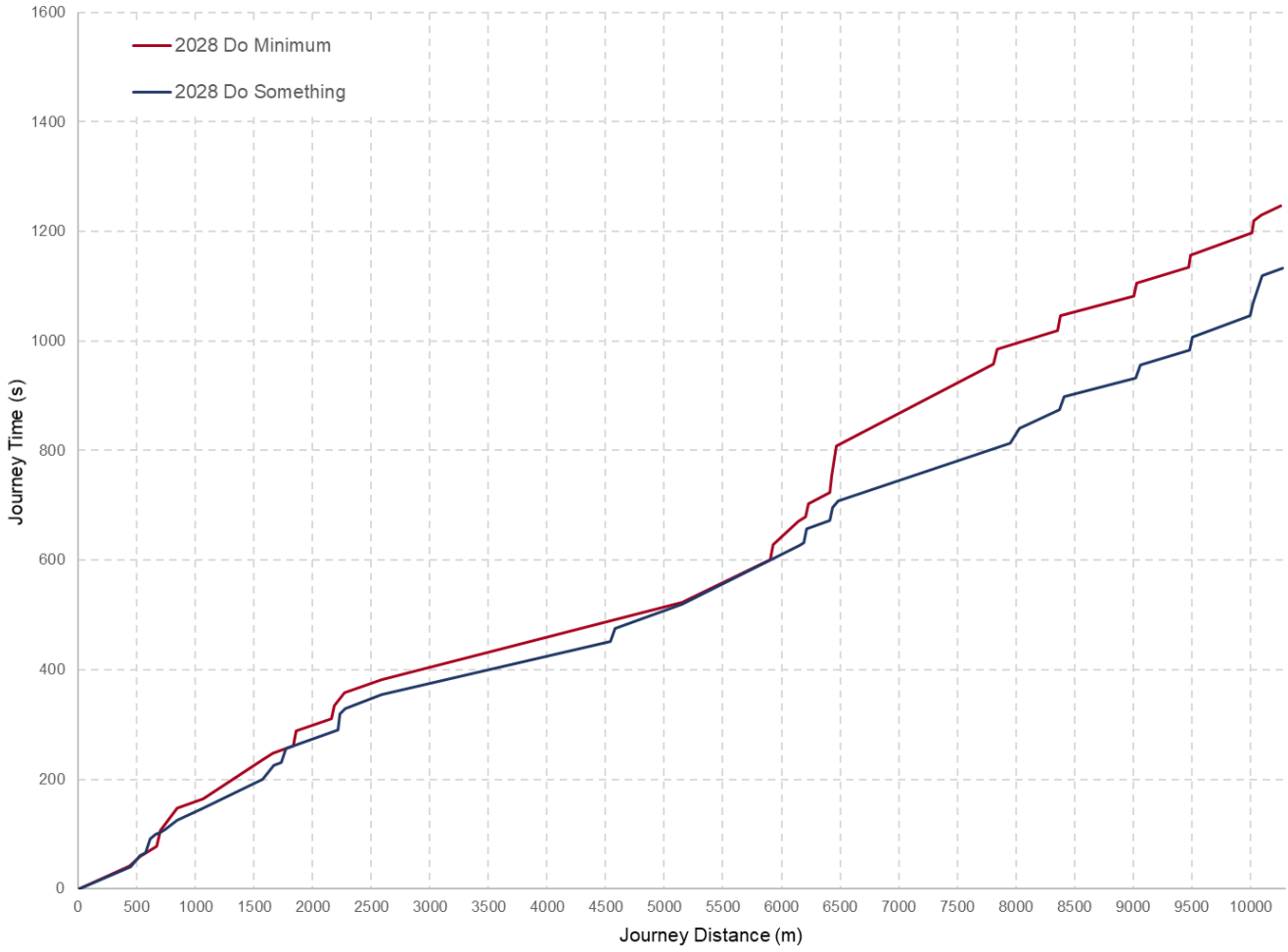


Diagram 6.22: C1 Bus Journey Time (2028 PM, Outbound)

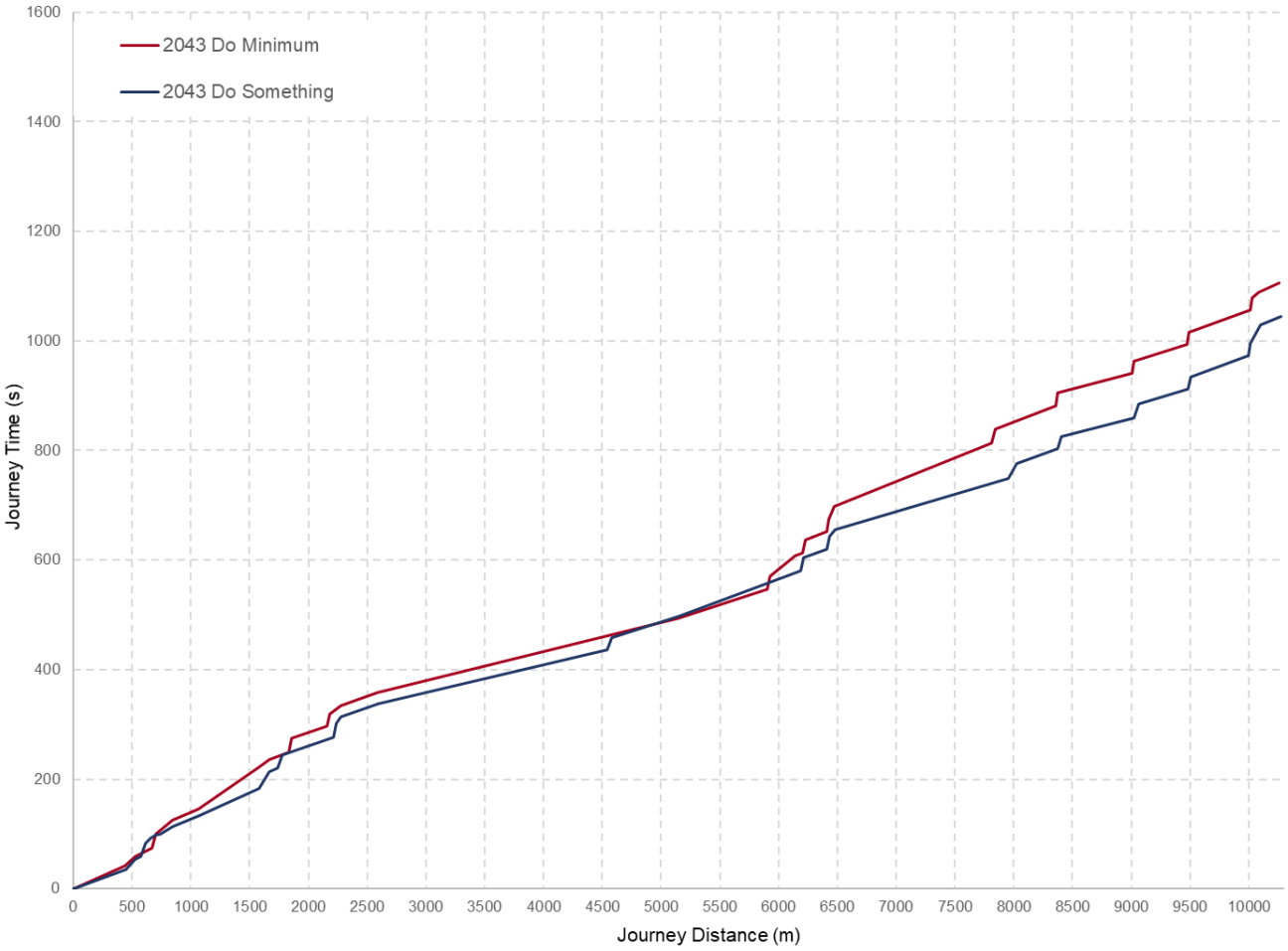


Diagram 6.23: C1 Bus Journey Time (2043 AM, Outbound)

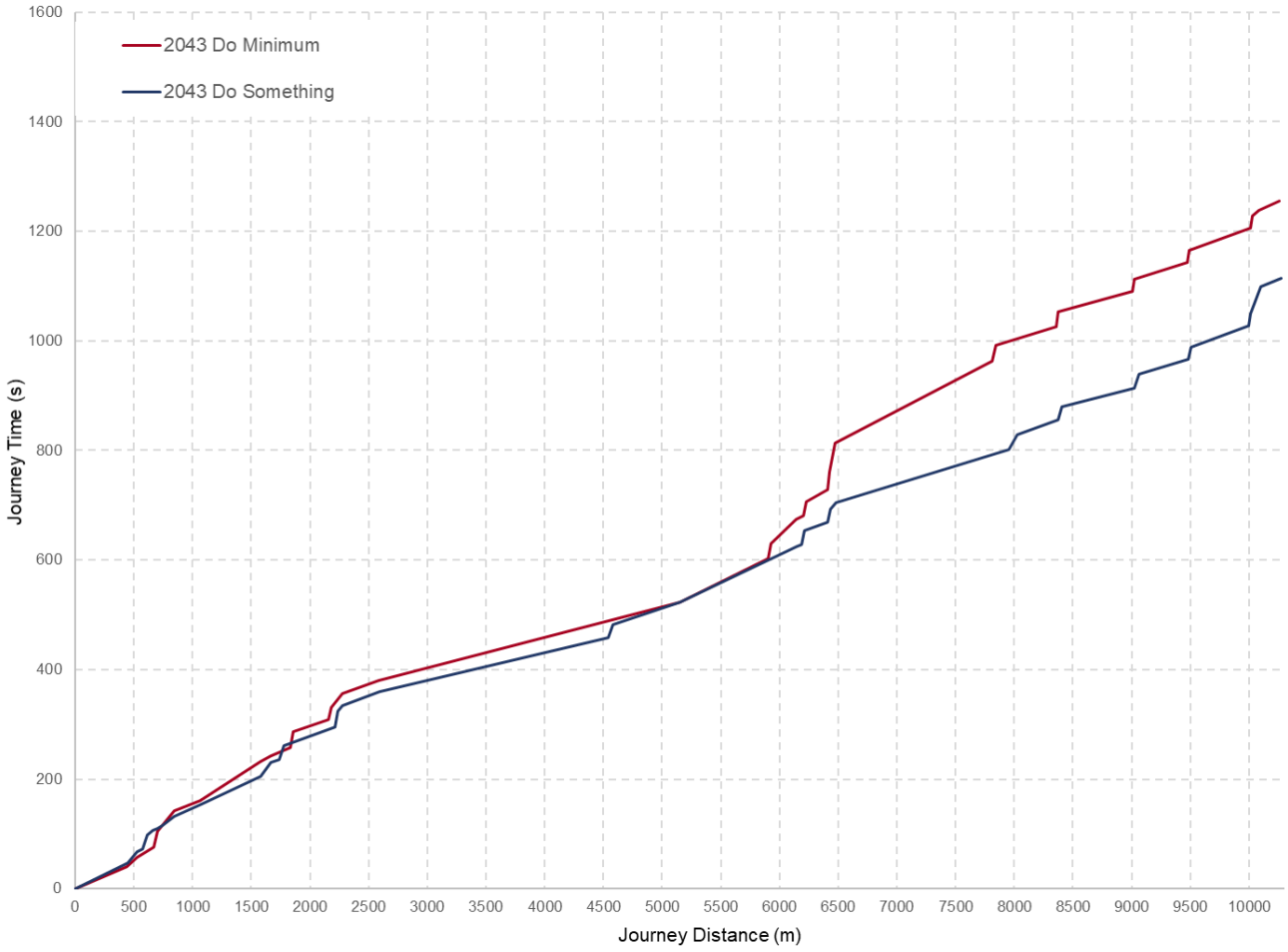


Diagram 6.24: C1 Bus Journey Time (2043 PM, Outbound)

Based on the results presented in Diagram 6.21 to Diagram 6.24, the Proposed Scheme is expected to deliver good bus journey time savings in both the AM and PM peak. The most notable journey time savings can be seen in the PM peak on the outbound approaches to the R111 South Circular Road gyratory and the R148 Chapelizod Bypass junction with The Oval. In both cases, the introduction of bus lanes up to the junction stopline can be seen to result journey time and reliability savings versus the Do Minimum.

6.4.6.2.5.3 Total Journey Time Changes for all Proposed Scheme Bus Services

The change in total bus journey time for all buses travelling along the Proposed Scheme, is shown in Table 6.46 in vehicle minutes.

Table 6.46: Total Bus Journey Time

Peak Hour	Do Minimum (vehicle.minutes)	Do Something (vehicle.minutes)	Difference (vehicle.minutes)	%Difference
2028 AM	1594.4	1293.4	-301.0	-19%
2028 PM	1283.5	1154.5	-129.0	-10%
2043 AM	1599.3	1302.4	-296.9	-19%
2043 PM	1286.9	1136.4	-150.5	-12%

Based on the results presented in Table 6.46, modelling shows that the Proposed Scheme will reduce total bus journey times along the Proposed Scheme by up to 19% in 2028 and 2043. Based on the AM and PM peak hours alone, this equates to c7.2 hours of savings in 2028 and c7.5 hours in 2043 combined across all buses when

compared to the Do Minimum. On an annual basis this equates to approximately 5,400 hours of bus vehicle savings in 2028 and 5,600 hours in 2043, when considering weekday peak periods only.

6.4.6.2.6 Bus Users Assessment Summary

The findings of the Bus User assessment shows that the Proposed Scheme fully aligns with the aims and objectives of the CBC Infrastructure Works, to 'Enhance the capacity and potential of the public transport system by improving bus speeds, reliability and punctuality through the provision of bus lanes and other measures to provide priority to bus movement over general traffic movements'.

The significance of impact on bus users of the Proposed Scheme has been appraised using a qualitative assessment, taking the changes in journey time and journey reliability metrics presented above into consideration. The Proposed Scheme is considered to deliver a **Positive, Very Significant and Long-term** effect overall.

6.4.6.2.7 Increased Bus Frequency - Resilience Sensitivity Analysis

6.4.6.2.7.1 Background

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 Bus Connects 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 and sustainable modes improvements along the Proposed Scheme.

This analysis, however, is 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 Proposed Scheme from implementation into the future. The resilience provided by the Proposed Scheme 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 below.

6.4.6.2.7.2 Resilience Testing

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.

To assess the resilience of the Proposed Scheme to cater for additional bus service frequency provision whilst maintaining a high level of bus journey time reliability, a separate analysis was undertaken in the Proposed Scheme micro-simulation model. In this analysis, the service frequency, in both directions of travel, was increased to achieve a 10 buses per hour increase, at the busiest section, to assess whether the Proposed Scheme could cater for this increased service frequency whilst maintaining a high level of journey time reliability. The analysis was undertaken in the 2028 Minimum and Do Something models to assess whether the bus priority infrastructure was having the desired impact of protecting bus journey time reliability.

The bus service frequency, along the busiest section along the Chapelizod Bypass, in the 2028 Do Minimum model and in the 2028 Do Something Resilience testing models is outlined in Table 6.47 below.

Table 6.47: Resilience Testing Bus Service Frequency Scenario Testing

Scenario	Inbound (Buses per Hour)	Outbound (Buses per Hour)
Do Minimum	55	43
Do Something	55	43
Do Minimum - Additional Services Resilience Test	65	53

Scenario	Inbound (Buses per Hour)	Outbound (Buses per Hour)
Do Something - Additional Services Resilience Test	65	53

Table 6.48 outlines the average journey times for the outbound C1 service in the 2028 Opening Year.

Table 6.48: F9 Service – Average Bus Journey Times

Direction	Do Minimum (minutes)	Do Minimum (Additional Services) (minutes)	% Difference	Do Something (minutes)	Do Something - Additional Services (minutes)	% Difference
2028 Inbound AM	25.1	26.0	3.6%	18.0	18.3	1.5%
2028 Outbound PM	20.8	21.1	1.7%	18.9	19.0	0.6%

The results of the scenario testing with an additional 10 buses per direction per hour operating along the Proposed Scheme in the 2028 Opening Year are presented graphically in Diagram 6.25 below. The diagram displays the maximum, minimum and average journey times for each of the D1 bus services modelled.

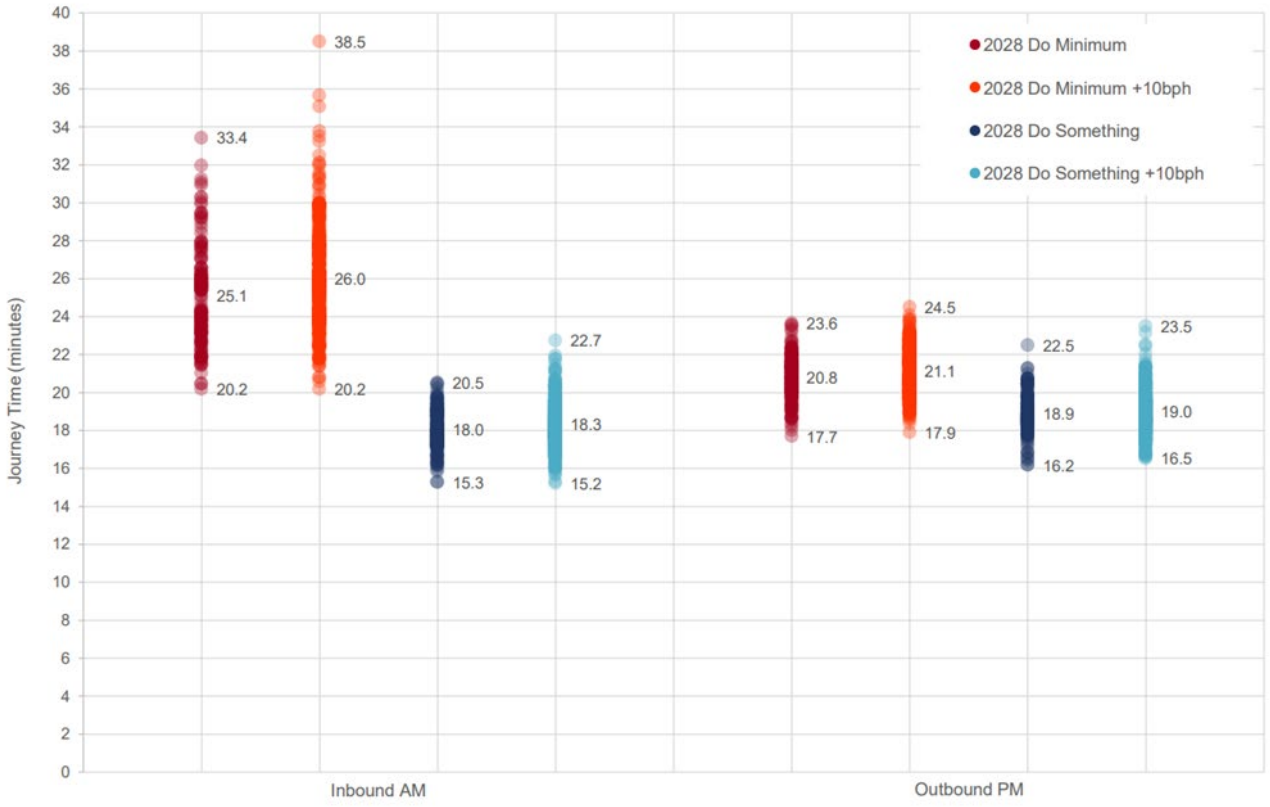


Diagram 6.25: Resilience Testing Bus Journey Time Reliability Indicators - Scenario Testing– Opening Year (2028)

As can be seen from Table 6.48 and Diagram 6.25, the results indicate that even with an additional 10 services operating per direction per hour along the Proposed Scheme, a high level of journey time reliability is maintained in the Do Something scenarios, comparable with the core scenario results. The results indicate limited change in journey times in the Do Something Resilience sensitivity test per bus. In the Do Minimum Resilience sensitivity test, however, bus journey time reliability is more severely impacted with additional services in place. The sensitivity test undertaken indicates that with the additional bus services in place in the Do Minimum scenario a larger change in bus journey times, with the maximum journey time per bus increasing by approximately 5 mins. This highlights the benefit that the Proposed Scheme infrastructure improvements can provide in protecting bus journey time reliability and consistency, as passenger demand continues to grow into the future.

It must be noted that it was assumed the general traffic levels included in each scenario would remain static. If traffic levels were to increase (typical daily variations are in the order of +/- 15%) then the bus priority infrastructure would further protect journey time reliability and resilience in comparison with the Do Minimum scenario.

Further details on the potential additional greenhouse gas (GHG) emissions savings that could occur from this resilience is outlined in Chapter 8 (Climate).

6.4.6.2.8 General Traffic Assessment

6.4.6.2.8.1 Overview

The Proposed Scheme 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 will likely create some level of trip redistribution onto the surrounding road network.

It should be noted that 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 reasonable 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, and delayed car ownership trends that are emerging.

The assessment also assumes that goods vehicles (HGVs and LGVs) continue to grow in line with forecasted economic activity with patterns of travel remaining the same. For example, the assessment assumes a 45% and 77% increase in goods traffic versus the base year in 2028 and 2043 respectively. This is considered a very conservative assumption. It should be noted, however, that the 2021 Climate Action Plan (CAP) (DCCAE 2021) includes reference to a freight strategy for the region that will seek to further integrate smart technologies in logistics management and may include the regulation of delivery times as far as practicable to off-peak periods to limit traffic congestion in urban areas. The 2021 Climate Action Plan outlines measures to manage the increase in delivery and servicing requirements as the population grows. These measures may include the development of consolidation centres to limit the number of ‘last-mile’ trips made by larger goods vehicles with plans for higher use of smaller electric vans or cargo bikes for ‘last-mile’ deliveries in urban areas. As proposals for the above are at a pre-planning stage, it was not deemed appropriate to account for them in the assessments and a worst-case assessment has been undertaken based on continued growth in goods traffic.

The purpose of this section is to assess the overall impact that any redistributed general traffic will have on both the direct and indirect study areas.

It should be noted that the impacts presented in this chapter are based on the final Preliminary Design for the Proposed Scheme which includes embedded mitigation to limit environmental and traffic and transport impacts to a minimal level as part of the iterative design development work described previously above.

6.4.6.2.8.2 Significance of the General Traffic Impact

To determine the impact that the Proposed Scheme will have in terms of general traffic redistribution on the direct and indirect study areas, the LAM Opening Year 2028 model results have been used to identify the difference in general traffic flows between the Do Minimum and Do Something scenarios and the associated level of traffic flow difference as a result of the Proposed Scheme. The assessment has been considered with reference to both the reductions and increases in general traffic flows along road links.

Significance of a Reduction in General Traffic: For this assessment, the reductions in general traffic flows have been described as a positive impact to the environment. The significance of this positive impact is outlined in Table 6.49.

Table 6.49: Significance of the Reduction in General Traffic Flows

Significance of Positive Impact	Description of Impact / Proposed Changes
Profound	< -1000
Very Significant	-1000 to -800
Significant	-800 to -400
Moderate	-400 to -300
Slight	-300 to -100
Not Significant	> -100

The majority of instances where a reduction in general traffic flow occurs are located along or adjacent to the Proposed Scheme (i.e. the direct study area), where there are proposed measures to improve priority for bus, cycle and walking facilities.

Localised junction models have been developed using industry standard modelling packages such as LinSig (a software tool by JCT Consultancy which allows traffic engineers to model traffic signals) and Junctions 10 (a software tool by TRL for the modelling and analysis of roundabout and priority intersections) to determine the appropriate staging, phasing, green times and operational capacity at all junctions along the direct study area. These junction models have been developed using consistent traffic flows as predicted and modelled in the ERM, LAM and micro-simulation models using the iterative traffic modelling process described in Section 6.2 (Methodology) of this EIAR. The full outputs of the results are available in the Appendix A6.3 (Junction Design Report) in Volume 4 of this EIAR.

Significance of an Increase in General Traffic: To determine the impact that the Proposed Scheme has in terms of an increase in general traffic flows on the direct and indirect study areas, a robust assessment has been undertaken, with reference to TII's Traffic and Transport Assessment Guidelines (May 2014).

This document is considered best practice guidance for the assessment of transport impacts related to changes in traffic flows due to proposed developments and is an appropriate means of assessing the impact of general traffic trip redistribution on the surrounding road network.

Diagram 6.26 is a snapshot from the guidance which outlines "Advisory Thresholds for Traffic and Transport Assessment Where National Roads are Affected".

Where applications affect national roads a Transport Assessment should be requested if the thresholds in Table 2.2, below, are exceeded.

Table 2.2 Advisory Thresholds for Traffic and Transport Assessment Where National Roads are Affected

Vehicle Movements	*100 trips in / out combined in the peak hours for the proposed development*
	Development traffic exceeds 10% of turning movements at junctions with and on National Roads.
	Development traffic exceeds 5% of turning movements at junctions with National Roads if location has potential to become congested or sensitive.

Traffic and Transport Assessment Guidelines PE-PDV-02045 May 2014, TII Publications

Diagram 6.26: Extract from TII Guidelines for Traffic and Transport Assessments (May 2014)

The basis of the guidance is to assess the impacts of additional trips that have been generated as part of a new development (for example, a new housing estate etc.). Noting that the guidance relates to National Roads only, for the purpose of this assessment, the principles of the guidance have been adapted for the assessment of the Proposed Scheme. This has been achieved by extending the threshold from National Roads only to cover all road types in the vicinity of the Proposed Scheme. This ensures a robust and rigorous assessment is undertaken and that potential impacts on more localised or residential streets have been captured as part of the assessment.

The impact assessment of increases to the general traffic flows has used the following thresholds based on the above guidelines:

- **Local / Regional Roads:** Traffic redistribution results in an increase above 100 combined flows (i.e., in a two-way direction) along residential, local and regional roads in the vicinity of the Proposed Scheme in the AM and PM peak hours;
- The threshold aligns with an approximate one vehicle per minute increase per direction on any given road. This is a very low level of traffic increase on any road type and ensures that a robust assessment of the impacts of redistributed traffic has been undertaken.
- **National Roads:** Traffic exceeds 5% of the combined turning flows at junctions with/ on/or with national roads in the AM and PM peak hours as a result of traffic redistribution comparing the Do Minimum to the Do Something scenario with the Proposed Scheme in place.
- The guidelines indicate that a 10% threshold may be used, however, to ensure a rigorous assessment in this instance the lower 5% threshold for turning movements has been utilised.

Where road links have been identified as experiencing additional general traffic flow increases that exceed the above thresholds, a further assessment has been undertaken by way of a traffic capacity analysis on the associated junctions along the affected links.

6.4.6.2.8.3 General Traffic Flow Difference – AM Peak Hour

Diagram 6.27 (extract from Figure 6.7 in Volume 3 of this EIAR) illustrates the difference in traffic flows on the road links in the AM Peak Hour for the 2028 Opening Year. Appendix A6.4.7 (General Traffic Assessment) of Volume 4 of this EIAR contains the full LAM outputs.

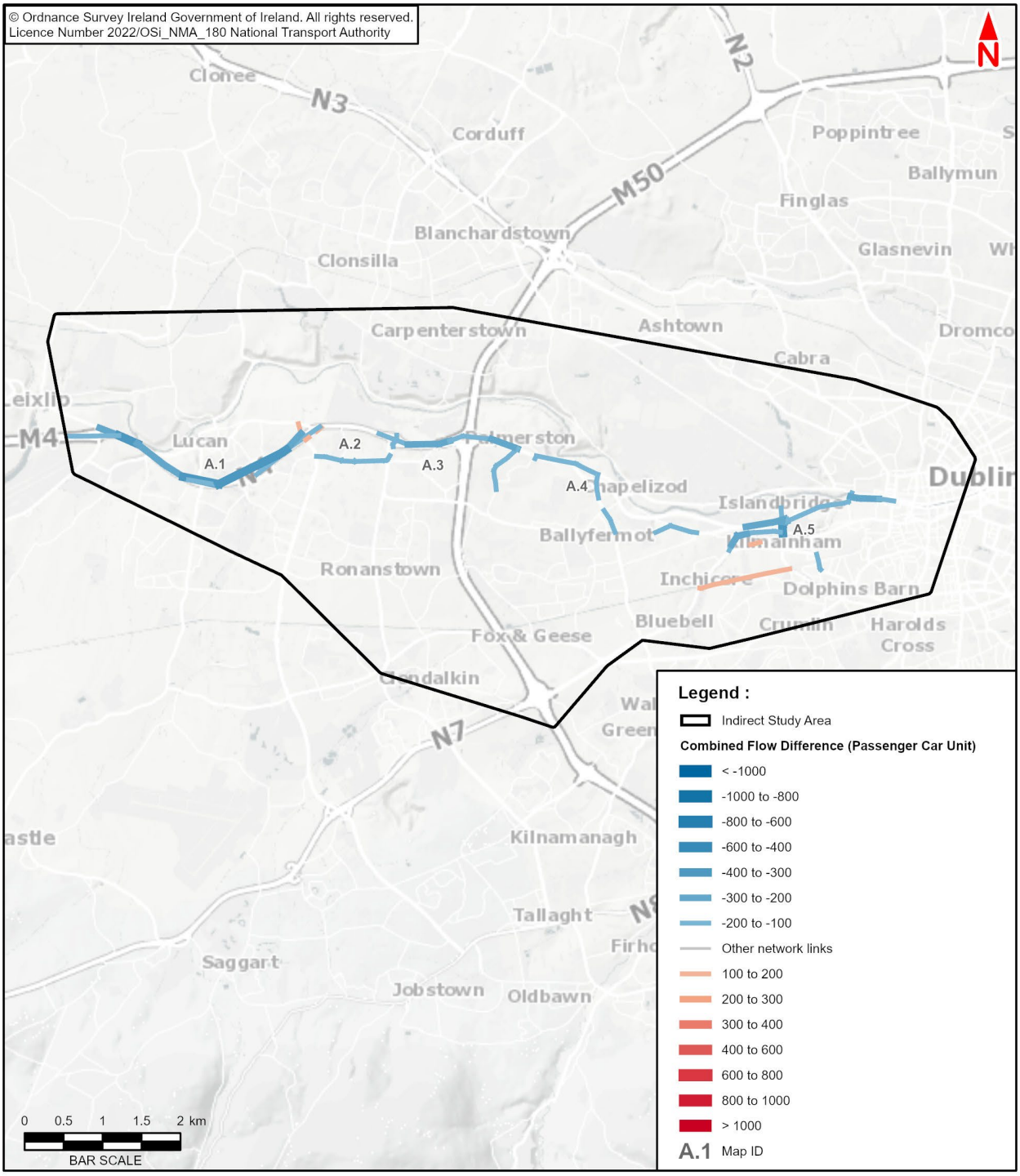


Diagram 6.27: Flow Difference on Road Links (Do Minimum vs. Do Something), AM Peak Hour, 2028 Opening Year

Impact on Direct Study Area (AM Peak Hour)

Direct Reductions in General Traffic: The LAM indicates that, during the 2028 Opening Year scenario, there are reductions in general traffic noted along the Proposed Scheme during the AM Peak Hour, as illustrated by the blue lines in Diagram 6.27, which indicates where a reduction of at least -100 combined traffic flows occurred in the model.

The key reductions in traffic flows during the 2028 AM Peak Hour are outlined in Table 6.50.

Table 6.50: Road Links that Experience a Reduction of at least -100 Combined Flows during 2028 AM Peak Hour (Direct Study Area)

Section	Map I.D.	Road Name	Do Minimum Flows (pcu)	Do Something Flows (pcu)	Flow Difference (pcu)
Section 1 – N4 Junction 3 to M50 Junction 7	A2	Fonthill Road North	935	791	-144
	A2	N4 Eb Between J2 Off and On Slips	4,068	3,949	-119
	A3	N4 Eb After J2	4,507	4,252	-255
	A3	R148 Eb On Approach to M50 J7	2,795	2,537	-259
Section 2 – M50 Junction 7 to R148 Con Colbert Road – Palmerstown Bypass and Chapelizod Bypass	A4	Lucan Road	847	726	-121
	A4	R112 Lucan Road at Chapelizod Village	916	799	-117
	A4	R148 East of Old Lucan Rd Jct	2,342	2,217	-125
	A4	R148 Eb Through M50 J7	2,245	2,055	-191
	A4	R148 Lucan Road Eb West Of Kennelsfort Road Lower	2,719	2,506	-213
	A4	The Oval	496	388	-108
Section 3 – R148 Con Colbert Road to City Centre (Frank Sherwin Bridge	A5	Con Colbert Road	1,970	1,721	-249
	A5	Con Colbert Road Eb West Of South Circular Road	1,970	1,721	-249
	A5	St Johns Road West	1,527	1,289	-238
	A5	St John's Road West Wb West Of Military Road	770	642	-128

As shown in Table 6.50 the traffic reductions vary between -108 and -259 combined flows. There are **Slight** reductions on road links within every section of the Proposed Scheme.

Direct Increases in General Traffic: The red lines in Diagram 6.27 indicate where the LAM predicts that an increase of at least +100 combined traffic flows will occur. These are presented in Table 6.51.

Table 6.51: Road Links that Experience an Increase of at least +100 Combined Flows during 2028 AM Peak Hour (Direct Study Area)

Section	Map ID	Road Name	Do Minimum Flows (pcu)	Do Something Flows (pcu)	Flow Difference (pcu)
Section 1 – N4 Junction 3 to M50 Junction 7	A.1	R136 Ballyowen Road between N4 and Lucan Road	1,375	1,523	+148
	A.1	N4 WB off slip at Junction 3	509	689	+180

Table 6.51 shows that there are predicted to be increases at two links on the Proposed Scheme route itself, ranging from +148 to +180 combined peak hour flows.

Overall Impact on Direct Study Area: In summary, there is predicted to be a Slight reduction of between -108 and -259 combined traffic flows along the direct study area during the AM Peak Hour. There are two locations where

Slight increases in flows are predicted. This overall reduction in general traffic flow has been determined as an overall **Positive, Slight and Long-Term effect** on the direct study area.

Impact on Indirect Study Area (AM Peak Hour)

Indirect Reductions in General Traffic: In addition to the general traffic flow reductions occurring along the direct study area, there are key reductions in general traffic noted along certain road links within the indirect study area during the AM Peak Hour. The key reductions in traffic flows along the indirect study area during the AM Peak Hour are outlined in Table 6.52.

Table 6.52: Road Links that Experience a Reduction of ≥100 Combined Flows during AM Peak Hour (Indirect Study Area)

Section	Map I.D.	Road Name	Do Minimum Flows (pcu)	Do Something Flows (pcu)	Flow Difference (pcu)
Section 1 – N4 Junction 3 to M50 Junction 7	A1	M4 Eb At J5, Between Eb Off and On Slips	4,509	4,396	-113
	A1	M4 Eb At J5, Just Before Eb Off Slip	3,558	3,450	-108
	A1	M4 J5 Sb On Slip	1,741	1,541	-200
	A1	N4 Through Jct 4	4,372	4,036	-336
	A1	N4 Btw Jct 3 and Jct 4	2,511	2,365	-146
	A1	N4 Eb just After J4A Off Slip	4,956	4,658	-298
	A1	N4 Eb To East of J5	5,279	4,971	-308
	A1	N4 J3 Eb Between Off and On Slip	4,213	4,110	-103
	A1	N4 J3 Nb Just Before Nb Off Slip	4,789	4,419	-370
	A1	N4 J3 Nb Off Slip	576	309	-267
	A1	N4 West of Jct 4	4,972	4,676	-296
	A2	Ballyowen Lane	534	411	-123
	A2	Ballyowen Road	1,066	868	-198
	A2	Fonthill Road North	935	791	-144
	A2	St Loman's Road	824	685	-139
Section 2 – M50 Junction 7 to R148 Con Colbert Road – Palmerstown Bypass and Chapelizod Bypass	A4	Ballyfermot Road	1,107	1,005	-102
	A4	Kennelsfort Road Upper	987	830	-158
	A4	Kylemore Road	854	709	-145
	A4	Lucan Road	847	726	-121
	A4	Lucan Road Between Chapelizod Bypass and Kylemore Road	870	752	-118
	A4	Sarsfield Road	1,149	1,026	-123
Section 3 – R148 Con Colbert Road to City Centre (Frank Sherwin Bridge)	A5	Frank Sherwin Bridge	1,264	1,113	-151
	A5	Grattan Crescent North of Inchicore Terrace South	1,347	1,147	-200
	A5	Grattan Crescent South of Inchicore Terrace South	810	590	-220
	A5	Grattan Crescent	810	590	-220
	A5	Inchicore Road	809	537	-273
	A5	South Circular Road	1,843	1,514	-329
	A5	Usher's Island	1,139	971	-169
	A5	Victoria Quay	1,078	862	-216

As indicated in Table 6.52, the traffic reductions vary between -102 and -336 combined flows along the surrounding road links, with the majority of positive impacts being Slight.

Indirect Increases in General Traffic: The key road links which experience additional traffic volumes are illustrated by the red lines in Diagram 6.27.

Table 6.53: Road Links that Experience an Increase of at least +100 Combined Flows (AM Peak Hour)

Section	Map I.D.	Road Name	Do Minimum Flows (pcu)	Do Something Flows (pcu)	Flow Difference (pcu)
Section 3 – R148 Con Colbert Road to City Centre (Frank Sherwin Bridge	A5	Emmet Road	919	1,025	+107
	A5	Davitt Road	1,123	1,312	+188

Table 6.53 shows that there are predicted to be increases at two links in the indirect study area, ranging from +107 to +188 combined peak hour flows. Both of these roads are classified as Regional roads.

National Roads: The inbound flow differences between the Do Minimum and Do Something scenarios during the AM peak hour at the National road junctions within the indirect study area are presented in Table 6.54.

Table 6.54: National Road Links Traffic Threshold Assessment (AM Peak Hour)

Junction	Total Do Minimum Inbound Flows (pcu)	Total Do Something Inbound Flows (pcu)	Difference (pcu)	Percentage Difference
M50 Junction 9	5,824	5,841	17	0.3%
M50 Junction 7	8,369	8,103	-266	-3.2%
N4 Junction 5	3,280	3,194	-86	-2.6%
N4 Junction 4a	1,771	1,816	45	2.5%
N4 Junction 4	2,326	2,352	26	1.1%
N4 Junction 3	3,181	3,064	-117	-3.7%
N4 Junction 2	3,814	3,755	-59	-1.6%

The results in Table 6.54 demonstrate that, in the AM peak hour, traffic flows at national roads junctions are expected to change by between -3.7% and +2.5%.

The highest impact predicted for total inbound flows between the Do Minimum and Do Something scenarios in the AM peak hour is a 2.5% increase at N4 Junction 4A, comfortably below the 5% threshold.

Overall, the Proposed Scheme is expected to have a **Negligible** effect on turning flows at junctions with national roads in the AM peak hour.

No further assessment into the junctions with national roads during the AM peak hour has been undertaken, except for instances where the 100 vehicle threshold for additional traffic is exceeded, as shown in Table 6.54.

Overall Impact on Indirect Study Area: The redistributed traffic as a result of the Proposed Scheme results in a Slight negative impact upon a single road (Davitt Road) during the AM Peak Hour. The results show that overall, many more links are expected to experience a reduction in traffic as a result of the scheme, all of which have been assessed as **Positive Slight** impacts. Overall, the Proposed Scheme is expected to have a **Negligible** effect on roads within the Indirect Study area.

6.4.6.2.8.4 General Traffic Flow Difference – PM Peak Hour

Diagram 6.28 (extract from Figure 6.8 in Volume 3 of this EIAR) illustrates the difference in traffic flows on road links in the PM Peak Hour for the 2028 Opening Year. Appendix A6.4.4 (General Traffic Assessment) in Volume 4 of this EIAR provides further details of the LAM outputs.

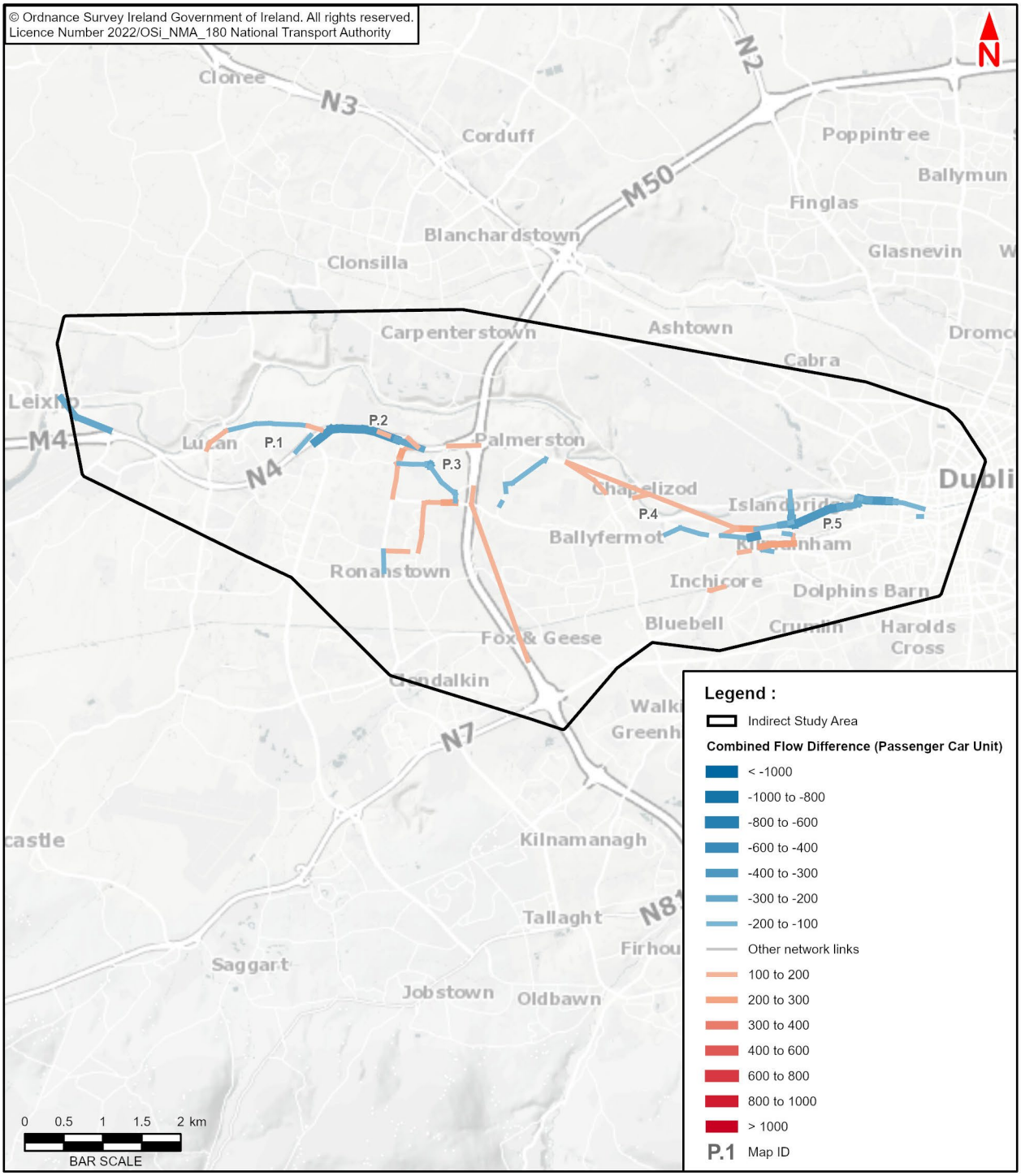


Diagram 6.28: Flow Difference on Road Links (Do Minimum vs. Do Something), PM Peak Hour, 2028 Opening Year

Impact on Direct Study Area (PM Peak Hour)

Direct Reductions in General Traffic Flows: The LAM indicates that during the 2028 Opening Year scenario, there are key reductions in general traffic noted along the Proposed Scheme during the PM Peak Hour, as illustrated by the blue lines in Diagram 6.28, which indicates where a reduction of at least -100 combined traffic flows occurs.

The key reductions in traffic flows during the 2028 PM Peak Hour are outlined in Table 6.55.

Table 6.55 Road Links that Experience a Reduction of at least ≥100 Combined Flows during PM Peak Hour (Direct Study Area)

Section	Map I.D.	Road Name	Do Minimum Flows (pcu)	Do Something Flows (pcu)	Flow Difference (pcu)
Section 1 – N4 Junction 3 to M50 Junction 7	P2	N4 Wb onto R136 Sb Slip	857	495	-362
	P2	N4 between Jct 2 and Jct 3	4,526	4,214	-312
	P3	N4 through Jct 2	3,534	3,312	-222
Section 2 – M50 Junction 7 to R148 Con Colbert Road – Palmerstown Bypass and Chapelizod Bypass	P4	The Oval	407	232	-175
Section 3 – R148 Con Colbert Road to City Centre (Frank Sherwin Bridge)	P5	St John's Road West WB West Of Military Road	1,378	995	-362
	P5	St Johns Road West	1,281	925	-383
	P5	Victoria Quay	1,906	1,584	-356
	P5	Con Colbert Road	1,499	1,368	-131

As indicated in Table 6.55 the traffic reductions vary between -131 and -383 combined flows. There are therefore predicted to be **Slight to Moderate** reductions on road links within the direct study area of the Proposed Scheme.

Increases in General Traffic Flows: The red lines in Diagram 6.28 indicate where the LAM predicts that an increase of at least +100 combined traffic flows will occur. These are presented in Table 6.56.

Table 6.56 Road Links that Experience an Increase of at least +100 Combined Flows during PM Peak Hour (Direct Study Area)

Orientation	Map ID	Road Name	Do Minimum Flows (pcu)	Do Something Flows (pcu)	Flow Difference (pcu)
Section 1 – N4 Junction 3 to M50 Junction 7	P2	Lucan Road	847	952	105
	P2	N4 Eb Between J3 And J4	3,007	3,136	129
	P3	Fonthill Road North to Lucan Road Inbound Slip	1,056	1,157	143
	P3	N4 Onto M50 South Slip	1,411	1,514	103
Section 2 – M50 Junction 7 to R148 Con Colbert Road – Palmerstown Bypass and Chapelizod Bypass	P4	R148 Chapelizod Bypass (Eb between the Oval and Con Colbert Road)	765	878	113
	P4	R148 Chapelizod Bypass (Wb)	1,869	1,990	121
Section 3 – R148 Con Colbert Road to City Centre (Frank Sherwin Bridge)	P5	R148 Chapelizod Bypass Eb after Con Colbert Road	1,051	1,292	241

Table 6.56 shows that there are predicted to be increases on seven links on the Proposed Scheme route itself, ranging from +103 to +241 combined peak hour flows.

Overall Impact on Direct Study Area: In summary, there is an overall **Slight to Moderate** reduction of between -131 and -383 on eight links in the direct study area during the PM Peak Hour, as well as seven links with increases in flow of between +103 and +241. On balance, a **Positive, Slight and Long-Term effect** is predicted.

Impact on Indirect Study Area (PM Peak Hour)

Reductions in General Traffic Flows: In addition to the general traffic flow reductions occurring along the direct study area, there are key reductions in general traffic noted along certain road links within the indirect study area during the 2028 PM Peak Hour. The key reductions in traffic flows along the indirect study area during the PM Peak Hour are outlined in Table 6.57.

Table 6.57: Road Links that Experience a Reduction of at least -100 Combined Flows during PM Peak Hour (Indirect Study Area)

Orientation	Map ID	Road Name	Do Minimum Flows (pcu)	Do Something Flows (pcu)	Flow Difference (pcu)
Section 1 – N4 Junction 3 to M50 Junction 7	P1	N4 J3 Nb Off Slip	278	141	-137
	P1	Leixlip Road	1,180	970	-209
	P1	Lucan Road	1,654	1,468	-187
	P1	Chapel Hill	884	760	-124
	P2	Fonthill Road North	2,443	2,341	-102
	P3	Fonthill Road	951	772	-179
Section 2 – M50 Junction 7 to R148 Con Colbert Road – Palmerstown Bypass and Chapelizod Bypass	P4	Kennelsfort Road Upper	885	759	-126
	P4	Ballyfermot Road Between O'Hogan Road and Saint Laurence Road	1,175	1,061	-114
	P4	Sarsfield Road	550	405	-145
	P4	Turret Road	227	115	-112
	P4	Wheatfield Road	389	279	-110
Section 3 – R148 Con Colbert Road to City Centre (Frank Sherwin Bridge)	P5	Victoria Quay	1,906	1,584	-321
	P5	Inchicore Road	355	205	-150
	P5	South Circular Road North of St John's Road	1,499	1,200	-299
	P5	Usher's Island	1,756	1,543	-214
	P5	Bulfin Road	397	259	-138
	P5	Usher's Quay	1,858	1,745	-113
	P5	Con Colbert Road	1,499	1,368	-131

As indicated in Table 6.57, the traffic reductions vary between -102 and -321 combined flows along the surrounding road links.

Increases in General Traffic Flows: The key road links which experience additional traffic volumes in the PM Peak Hour are illustrated by the red lines in Diagram 6.28. These red lines indicate where an increase in at least 100 combined flows are occurring. The key increases in traffic flows along the indirect study area during the PM Peak Hour are outlined in Table 6.58.

Table 6.58: Road Links that Experience an Increase of at least +100 Combined Flows (PM Peak Hour)

Orientation	Map I.D.	Road Name	Do Minimum Flows (pcu)	Do Something Flows (pcu)	Flow Difference (pcu)
Section 1 – N4 Junction 3 to M50 Junction 7	P1	R109 Main Street	878	1,012	134
	P2	R113 Fonthill Road North (South of St Loman's Road)	1,687	1,886	199
	P2	R113 Fonthill Road North (North of St Loman's Road)	2,819	3,020	202
	P3	Neilstown Road	888	1,041	153
	P3	Coldcut Road	1,515	1,638	123
	P3	Lucan Newlands Road	455	595	140
	P3	N4 Wb Off Slip to R113 Fonthill Road North	1,284	1,441	157
	P4	M50 Btw N4 And N7 Jct	6,175	6,275	100
Section 2 – M50 Junction 7 to R148 Con Colbert Road – Palmerstown Bypass and Chapelizod Bypass	P4	Sarsfield Road	336	444	108
	P4	Davitt Road	1,199	1,308	110
Section 3 – R148 Con Colbert Road to City Centre (Frank Sherwin Bridge)	P4	Chapelizod Road	1,093	1,230	137
	P4	R112 Slip to Wb R148	704	866	162
	P5	Emmet Road	898	1,114	216
	P5	South Circular Road	1,231	1,359	128

As outlined in Table 6.58 the key road links which experience additional traffic flows vary between +100 and +216 combined flows along the surrounding road links, during the PM Peak Hour. As described in Section 6.4.6.2.8.2, these road links have been identified as experiencing additional traffic volumes over the threshold for further assessment.

National Roads: The inbound flow differences between the Do Minimum and Do Something scenarios during the PM Peak Hour at the National road junctions within the indirect study area are presented in Table 6.59.

Table 6.59: National Road Links Traffic Threshold Assessment (PM Peak Hour)

Junction	Total Do Minimum Inbound Flows (pcu)	Total Do Something Inbound Flows (pcu)	Difference (pcu)	Percentage Difference
M50 Junction 9	17,601	17,556	-46	-0.3%
M50 Junction 7	8,898	8,775	-123	-1.4%
N4 Junction 5	2,825	2,757	-68	-2.4%
N4 Junction 4a	1,883	1,844	-39	-2.1%
N4 Junction 4	2,099	2,139	39	1.9%
N4 Junction 3	2,963	2,654	-309	-10.4%
N4 Junction 2	3,633	3,744	111	3.1%

Table 6.59 shows in total, two of the seven assessed junctions are expected to experience slight increases in inbound traffic as a result of the scheme, but in each instance, is less than the 5% threshold. The highest impact predicted for total turning flows between the Do Minimum and Do Something scenarios in the PM peak hour is a 3.1% increase at N4 Junction 2, below the 5% threshold. Inbound traffic flows at the remaining five junctions are predicted to decrease.

Overall, the Proposed Scheme is expected to have a **Negligible** effect on turning flows at junctions with national roads in the PM peak hour.

No further assessment into the junctions with national roads during the PM peak hour has been undertaken, except for instances where the 100 vehicle threshold for additional traffic is exceeded, as shown in 6.4.6.2.8.2.

Overall Impact on Indirect Study Area: In the PM peak hour, the redistributed traffic as a result of the Proposed Scheme results in a Slight negative impact on 14 links, and Positive Slight impacts, where traffic is predicted to reduce, on 19 links. The results show that overall, more links are expected to experience a reduction in traffic as a result of the scheme, which on balance is assessed as a **Negligible** impact. The Proposed Scheme is expected to have a negligible effect on National roads within the Indirect Study area.

6.4.6.2.8.5 General Traffic Impact Assessment

Following the above threshold assessment, the following three-step approach has been undertaken to determine the significance of the negative impact as a result of the redistributed general traffic on the indirect study area:

- **Step 1 - Determination of Junction Sensitivity**: Where road links experience additional traffic volumes of above the proposed thresholds, a review has been undertaken of its associated junctions using the following categories:
    - **High Sensitivity (Category 5)** – Roads that cater for a lower volume of traffic than Category 4 with a lower speed limit (30km/h);
    - **Medium Sensitivity (Category 4)** – Roads that can cater for a high volume of traffic with a moderate speed limit (30km/h – 50km/h), connecting neighbourhoods;
    - **Low Sensitivity (Category 3) –** Roads that interconnect Category 2 type roads with a lower level of mobility than national roads; and
    - **Negligible Sensitivity (Category 1 and Category 2)** – Roads that can cater for a high volume of traffic with a high speed limit (100km/h - 120km/h), between major metropolitan cities, i.e. national primary and secondary roads.
    - The above sensitivities / categories establish the characteristics of the surrounding road network impacted by the Proposed Scheme. The road link characteristics of the major arm of a junction has been used to determine the junction sensitivity. This has allowed for the identification of where more sensitive locations, in particular Category 5 roads / junctions, are impacted.

- **Step 2 – Determination of the Magnitude of Impact using Junction Analysis:** To understand the magnitude impact of the redistributed traffic, operational capacities have been extracted from the LAM.

The capacity of junctions within the LAM are expressed in terms of Volume to Capacity ratios (V / C ratios). The V / C ratios represent the operational efficiency for each arm of a junction. For the purpose of this EIAR, operational capacity outputs of a junction have been identified with reference to the busiest arm which experiences the maximum V/C ratio.

A V / C ratio of below 85% indicates that a junction is operating well, has spare capacity, and that traffic does not experience queuing or delays throughout the hour. A value of 85% to 100% indicates that the junction is approaching its theoretical capacity with traffic possibly experiencing occasional queues and delays within the hour. A value of over 100% indicates that a junction is operating above its theoretical capacity and traffic experiences queues and delays regularly within the hour. The junctions have been described in the ranges outlined in Table 6.60.

Table 6.60 Junction Volume / Capacity Ranges

VoC Ratio	Traffic Condition
≤85%	A junction is operating well within theoretical capacity.
85% - 100%	A junction is approaching theoretical capacity and may experience occasional queues and delays within the hour.
≥100%	A junction is operating above its theoretical capacity and experiences queues and delays quite regularly within the hour.

When comparing the V / C ratios during the Do Minimum and Do Something scenarios for the key junctions, the terms outlined in Table 6.61 have been used to describe the impact.

Table 6.61 Magnitude of Impact for Redistributed Traffic

		Do Something		
		≤85%	85% - 100%	≥100%
Do Minimum	≤85%	Negligible	Low Negative	High Negative
	85% - 100%	Low Positive	Negligible	Medium Negative
	≥100%	Medium Positive	Low Positive	Negligible

As indicated in Table 6.61, the changes in V / C ratios between the Do Minimum and Do Something scenarios result in either a positive, negative or negligible magnitude of impact.

- **Step 3 – Determination of Significance of Effects:** The magnitude of impact has been combined with the sensitivity of the road link to determine the Significance of Effect using the matrix shown Table 6.4, which is based upon the EPA Guidelines on EIAR.

  Potential mitigation measures have been considered at junctions where the Significance of Effect is predicted to be Significant or higher. At junctions where a moderate effect or lower is predicted, further consideration has not been undertaken as moderate effects represent that which effects the 'character of the environment in a manner that is consistent with existing and emerging baseline trends' (as per Table 6.5).

The above analysis was carried out on the following scenarios:

- 2028 Opening Year – Do Minimum vs Do Something – AM Peak Hour;
- 2043 Design Year (Opening Year + 15 Years) – Do Minimum vs Do Something – AM Peak Hour;
- 2028 Opening Year – Do Minimum vs Do Something – PM Peak Hour; and
- 2043 Design Year (Opening Year + 15 Years) – Do Minimum vs Do Something – PM Peak Hour.

The AM and PM Peak Hour flows are modelled as occurring between 08:00 to 09:00 and 17:00 to 18:00 respectively. The interpeak periods have not been analysed for this impact assessment as the AM and PM Peak Hour flows present an overall worst-case scenario. The full analysis tables for each scenario, demonstrating the Do Minimum and Do Something Peak Hour traffic flows and maximum V / C ratio for each junction assessed is detailed in Table 14 to Table 17 of Appendix A6.4.4 (General Traffic Assessment) in Volume 4 of this EIAR.

General Traffic Impact Assessment (2028 Opening Year) – Indirect Study Area - AM Peak Hour

The contents of Table 6.62 outline the maximum V / C ratios at the key local / regional road junctions in the AM Peak Hour for the 2028 Opening Year at junctions where the ratio exceeds 100% in the Do Something scenario, or the significance of effect is slight or higher. The location of these junctions and the V / C ratio comparison between the Do Minimum and Do Something scenarios in the 2028 AM Peak Hour are illustrated in Figure 6.9 in Volume 3 of this EIAR.

Table 6.62 Volume over Capacity Ratios at Key Junctions (Do Minimum vs. Do Something), AM Peak, 2028 Opening Year

Road Name	Road Sensitivity	Junction Name	DM Max V / C Ratio			DS Max V / C Ratio			Magnitude of Impact	Significance of Effects
			<85%	85% - 100%	>100%	<85%	85% - 100%	>100%		
Davitt Road	Medium	Davitt Road / Davitt Road / Benbulbin Road	✓			✓			Negligible	Not Significant
	Medium	Davitt Road / Davitt Road / Kilworth Road	✓			✓			Negligible	Not Significant
	Medium	Dolphin Road / Slievenamon Road / Dolphin Road / Davitt Road	✓			✓			Negligible	Not Significant
Emmet Road	Medium	Myra Close / Emmet Road / Emmet Road	✓			✓			Negligible	Not Significant
	Medium	Emmet Road / Bulfin Road	✓			✓			Negligible	Not Significant
Naas Road	Low	Naas Road / Davitt Road		✓			✓		Negligible	Not Significant

The results of the junction analysis shown in Table 6.62 demonstrate that five of the six junctions are predicted to operate with a maximum VoC ratio of below 85% during the AM Peak Hour in the 2028 Opening Year and the Proposed Scheme. At the Naas Road / Davitt Road junction, the junction is expected to perform with a maximum VoC ratio of between 85% and 100% in both the Do Minimum and Do Something scenarios.

A Negligible impact is predicted at each of the six junctions, which has been assessed as **Not Significant**.

Capacity issues (where the max VoC ratio is greater than 100%) are not predicted to arise at any junctions.

No further assessment into potential mitigation measures is therefore deemed to be required for junctions in the 2028 AM Peak Hour scenario.

General Traffic Impact Assessment (2028 Opening Year) – Indirect Study Area - PM Peak Hour

The contents of Table 6.63 outline the V / C ratios at the key local / regional road junctions in the PM Peak Hour for the 2028 Opening Year and the resultant magnitude of impact and significance of effect at each junction. The location of these junctions and the V / C ratio comparison between the Do Minimum and Do Something scenarios in the 2028 PM Peak Hour are illustrated in Figure 6.10 in Volme 3 of this EIAR.

Table 6.63 Volume over Capacity Ratios at Key Junctions (Do Minimum vs. Do Something), PM Peak, 2028 Opening Year

Road Name	Road Sensitivity	Junction Name	DM Max V / C Ratio			DS Max V / C Ratio			Magnitude of Impact	Significance of Effects
			<85%	85% - 100%	>100%	<85%	85% - 100%	>100%		
Chapelizod Road	Low	Main Street / Chapelizod Road /		✓			✓		Negligible	Not Significant
	Low	Chapelizod Hill Road / St Laurence Road / Lucan Road			✓			✓	Negligible	Not Significant
Coldcut Road	Medium	Coldcut Road / Fonthill Road	✓				✓		Low	Moderate
	Medium	Coldcut Road / Neilstown Road	✓			✓			Negligible	Not Significant
Davitt Road	Medium	Naas Road / Davitt Road		✓			✓		Negligible	Not Significant

Road Name	Road Sensitivity	Junction Name	DM Max V / C Ratio			DS Max V / C Ratio			Magnitude of Impact	Significance of Effects
			<85%	85% - 100%	>100%	<85%	85% - 100%	>100%		
	Medium	Davitt Road / Davitt Road / Kilworth Road	✓			✓			Negligible	Not Significant
Emmet Road	Medium	Grattan Crescent / Tyrconnell Road / Emmet Road		✓			✓		Negligible	Not Significant
	Medium	Emmet Road / St Vincent Street West / Emmet Road	✓			✓			Negligible	Not Significant
	Medium	Emmet Road / Bulfin Road	✓			✓			Negligible	Not Significant
Fonthill Road North Rdbt	Low	Fonthill Road North / St Loman's Road	✓			✓			Negligible	Not Significant
Lucan Newlands Road	Low	Lucan Newlands Road / R113 Fonthill Road North / R113		✓			✓		Negligible	Not Significant
	Low	Lucan Newlands Road / Rowlagh Park	✓			✓			Negligible	Not Significant
Neilstown Road	Medium	Neilstown Road / Coldcut Road / Coldcut Road	✓			✓			Negligible	Not Significant
	Medium	St Marks Avenue / Neilstown Road / Neilstown Road	✓			✓			Negligible	Not Significant
	Medium	Neilstown Road / Collinstown Road / Neilstown Road	✓			✓			Negligible	Not Significant
	Medium	Neilstown Road / St Mark's Avenue	✓			✓			Negligible	Not Significant
	Medium	Lucan Newlands Road / Neilstown Road	✓			✓			Negligible	Not Significant
R109 Main Street	High	Leixlip Road / Main Street	✓			✓			Negligible	Not Significant
	High	R109 / Lower Main Street / Lower Main Street	✓			✓			Negligible	Not Significant
	High	Chapel Hill / Lower Main Street / R109	✓			✓			Negligible	Not Significant
R112 Slip to Wb R148	Low	R112 WB R148 on-slip / Kylemore Road	✓			✓			Negligible	Not Significant
R113 Fonthill Road North (North of St Loman's Road)	Negligible	R113 SB on slip to Fonthill Road North SB	✓			✓			Negligible	Imperceptible
R113 Fonthill Road North (South of St Loman's Road)	Low	R113 Fonthill Road North / Saint Loman's Road			✓			✓	Negligible	Not Significant
Sarsfield Road	Negligible	Sarsfield Road / Ballyfermot Road	✓			✓			Negligible	Imperceptible
South Circular Road	Negligible	Emmet Road / Old Kilmainham / South Circular Road / South Circular Road	✓			✓			Negligible	Imperceptible
	Negligible	South Circular Road / Inchicore Road / Kilmainham Lane	✓				✓		Low	Not Significant

The results of the junction analysis shown in the table above, demonstrate that the majority of junctions are predicted to operate with a maximum VoC ratio of below 85% during the PM Peak Hour in the 2028 Opening Year and the Proposed Scheme.

Capacity issues (where the max VoC exceeds 100%) are predicted at the following junctions:

- Chapelizod Hill Road / St Laurence Road / Lucan Road signalised junction (14158) – operates above 100% during both the Do Minimum and Do Something scenario.
- **Fonthill Road North / Saint Loman's Road roundabout node (25129) –** operates above 100% during both the Do Minimum and Do Something scenario.

A **Moderate** effect is predicted at the Coldcut Road / Fonthill Road signalised junction (Node 25100), which provides one of the access points into the Liffey Valley Shopping Centre, as a result of the max VoC ratio rising above 85% in the Do Something scenario. Closer inspection of the figures shows that the max VoC ratio is expected to increase by just 2%, from 84% to 86%, meaning that the impact of the scheme would be marginal.

A **Not Significant** effect is predicted at 22 junctions, and an **Imperceptible** effect at three further junctions.

No further assessment into potential mitigation measures is therefore deemed to be required for junctions in the 2028 PM Peak Hour scenario.

General Traffic Impact Assessment (2043 Design Year) – Indirect Study Area – AM Peak Hour

The contents of Table 6.64 outline the V / C ratios at the key local / regional road junctions in the AM Peak Hour for the 2043 Design Year and the resultant magnitude of impact and significance of effect at each junction. The location of these junctions and the V / C ratio comparison between the Do Minimum and Do Something scenarios in the 2043 AM Peak Hour are illustrated in Figure 6.11 in Volume 3 of this EIAR.

Table 6.64 Volume over Capacity Ratios at Key Junctions (Do Minimum vs. Do Something), AM Peak, 2043 Opening Year

Road Name	Road Sensitivity	Junction Name	DM Max V / C Ratio			DS Max V / C Ratio			Magnitude of Impact	Significance of Effects
			<85%	85% - 100%	>100%	<85%	85% - 100%	>100%		
Davitt Road	Medium	Davitt Road / Davitt Road / Benbulbin Road	✓			✓			Negligible	Not Significant
	Medium	Davitt Road / Davitt Road / Kilworth Road	✓			✓			Negligible	Not Significant
	Medium	Dolphin Road / Slievenamon Road / Dolphin Road / Davitt Road	✓			✓			Negligible	Not Significant
Emmet Road	Medium	Myra Close / Emmet Road / Emmet Road	✓			✓			Negligible	Not Significant
	Medium	Emmet Road / Bulfin Road	✓			✓			Negligible	Not Significant
Naas Road	Low	Naas Road / Davitt Road		✓			✓		Negligible	Not Significant

The results of the junction analysis shown in Table 6.64 demonstrate that five of the six of the assessed junctions are predicted to operate with a maximum VoC ratio of below 85% during the AM Peak Hour in the 2043 Opening Year and the Proposed Scheme. At the Naas Road / Davitt Road junction, the junction is expected to perform with a maximum VoC ratio of between 85% and 100% in both the Do Minimum and Do Something scenarios.

Capacity issues (Max VoC ratios greater than 100%) are not predicted to arise at any junctions.

A Negligible impact is predicted at each of the five junctions assessed, which is deemed as a **Not Significant effect**.

Considering this, no further assessment into potential mitigation measures is required for junctions in the 2043 AM Peak Hour scenario.

General Traffic Impact Assessment (2043 Design Year) – Indirect Study Area – PM Peak Hour

The contents of Table 6.65 outline the V / C ratios at the key local / regional road junctions in the PM Peak Hour for the 2043 Design Year and the resultant magnitude of impact and significance of effect at each junction. The location of these junctions and the V / C ratio comparison between the Do Minimum and Do Something scenarios in the 2043 PM Peak Hour are illustrated in Figure 6.12 in Volme 3 of this EIAR.

Table 6.65 Volume over Capacity Ratios at Key Junctions (Do Minimum vs. Do Something), PM Peak, 2043 Opening Year

Road Name	Road Sensitivity	Junction Name	DM Max V / C Ratio			DS Max V / C Ratio			Magnitude of Impact	Significance of Effects
			<85%	85% - 100%	>100%	<85%	85% - 100%	>100%		
Chapelizod Road	Low	Main Street / Chapelizod Road /		✓			✓		Negligible	Not Significant
	Low	Chapelizod Hill Road / St Laurence Road / Lucan Road			✓			✓	Negligible	Not Significant
Coldcut Road	Medium	Coldcut Road / Fonthill Road	✓				✓		Low	Moderate
	Medium	Coldcut Road / Neilstown Road	✓			✓			Negligible	Not Significant
Davitt Road	Medium	Naas Road / Davitt Road		✓			✓		Negligible	Not Significant
	Medium	Davitt Road / Davitt Road / Kilworth Road	✓			✓			Negligible	Not Significant
Emmet Road	Medium	Grattan Crescent / Tyrconnell Road / Emmet Road		✓			✓		Negligible	Not Significant
	Medium	Emmet Road / St Vincent Street West / Emmet Road	✓			✓			Negligible	Not Significant
	Medium	Emmet Road / Bulfin Road	✓			✓			Negligible	Not Significant
Fonthill Road North Rdbt	Low	Fonthill Road North / St Loman's Road	✓			✓			Negligible	Not Significant
Lucan Newlands Road	Low	Lucan Newlands Road / R113 Fonthill Road North / R113			✓			✓	Negligible	Not Significant
	Low	Lucan Newlands Road / Rowlagh Park	✓			✓			Negligible	Not Significant
Neilstown Road	Medium	Neilstown Road / Coldcut Road / Coldcut Road	✓			✓			Negligible	Not Significant
	Medium	St Marks Avenue / Neilstown Road / Neilstown Road	✓			✓			Negligible	Not Significant
	Medium	Neilstown Road / Collinstown Road / Neilstown Road	✓			✓			Negligible	Not Significant
	Medium	Neilstown Road / St Mark's Avenue	✓			✓			Negligible	Not Significant
	Medium	Lucan Newlands Road / Neilstown Road	✓			✓			Negligible	Not Significant
R109 Main Street	High	Leixlip Road / Main Street	✓			✓			Negligible	Not Significant
	High	R109 / Lower Main Street / Lower Main Street	✓			✓			Negligible	Not Significant
	High	Chapel Hill / Lower Main Street / R109	✓			✓			Negligible	Not Significant
R112 Slip to Wb R148	Low	R112 WB R148 on-slip / Kylemore Road	✓			✓			Negligible	Not Significant
R113 Fonthill Road North	Negligible	R113 SB on slip to Fonthill Road North SB	✓			✓			Negligible	Imperceptible

Road Name	Road Sensitivity	Junction Name	DM Max V / C Ratio			DS Max V / C Ratio			Magnitude of Impact	Significance of Effects
			<85%	85% - 100%	>100%	<85%	85% - 100%	>100%		
(North of St Loman's Road)										
R113 Fonthill Road North (South of St Loman's Road)	Low	R113 Fonthill Road North / Saint Loman's Road			✓			✓	Negligible	Not Significant
Sarsfield Road	Negligible	Sarsfield Road / Ballyfermot Road	✓			✓			Negligible	Imperceptible
South Circular Road	Negligible	Emmet Road / Old Kilmainham / South Circular Road / South Circular Road	✓			✓			Negligible	Imperceptible
	Negligible	South Circular Road / Inchicore Road / Kilmainham Lane	✓			✓			Negligible	Imperceptible

The results of the junction analysis shown in the table above, demonstrate that the majority of junctions are predicted to operate with a maximum VoC ratio of below 85% during the PM Peak Hour in the 2043 Opening Year and the Proposed Scheme.

Capacity issues are predicted at the following junctions:

- **Chapelizod Hill Road / St Laurence Road / Lucan Road signalized junction** (14158) – predicted to operate at 101% on the worst performing arm of the junction during both the Do Minimum and Do Something scenario.
- **Lucan Newlands Road / Fonthill Road North / R113 (25375) –** similar to the junction above, predicted to operate at 101% on the worst performing arm of the junction during both the Do Minimum and Do Something scenario.

A **Moderate** effect is predicted at the Coldcut Road / Fonthill Road signalised junction (Node 25100), which provides one of the access points into the Liffey Valley Shopping Centre, as a result of the max VoC ratio rising above 85% in the Do Something scenario. Closer inspection of the figures shows that the max VoC ratio is expected to increase by just 1%, from 85% to 86%, meaning that the impact as a result of the Proposed Scheme is minimal.

A **Not Significant** effect is predicted at 24 junctions, and an **Imperceptible** effect at four further junctions.

No further assessment into potential mitigation measures is therefore deemed to be required for junctions in the 2043 PM Peak Hour scenario.

6.4.6.2.8.6 Night-time Traffic Redistribution

The night-time period is defined as between 23:00 and 07:00. An analysis of traffic data during this period indicates that traffic levels are considerably lower and that junctions have a higher capacity for vehicular movement (Less pedestrian, cycling and bus demand requirements leading to higher level of general traffic green time allocation per typical signal cycle). Automatic Traffic Counter data demonstrates that, typically, within Dublin the night-time period has approximately 19% of the traffic levels compared to the morning peak hour (08:00-09:00). As a result, during the night-time period, junctions do not experience flows in excess of capacity that would result in queuing and in turn potential re-distribution of traffic to alternative routes to avoid congestion. Therefore, the effects of traffic redistribution due to any of the Proposed Schemes will be **Negligible and Long-term** during the night-time period.

6.4.6.2.8.7 General Traffic Impact Assessment Summary – Indirect Study Area

Given the improvements to bus priority, walking and cycling as a result of the Proposed Scheme, there will likely be an overall reduction in operational capacity for general traffic along the direct study area. This may in turn result in some level of redistribution of general traffic away from the main corridor onto the surrounding road network.

Using the TII guidelines as an indicator for best practice, the LAM Opening Year 2028 model results were used to identify the difference in traffic flows between the Do Minimum and Do Something scenarios. The following thresholds have been used to identify where a Transport Assessment is required:

- **Local / Regional Roads:** Traffic redistribution results in an increase above 100 combined flows (i.e. in a two-way direction) along residential, local and regional roads in the vicinity of the Proposed Scheme in the AM and PM peak hours; and
- **National Roads:** Traffic exceeds 5% of the combined turning flows at junctions with/ on/or with national roads in the AM and PM peak hours as a result of traffic redistribution comparing the Do Minimum to the Do Something scenario with the Proposed Scheme in place.

The threshold impact assessment identified the following roads that required further traffic analysis:

- **AM Peak Hour:** Emmet Road, Davitt Road, R136 Ballyowen Road and the N4 westbound off-slip at Junction 3.
- **PM Peak Hour:** R109 Main Street, R834 Lucan Road, N4 eastbound between J3 and J4, N4 westbound off-slip at J2, Coldcut Road, R113 Fonthill Road North, Neilstown Road, Lucan Newlands Road, Chapelizod Road, R148 Con Colbert Road, R148 Chapelizod Bypass, R148 St John's Road West, R111 South Circular Road, Emmet Road, Sarsfield Road and Davitt Road.

The general traffic impact assessment was undertaken by extracting operational capacities from the LAM at the key junctions along the above road links. To undertake a robust assessment, the outputs for the worst-performing arm at each junction have been assessed. Potential mitigation measures have been considered at junctions where the Significance of Effect is predicted to be **Significant** or higher.

The overall results of this assessment can be summarised as follows:

- The majority of assessed junctions have VoC ratios of below 85%, i.e. they are operating within capacity for all assessed years in the Do Minimum and Do Something scenarios. This indicates that these junctions will be able to accommodate for the additional general traffic volumes redistributed, as a result of the Proposed Scheme and the effect is deemed **Imperceptible / Not Significant.**
- No capacity issues are predicted at any identified junctions in the AM peak hour. Capacity issues (where the maximum VoC ratio is greater than 100%) are predicted to arise at the following junctions during the PM Peak Hour in the 2028 Opening Year and the 2043 Opening Year + 15 Years:
- Chapelizod Hill Road / St Laurence Road / Lucan Road signalized junction (14158)
- Fonthill Road North / Saint Loman's Road roundabout (25129)

At both of these junctions, operational performance is expected to be similar in the Do Minimum and Do Something scenarios.

No **Significant** (or higher) effects are predicted. Only one **Moderate** effect was predicted, at the Coldcut Road / Fonthill Road signalised junction (Node 25100) in the PM 2028 and PM 2043 scenarios. This junction provides one of the access points into the Liffey Valley Shopping Centre. Closer inspection of the figures shows that the max VoC ratio is expected to increase by just 1-2% (but breaches the 85% threshold), meaning that in reality the impact of the scheme would be limited.

No mitigation measures are therefore deemed to be required in either the AM or PM peak hours.

In terms of the National roads 5% threshold impact assessment, the highest impact predicted for total inbound flows between the Do Minimum and Do Something scenarios is in the PM peak hour, where there is predicted to be 3.1% increase at N2 Junction 4. In the majority of cases, traffic flows at national road junctions are expected

to decrease slightly, and overall the Proposed Scheme is expected to have a negligible effect on national road junctions within the indirect study area.

6.4.6.3 Operational Phase Summary

The aim of the Proposed Scheme is to provide enhanced walking, cycling and bus infrastructure on this key access corridor in the Dublin region, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the CBC Infrastructure Works, applicable to the Traffic and Transport assessment of the Proposed Scheme are to:

- Enhance the capacity and potential of the public transport system by improving bus speeds, reliability and punctuality through the provision of bus lanes and other measures to provide priority to bus movement over general traffic movements; and
- Enhance the potential for cycling by providing safe infrastructure for cycling, segregated from general traffic wherever practicable;
- Support the delivery of an efficient, low carbon and climate resilient public transport service, which supports the achievement of Ireland's emission reduction targets;
- Enable compact growth, regeneration opportunities and more effective use of land in Dublin, for present and future generations, through the provision of safe and efficient sustainable transport networks;
- Improve accessibility to jobs, education and other social and economic opportunities through the provision of improved sustainable connectivity and integration with other public transport services; and
- Ensure that the public realm is carefully considered in the design and development of the transport infrastructure and seek to enhance key urban focal points where appropriate and feasible.

Based on the information and analysis presented within Section 6.4.6 (Operational Phase), the assessment determines that the Proposed Scheme meets the above objectives and integrates within the receiving transport environment with minimal impacts during the Operational Phase. The assessment demonstrates the following:

- **Pedestrian Infrastructure:** The Proposed Scheme consists of measures to enhance the existing pedestrian infrastructure along the direct study area. All proposed facilities have been designed in accordance with PDGB which has been developed with cognisance to the relevant accessibility guidance. A LoS junction assessment was undertaken using a set of five criteria to determine the impact that the Proposed Scheme has for pedestrians. The results of the impacted junctions demonstrate that in the Do Minimum scenario, 73% of the junctions assessed has LoS ratings of C or D, with the exception of two B, three E and one F ratings. In the Do Something scenario, i.e. following the development of the Proposed Scheme, 82% of the assessed junctions had the highest A / B LoS ratings. The effects of the improvements to the quality of the pedestrian infrastructure will be **Positive, Moderate and Long-term** in Section 2 and **Positive, Significant and Long-term** in Section 1 and 3 of the Proposed Scheme.

- **Cycling Infrastructure:** The Proposed Scheme also consists of measures to enhance the potential for cycling by providing safe infrastructure for cycling, segregated from general traffic (and pedestrians) wherever practicable along the direct study area. A LoS assessment was undertaken using an adapted version of the NTA's National Cycle Manual QoS Evaluation criteria. The results of the assessment demonstrate that the LoS in the Do Minimum scenario consists predominantly of C ratings, with the exception of one B rating. In the Do Something scenario, eight of the nine LoS ratings are the highest A+, A and B ratings, with the remainder being C rating. Given the quality of the existing cycling infrastructure along the Proposed Scheme, the effects of the improvements will be **Positive, Moderate and Long-term** in Sections 1, 2 and 3.

- **Bus Infrastructure:** The implementation of the Proposed Scheme will result in improvements in the quality of bus infrastructure provision along the direct study area. A qualitative impact assessment has been undertaken based on the provision of bus priority, pedestrian accessibility and changes to the bus stop facilities. The results of the assessment demonstrate that the effects of the improvements to the quality of the bus infrastructure will be **Positive, Very Significant and Long-term** in Section1 and 2, and **Positive, Profound and Long-term** in Section 3 of the Proposed Scheme.

- **Parking and Loading:** A qualitative impact assessment has been undertaken of the Proposed Scheme impacts on the existing parking and loading. The results of the assessment demonstrate that the changes to the parking and loading provision will result in an overall loss of 265 spaces (-108 spaces in Section 1, -124 spaces in Section 2 and -33 spaces in Section 3). Given the nature of the loss in parking (i.e. predominately low use informal parking on sections of road where properties and businesses have off road parking) and the availability of alternative spaces in the indirect study area, the effects are expected to be **Negative, Moderate and Long-term** in Section 1 and **Negative, Slight and Long-term** in Section 2 and Section 3.

- **People Movement:** Given the proposed amendments to the pedestrian, cycling, bus and parking / loading infrastructure outlined above, the Proposed Scheme will have greater capacity to facilitate the movement of people travelling along the corridor. A quantitative impact assessment has been undertaken using outputs from the NTA's ERM and LAM, comparing the Do Minimum and Do Something peak hour scenarios for each forecast year (2028, 2043). The results of the assessment demonstrate that there will be an increase in 13% and 9% of people travelling along the Proposed Scheme during the 2028 AM and PM Peak Hours respectively. During the 2043 scenario there will be an increase in 18% and 9% in the number of people travelling along the Proposed Scheme during the AM and PM Peak Hours. The analysis also shows that there will be an increase in 4.6% and 5.3% of passengers boarding buses during the 2028 AM and PM Peak Hours respectively. During the 2043 scenario there will be an increase of 6.3% and 4.8% of passengers boarding buses during the AM and PM Peak Hours respectively. Overall, it is anticipated that the effects of the increases to the total number of people travelling along the Proposed Scheme will be **Positive, Significant and Long-term.**
- **Bus Network Performance Indicators:** A micro-simulation modelling assessment has been developed and network performance indicators of the bus operations along the 'end to end' corridor. The results of the assessment demonstrate that the total bus journey times on all modelled bus services will improve by up to 19% during the AM and PM Peak hours of the 2028 Opening Year and 2043 Design Year. Based on the AM and PM peak hours alone, this equates to **c7.2 hours of savings in 2028 and c7.5 hours in 2043,** when compared to the Do Minimum combined across all buses. On an annual basis this equates to approximately 5,400 hours of bus vehicle savings in 2028 and 5,600 hours in 2043, when considering weekday peak periods only. Journey time variation and reliability are shown to improve in all Do Something scenarios compared to the Do Minimum. Overall, it is anticipated that the improvements in journey times and reliability for bus users along the Proposed Scheme will have a **Positive, Very Significant and Long-term effect.**

- **General Traffic Network Performance Indicators:** There will be an overall reduction in operational capacity for general traffic along the direct study area, given the proposed infrastructural changes to the existing road layout outlined above. This reduction in operational capacity for general traffic will create some level of traffic redistribution from the Proposed Scheme onto the surrounding road network.

  The LAM Opening Year 2028 model results were used to identify the impact in traffic flows between the Do Minimum and Do Something scenarios. A reduction in general traffic flows along a road link has been described as a positive impact to the environment. The significance of the impact has been described in terms of the reduction in traffic flows.

  An increase in general traffic flows along a road link has been described as a negative impact to the environment. Reference has been given to TII's Traffic and Transport Assessment Guidelines as an indicator for best practice, to determine the key road links that require further traffic analysis due to the increase in traffic. Operational capacities were extracted from the LAM at the associated junctions of the key road links to identify the impact that the Proposed Scheme will have on the Volume / Capacity ratios. The results are presented in terms of the significance of the impact to the VoC ratio for each junction based on its sensitivity and magnitude of impact.

  The results of the assessment demonstrate that the surrounding road network has the capacity to accommodate the redistributed general traffic as a result of the Proposed Scheme. The majority of assessed junctions that required further traffic analysis have VoC ratios that are broadly similar before and after the Proposed Scheme.

Overall, it has been determined that the impact of the reduction in general traffic flows along the Proposed Scheme will be **Positive, Slight and Long-term** whilst the impact of the redistributed general traffic along the surrounding road network will be **Negligible.**

Table 6.66 presents a summary of the predicted impacts of the Proposed Scheme during the operational phase.

Table 6.66:Summary of Potential Operational Phase Impacts

Assessment of Topic	Description of Change	Potential Impact
Pedestrian Infrastructure	Improvements to the quality of the pedestrian infrastructure along the Proposed Scheme.	Positive, Moderate to Significant and Long-term.
Cycling Infrastructure	Improvements to the quality of the cycling infrastructure along the Proposed Scheme.	Positive, Moderate and Long-term.
Bus Infrastructure	Improvements to the quality of the bus infrastructure along the Proposed Scheme.	Positive, Very Significant to Profound and Long-term.
Parking and Loading	A total loss of 265 parking / loading spaces along the Proposed Scheme.	Negative, Slight to Moderate and Long-term.
People Movement	Increases to the total number of people travelling through the Proposed Scheme.	Positive, Significant and Long-term.
Bus Network Performance Indicators	Improvements to the network performance indicators for bus users along the Proposed Scheme.	Positive, Very Significant and Long-term.
General Traffic Network Performance Indicators	Reduction in general traffic flows along the Proposed Scheme.	Positive, Slight and Long-term.
	Redistributed general traffic along the surrounding road network in the indirect study area as a result of the reduction of reserve capacity along the Proposed Scheme.	Negligible

As outlined within Section 6.4.6 (Operational Phase) and summarised in Table 6.66 above, the Proposed Scheme will deliver strong positive impacts to the quality in terms of People Movement, pedestrian, cycling and bus infrastructure during the operational phase. These improvements will help to provide an attractive alternative to the private car and promote a modal shift to walking, cycling and public transport, allowing for greater capacity along the corridor to facilitate the movement of people.

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. 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, more reliable journey times which the Proposed Scheme provides. This in turn will support the future increase to the capacity of the bus network and services operating along the corridor and thereby further increasing the attractiveness of public transport. In addition to this, the significant segregation and safety improvements to walking and cycling infrastructure that are a key feature of the Proposed Scheme will further maximise the movement of people travelling sustainably along the corridor. All of these changes combined will therefore cater for higher levels of future sustainable population and employment growth.

In the absence of the Proposed Scheme bus services will be operating in a more congested environment, leading to higher journey times and lower reliability for bus journeys. This limits their attractiveness to users which will lead to reduced levels of public transport use, making the bus system less resilient to higher levels of growth and leading to increased levels of car use and congestion. The absence of walking and cycling measures that the Proposed Scheme provides will also significantly limit the potential to grow those modes into the future.

On the whole, the Proposed Scheme will make a significant contribution to the overall aims of BusConnects, the GDA Transport Strategy and allow the city to grow sustainably into the future, which would not be possible in the absence of the Proposed Scheme.

6.5 Mitigation and Monitoring Measures

6.5.1 Construction Phase

Chapter 5 (Construction) has been prepared to demonstrate the likely approach that will be taken to construct the Proposed Scheme, while it also provides an overview of the construction activities necessary to undertake the works, including information on proposed Construction Compounds, construction plant and equipment.

A CEMP has been prepared and is included as Appendix A5.1 in Volume 4 of this EIAR. The CEMP which will be implemented (and developed further as required) by the appointed contractor prior to construction commencing. The CEMP comprises the construction mitigation measures, which are set out in this EIAR, and will be updated with any additional measures which may be required by the conditions attached to An Bord Pleanála's decision. Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum during the Construction Phase. The CEMP has regard to the guidance contained in the TII Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan, and the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015). All of the content provided in this CEMP will be implemented in full by the appointed contractor and its finalisation will not affect the robustness and adequacy of the information presented and relied upon in this EIAR.

A detailed Construction Traffic Management Plan will be prepared and included in the CEMP, and subsequently implemented, by the appointed contractor prior to construction, including Temporary Traffic Management arrangements prepared in accordance with Department of Transport's 'Traffic Signs Manual, Chapter 8 Temporary Traffic Measures and Signs for Roadworks'. The CTMP will be consulted upon with the road authority and will include measures to minimise the impacts associated with the Construction Phase upon the peak periods of the day. It will include imbedded mitigation measures which will assist to alleviate any negative impact as a result of the Construction Phase of the Proposed Scheme. The appointed contractor will also prepare and include in the CEMP a Construction Stage Mobility Management Plan (CSMMP) which will be developed prior to construction, as described in the CEMP, to actively encourage its personnel to travel to site by sustainable means.

No further mitigation measures are therefore required to be considered as part of the Proposed Scheme.

6.5.2 Operational Phase

Given that the Proposed Scheme results in a positive impact for walking, cycling, bus and people movement, mitigation and monitoring measures have not been considered beyond those already incorporated as part of the Proposed Scheme.

The impacts to general traffic and parking / loading, including the mitigation measures incorporated into the Proposed Scheme have been outlined in Chapter 4 (Proposed Project Description) of this EIAR.

No further mitigation measures are required to be considered as part of the Proposed Scheme.

6.6 Residual Impacts

With the implementation of the imbedded mitigation measures which have been included as part of the Proposed Scheme, the residual impacts associated with the assessment topics outlined in Section 6.4 remain the same.

6.7 References

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