Chapter 6

Traffic and Transportation

Contents

6. Traffic & Transportation

6.1. Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) identifies, describes, and presents an assessment of the likely significant effects of the proposed Project on Traffic & Transportation. The chapter describes the characterisation of the existing road and transport network and assesses the likely potential impact of the proposed DART+ South West Project (hereafter as 'the proposed Project') during both the construction and operational phases.

This chapter has been prepared with and should be read in conjunction with the following chapters of the EIAR:

- Chapter 4 Project Description
- Chapter 5 Construction Strategy

6.2. Legislation, Policy and Guidance

The key legislation and guidance referenced in the preparation of the EIAR is outlined in Chapter 1 (Section 1.5, 1.6 and 1.7). Specific to the Traffic & Transportation chapter, the legislation, policy and guidance documents which have informed the assessment are outlined below.

6.2.1. Legislation

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála.

The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I. No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 ('the 2001 Act').

CIÉ, as part of its application, is required under the 2001 Act to submit *inter alia* a draft of the proposed Railway Order and a plan of the proposed railway works. The draft Railway Order provides for various works in relation to roads, including public roads, in consultation with the relevant road authority.

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

Generally, and by way of background, in carrying out an EIA in respect of an application made under section 37 of the 2001 Act, An Bord Pleanála is required, where appropriate, to co-ordinate the assessment with any assessment under the Habitats Directive or the Birds Directive. Ireland has given effect to the Habitats and Birds Directives through Part XAB of the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) as amended.

The following assessment of the likely effects of the proposed project on the existing road and transport network has been undertaken in accordance *inter alia* with the above legislative and regulatory framework.

6.2.2. Policy

The assessment has had due regard to relevant policy that includes the following:

- National Investment Framework for Transport in Ireland (Department of Transport, 2021);
- Transport Strategy for the Greater Dublin Area 2016-2036 (NTA, 2015);
- Draft Greater Dublin Area Transport Strategy 2022 – 2042 (NTA , 2021)[1];
- Draft 2021 GDA Cycle Network Plan (NTA, 2021);
- Project Ireland 2040 (National Planning Framework and National Development Plan 2021 – 2030);
- Dublin City Development Plan 2022-2028;
- Park West-Cherry Orchard Local Area Plan (2019);
- South Dublin County Development Plan 2022 – 2028;
- Adamstown Strategic Development Zone (SDZ) Planning Scheme 2014;
- Clonburris Strategic Development Zone (SDZ) Planning Scheme 2019;
- Kildare County Development Plan 2017-2023 (and draft plan 2023-2029 as available);
- Celbridge Local Area Plan 2017-2023;
- Eastern and Midlands Regional Assembly Regional Spatial and Economic Strategy 2019-2031;
- National Sustainable Mobility Policy (Department of Transport, 2022);
- Permeability Best Practice Guide (NTA, 2015);
- Design Manual for Urban Roads & Streets - Department of Transport, Tourism and Sport and the Department of Environment, Community and Local Government (2013);
- Greater Dublin Area Cycle Network Plan (NTA, 2013); and
- National Cycle Manual (NTA, 2011).

In addition, key planned infrastructure located within the proposed Project's area is included in the future year transport infrastructure, for the modelling process as detailed herein.

[1] At the time of going to print the Transport Strategy for the Greater Dublin Area 2022-2042 was in Draft format. It is anticipated that the Final Strategy will be published in Quarter 1 of 2023.

6.2.3. Guidance

The assessment has had due regard to the relevant guidelines that include the following:

- TII Project Appraisal Guidelines for National Roads;
- Design Manual for Roads and Bridges (TII, 2015);
- Permeability Best Practice Guide (NTA, 2015);
- Traffic and Transport Assessment Guidelines (TII, 2014);
- Design Manual for Urban Roads and Streets (DMURS) (DTTAS, 2013);
- National Cycle Manual (NTA, 2011); and
- Guidelines for the Environmental Assessment of Road Traffic (IEMA, 1993).

6.3. Methodology

6.3.1. Study Area

The study area relates to the areas along the extent of the proposed Project route including train stations and construction compounds and covers the extents likely to be impacted during the construction and operational phases of the proposed Project. The direct and indirect impacts of the proposed Project were considered with reference to the following study area extents:

- Direct Study Area – works areas adjacent to and/or crossing the railway corridor as well as the junctions along proposed bridge closure temporary traffic management diversion routes.
- Indirect Study Area - due to the impact on transport options and mode split a wider study area was included in the assessment.

Beyond the study area boundary, it is predicted that the construction and operational traffic would be fully integrated within the wider road network without any significant delay or effects and is below the thresholds set out in the TII's Traffic and Transport Assessment Guidelines (May 2014). The study area is illustrated in Figure 6-1 below.

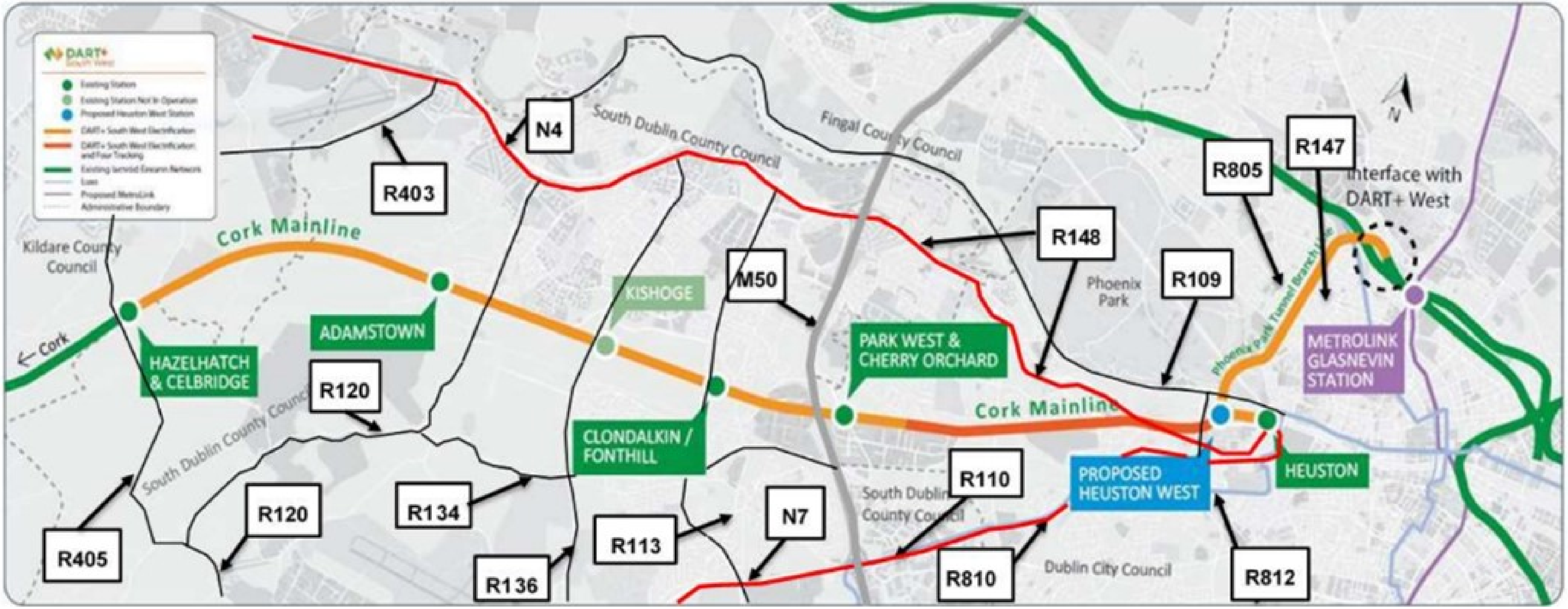

Figure 6-1 Study Area

6.3.2. Survey Methodology

To inform the assessment several sources of data have been referred to. These are described in the following sections.

6.3.2.1 Desk Surveys

The following publicly available data sources have been used to inform the assessment:

- Census 2016 data - (https://www.cso.ie/en/census/);
- Traffic Count Data TII Field Surveys - (https://www.tii.ie/roads-tolling/operations-and-maintenance/traffic-count-data/);
- Transport Data - (https://www.cso.ie/en/releasesandpublications/ep/p-tranom/transportomnibus2020/publictransport/);
- National Rail Census Report - (https://www.nationaltransport.ie/wp-content/uploads/2020/08/NTA_Heavy_Rail_Census_Report_2019.pdf);
- Road Safety Authority's (RSA) online database for road traffic collision (RTC) data;
- Bus Route Data - (Transport for Ireland Journey Planner[2]); and
- Bus Connects Traffic Count Data - Traffic Count Data 2019 - 2020 | BusConnects[3].

6.3.2.2 Mapping Data

The following sources of mapping data have been used to inform the assessment:

- Google Earth;
- Google Maps;
- OpenStreet Map; and
- Ordnance Survey Ireland (OSI) Mapping.

6.3.2.3 Road Traffic Surveys

While the DART+ South West Project is a transportation project, the proposed works on the road network within the immediate study area are very limited, with the primary focus of the assessment on contributary construction traffic volumes to the existing road network during construction works; in addition to the impact of temporary road closures or temporary junction modifications associated with the bridge reconstructions. During the operational phase, the more significant impact being increased capacity and ridership on rail services and an anticipated reduction in road traffic within the M50 cordon. To inform the assessment, several sources of data collection are referred to. These are described in the following sections.

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[2] Available at https://journeyplanner.transportforireland.ie/nta/XSLT_TRIP_REQUEST2?language=en

[3] Available at https://busconnects.ie/initiatives/core-bus-corridors/background-information/traffic-count-data-2019-2020/

6.3.2.3.1. Road Traffic Counts

The impact on road traffic during the construction phase arises primarily as a result of the proposed temporary bridge closures and proposed diversion routes in Zone B (Park West & Cherry Orchard Station to Heuston Station – further detail is provided in Chapter 4 Project Description and Chapter 5 Construction Strategy). As such, the scope of the traffic count data collection for the proposed Project was only undertaken at junctions along the diversion routes.

Traffic counts were supplemented with recent traffic survey data from counts that were undertaken for the proposed BusConnects schemes that interface with the roads crossing the railway. The BusConnects scheme counts that were used are as follows:

- Route 6: Lucan to City Centre (Tuesday 11th February 2020);
- Route 7: Liffey Valley to City Centre (Thursday 28th November 2019); and
- Route 8: Clondalkin to Drimnagh (Thursday 28th November 2019).

Traffic counts were undertaken at the locations shown in Figure 6-2 below and are concentrated in areas proximate to the proposed bridge reconstructions/road works of the proposed DART+ South West Project.

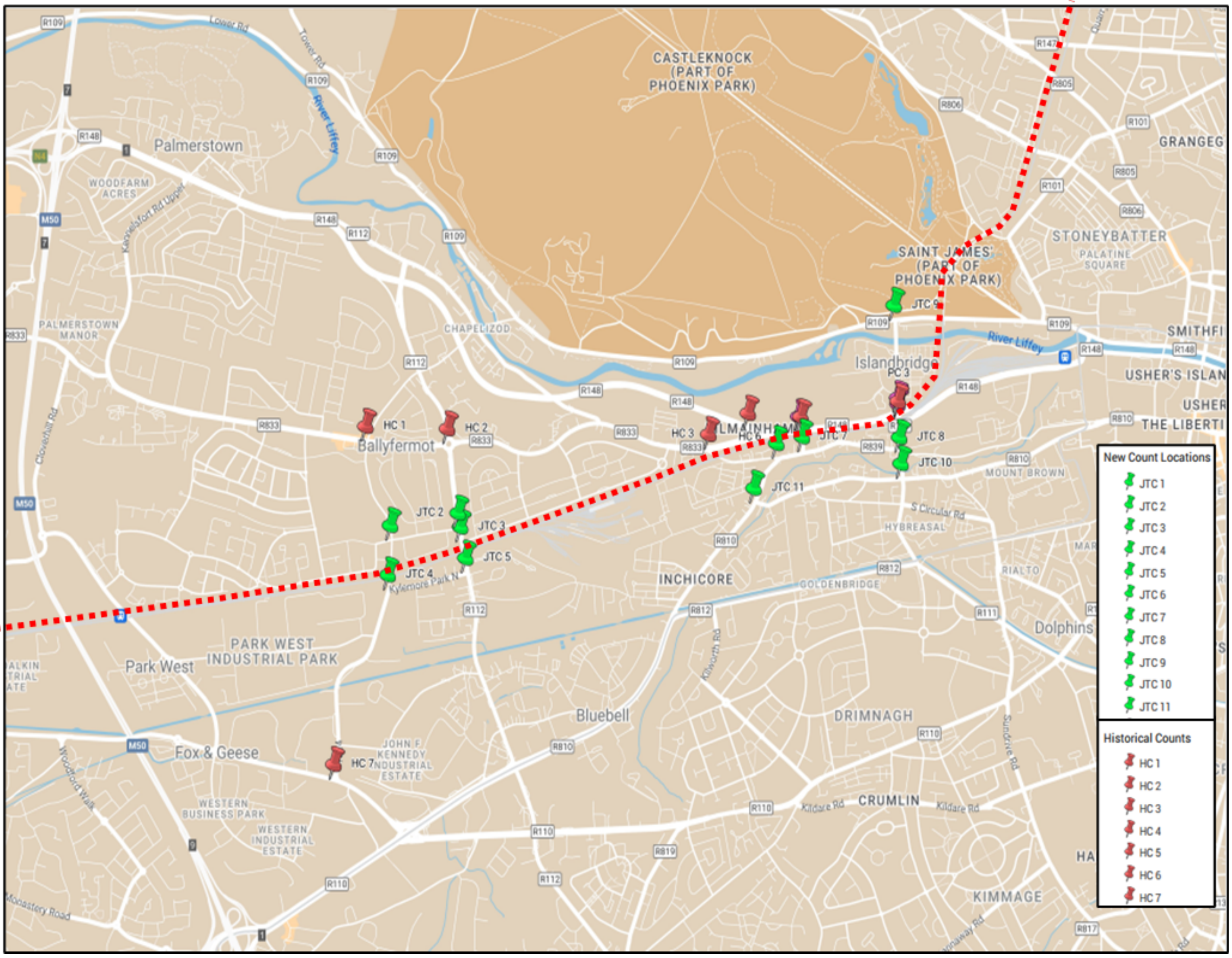


Figure 6-2 Location of Traffic Counts within the Four-Tracking Section of the Project

The dates and locations at which the traffic counts took place are presented in Table 6.1. Those referred to as historical are from BusConnects data received and those in 2021 were procured specifically for the assessment of diversion routes associated with bridge reconstructions on public roads.

Table 6.1: Dates and Locations of Traffic Counts

Count ID	Location	Type	Count Date
HC 1	Le Fanu & Ballyfermot Rd	Historical Junction Turning Count	28th November 2019
HC 2	Kylemore Avenue & Ballyfermot Rd	Historical Junction Turning Count	28th November 2019
HC 3	Sarsfield Rd & Con Colbert Rd	Historical Junction Turning Count	28th November 2019
HC 4	Memorial Road & Con Colbert Rd	Historical Junction Turning Count	11th February 2020
HC 5	South Circular Rd & Con Colbert Rd	Historical Junction Turning Count	11th February 2020
HC 6	Ballyfermot Rd & Con Colbert Rd	Historical Junction Turning Count	11th February 2020
JTC 1	Kylemore Ave, Le Fanu & Raheen Park Rd	New Junction Turning Count	6th May 2021
JTC 2	Kylemore Ave & Kylemore Rd	New Junction Turning Count	6th May 2021
JTC 3	Landon Rd & Kylemore Rd	New Junction Turning Count	6th May 2021
JTC 4	Kylemore Park N & Le Fanu Rd	New Junction Turning Count	6th May 2021
JTC 5	Kylemore Park N & Kylemore Rd	New Junction Turning Count	6th May 2021
JTC 6	Sarsfield Rd & Inchicore Rd (R839)	New Junction Turning Count	6th May 2021
JTC 7	Memorial Road & Inchicore Rd (R839)	New Junction Turning Count	6th May 2021
JTC 8	South Circular Rd & Inchicore Rd (R839)	New Junction Turning Count	6th May 2021
JTC 9	Conyngham Rd & South Circular Rd	New Junction Turning Count	6th May 2021
JTC 10	SCR, Old Kilmainham & Emmet Rd	New Junction Turning Count	6th May 2021
JTC 11	Tyrconnell Rd & Emmet Rd	New Junction Turning Count	6th May 2021

The baseline peak period count data used in the assessment are discussed in further detail in Section 6.4.1.1 with the summary of relevant traffic count data provided specifically in Table 6.16.

Signalised junctions, phasing and signal timing information was received from Dublin City Council (DCC) between February 2021 and June 2021. This information was used to validate the accuracy of isolated junction models.

6.3.2.3.2. Pedal Cycle Counts

Pedal cyclists were counted as part of the junction turning counts referenced above (Section 0) while additional pedestrian counts were conducted at the South Circular Road Interchange, phased temporary modifications at the following three junctions:

- Con Colbert Road/Chapelizod Bypass (R148) & Memorial Road;
- Con Colbert Road/Chapelizod Bypass (R148) & South Circular Road (R111) - north; and
- Con Colbert Road/Chapelizod Bypass (R148) & South Circular Road (R111) - south.

Details relating to the pedestrian count locations and results are set out in Section 6.4.1.3.

6.3.2.4 Road Accident Data

To inform the road safety review within the impact assessment and the mitigation identified for the proposed Project, reference is made to the Road Safety Authority's (RSA) online database. This identifies the number of accidents which have occurred along a link or at a junction in a particular year.

As outlined previously in Chapter 4 Project Description and Chapter 5 Construction Strategy, where bridge reconstructions are necessary as part of the Project, associated roadworks will be necessary. The proposed road works are typically confined to the new bridge replacement/upgrades and approaches to these. As such the scope of the data collection has been limited to the locations where bridge reconstructions and associated road works are located due to the risk within these area during the construction stage.

6.3.2.5 Train Service Data

The existing rail services and the proposed DART+ Programme network were reviewed to develop the following:

- Baseline Train Service Specification (TSS) and service frequencies within peak period; and
- Design Train Service Specification.

Demand Modelling study was carried out using the National Transport Authority's East Regional Model (ERM) for 2028 and 2043 future years.

6.3.3. Assessment Methodology

The methodology used when assessing the potential magnitude of impacts of the proposed Project on Vehicle Travellers, Non-Motorised Users (NMU) and Public Transport Users is based on the IEMA guidance in combination with that set out in guidance provided within the DMRB and by the Environmental Protection Agency (EPA).

6.3.3.1 Assessment of Impact on Vehicles, Pedestrians, Cyclists and Safety

6.3.3.1.1. Construction Phase

As there are no significant changes to the road network as part of the scope of the proposed Project, the assessment is primarily focused on contributary construction traffic volumes to the existing road network during construction works; in addition to the impact of temporary road closures or temporary junction modifications associated with the bridge reconstructions. The project construction duration is expected to last approximately 50 months.

The methodology for assessing the construction traffic impacts is based on the following:

- Works packages as per the proposed Construction Strategy for the Project identified for their potential impact on transport.
- Assessment of the 'peak' construction periods for a particular section of track and work package with the initial mitigation measures required to alleviate and reduce the associated traffic impact.
- Using available traffic survey data supported by the information extracted from various traffic models, where survey information is not available to carry out the following:
    - Road Junction Traffic Modelling along proposed diversion routes using the parameters as outlined in Section 6.3.5.1, and an assessment opening year as presumed in the NTA's East Regional Model (ERM) of 2028, including both background traffic and construction specific traffic. (including for closure of the bridges, construction compounds, prohibition of movements i.e. junction modifications, as well as other restrictions where they might impact flows).
- Determination of the Compound and Site and Track Access Point requirements.
- Determination of Construction Traffic Volumes anticipated to contribute additional flow to the external haul routes leading to and from construction Access Points.
    - This includes determination of the construction phases which generate the greatest cumulative contributary volumes.
- Review Public transport infrastructure and service routes for the interface potential with the above identified works.
- Review the pedestrian and cyclist numbers and routing within affected areas.

Finally, the above data has then been collated and evaluated in accordance with the criteria outlined in Section 6.3.6 to provide a summary significance of effect of the Project works identified as requiring review.

6.3.3.1.2. Operational Phase

The operational assessment will determine the impact in terms of safety for the opening year 2028 as presumed in the ERM and the design year 2043. This will be based on:

- Mode share from the modelling;
- Changes to the road network;
- Public transport infrastructure and service details;
- Pedestrian and cyclists' numbers and infrastructure including new pedestrian / cycle infrastructure on bridges and parking; and
- Access and servicing requirements.

6.3.3.2 Assessment Scenarios

In line with the guidance, the assessment will describe the baseline conditions, determine the likely potential impacts associated with the construction and operation of the proposed Project, determine appropriate mitigation and monitoring, and define residual effects. The key aspects of the proposed methodology are summarised below.

6.3.3.2.1. Road Closure Diversion Scenarios

The property, road and topological constraints (in the heavily urbanised four-tracking section of the Project) limits the solutions to facilitate the project objectives of providing additional tracks and electrification.

The diversion impact assessment relates primarily to Public Road diversion scenarios associated with:

1. The temporary closure of the Le Fanu Road Bridge (OBC7) for its reconstruction;
2. The temporary closure of the Kylemore Road Bridge (OBC5A) for its reconstruction;
3. The temporary closure of the Memorial Road Bridge (OBC3) for its reconstruction; and
4. The temporary modification to the R111 (South Circular Road) / R148 (Con Colbert Road) interchange in order to construct the proposed new cut and cover portal structure (OBC1A).

The locations of proposed temporary bridge and public road closures along the four-tracking section of the Project are outlined in Figure 6-3.

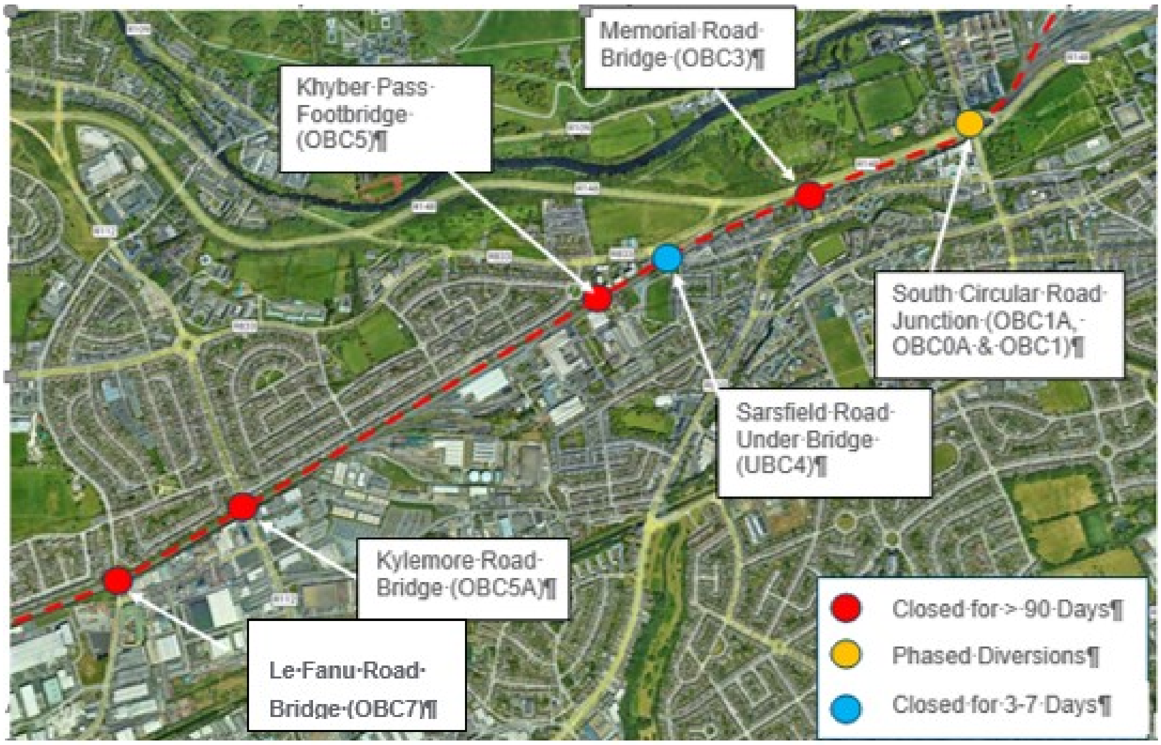


Figure 6-3 Long Duration Temporary Bridge Closures on Public Roads

In order to provide a robust assessment within model scenarios, 100% of the traffic which currently utilises a specific bridge, is redistributed onto the surrounding network. Although it is understood that larger scale diversions are expected to occur, this assessment approach ensures a conservative analysis.

The sensitivity analysis is an alternative scenario, considered to be more realistic, where the diverted volumes are reduced by 20% in order to account for general network re-routing outside of the study area (traffic count area).

Dependencies exist between the start and finish of certain bridges in the programme of works. However, where no dependencies exist it is assumed that works packages can and will commence at the same time (while this is unlikely, the potential exists); this assumption provides a conservative approach to the assessment.

All details of modelling scenarios for bridge closure or junction modification diversions (including redistribution context) are shown in Section 6.5 and in Volume 4, Appendix 6.1 to Appendix 6.4.

The following assessment scenarios were applied to the public road closures lasting longer than 7 days, for both AM and PM peak hour volumes:

- Existing Traffic (Baseline/Do Nothing - 2022);
- Le Fanu Road Bridge (OBC7) Closure (Do Minimum - 2028) Assumes 100% diversion to Kylemore;
- Le Fanu Road Bridge (OBC7) Closure Sensitivity Analysis (2028) Assumes 80% diversion to Kylemore;
- Kylemore Road Bridge (OBC5A) Closure (Do Minimum - 2028) Assumes 100% diversion to Le Fanu;
- Kylemore Road Bridge (OBC5A) Closure Sensitivity Analysis (2028) Assumes 80% diversion to Le Fanu;
- Memorial Road Bridge (OBC3) Closure (Do Minimum - 2028) Assumes 100% diversion toward South Circular Road; and
- Memorial Road Bridge (OBC3) Closure Sensitivity Analysis (2028) Assumes 80% diversion toward South Circular Road.

6.3.3.2.2. Junction Modification Diversion Scenarios

The following scenarios were modelled for South Circular Road interchange modifications required to facilitate the construction of the cut and cover portal structure OBC1A:

- Do Something Scenario (Phase 1) – represents the impact on road network due to construction of first phase of the cut and cover portal; and
- Do Something Scenario (Phase 2) – represents the impact on road network due to construction of second phase of the cut and cover portal.

6.3.3.2.3. Construction Traffic Volume Scenario

The most voluminous traffic generating works packages, using each of the public road access points (as listed in Table 6.27 in Section 6.5.2) is considered to take place over the course of an entire year. This is a highly conservative assessment scenario as most works items of said nature are estimated to last between 2-8 months; with other access points serving short duration works that potentially only last 3 weeks.

6.3.4. Models / Tools Used in Assessment

This section summaries the various transport modelling tools that have been developed and used to inform this assessment and chapter of the EIAR. The purpose of each tool has been detailed and its use related to the construction and/or operational phase of the proposed Project is outlined in the sections below.

6.3.4.1 Assessment of Construction Diversions Scenarios

Isolated junction modelling was used for the assessment of traffic diversions as a result of temporary bridge closures. The junctions were analysed individually using various transport modelling software as listed in Table 6.2 below and depending on the junction type being assessed.

Table 6.2: Junction Modelling Software Utilised

Modelling Software	Junction Type	Junctions Modelled
JCT Linsig	Traffic Signals	JTC1, JTC3, JTC6, JTC, JTC8, JTC10, JTC11 and HC1
TRL Junctions 9	Priority and Roundabout	JTC2, JTC4, JTC5, & HC2
PTV VISSIM	Any	R111 & R148 Junction

6.3.4.2 Assessment of Operational Impacts

Transport modelling has been used to determine the baseline and future operational scenarios for the proposed Project and therefore allowing an assessment of its impact to be undertaken.

6.3.4.2.1. East Regional Model

The NTA's ERM has been used to carry out the demand modelling associated with the DART+ Programme. The ERM is one of five transport demand models in the NTA's Regional Modelling System and focuses on the Greater Dublin Area (GDA). The ERM can be used as a tool to assess the impact of interventions on peoples travel choices in relation to time of travel, mode of travel and route of travel.

The ERM includes all surface access modes for personal travel and goods vehicles, including private vehicles (taxis and cars), public transport (bus, rail, Luas, BRT, Metro), active modes (walking and cycling) and goods vehicles (light goods vehicles and heavy goods vehicles). The NTA ERM is a multi-modal tour model and consists of four input elements:

- Public Transport (PT) Model (e.g. rail/bus/light rail services and separate Park & Ride [P&R] module);
- Walking and Cycling Model;
- Highway Model (e.g. road links/junctions and parking model); and
- Demand Model - GDA total transport demand is taken from the National Demand Forecasting Model (NDFM) which outputs travel demand to the ERM for iteration through the choice, destination, and assignment modules.

The geographical extent of the ERM is shown in Figure 6-4.

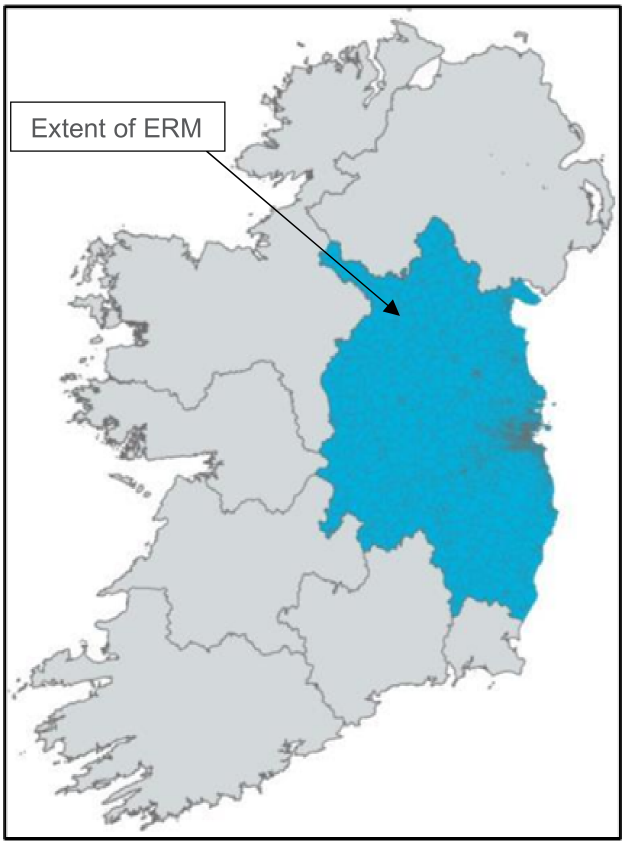


Figure 6-4 Extent of East Regional Model

The NTA have developed several ERM reference case forecasts (years 2028 and 2043 were used on DART+ South West), which are in line with the projections contained in the National Planning Framework (NPF). These projections take account of employment, population, and education projections at Small Area level. The projections are developed using the National Demand Forecast Model (NDFM) which outputs travel demand to the ERM for iteration through the choice and assignment modules. The demand in the NDFM is based on Central Statistics Office *Place of Work,* School or College – Census of Anonymised Records (CSO POWSCAR 2011), NTA Household Travel Surveys, Transport Surveys, and other transport related datasets. During the model run, mode choice is undertaken based on current costs for each mode for each origin and destination pair.

The ERM modelling has been undertaken as part of DART+ Programme and was carried out by AECOM. Iarnród Éireann provided this ERM model output data to the DART+ South West Project Team in May 2021 and the modelling has informed this assessment.

The modelling years used in the analysis are outlined below:

- Opening Year 2028;
- Future Design Year (Opening + 15 years) 2043

Determination of forecast year operational traffic conditions has been undertaken using future year ERM traffic models for:

- Standard EIAR – Do Minimum: Modelled scenario for the business case with only funded and committed schemes included in the Do Minimum.

- Standard EIAR – Do Something Includes the same network as the Standard EIAR Do Minimum with DART+ Programme added.
- Dynamic EIAR – Do Minimum: Scenario will be based on inclusion of all projects contained in the Transport Strategy for the Greater Dublin Area (excluding DART+ Programme) such as the MetroLink and BusConnects schemes.
- Dynamic EIAR – Do Something: Scenarios will be based on inclusion of all projects contained in the Transport Strategy for the Greater Dublin Area with DART+ Programme added.

Assessment of the traffic impact is for an operational year of opening being 2028 and a +15-horizon operational year, which is 2043 in the ERM. The Future years 2028 and 2043 include several schemes that are planned as part of the *GDA Transport Strategy 2016 - 2036*.

Data has been extracted from this model pertaining to the entire ERM model area and also a 5km corridor along the proposed Project and is presented in Section 6.5.8.

6.3.5. Key Assessment Parameters

6.3.5.1 Modelling Parameters for Construction Assessment

The key parameters used in the assessment of the projects construction impact on traffic are outlined below.

6.3.5.1.1. Calibration of the Microsimulation Model for New Cut and Cover Portal Phasing

The new cut and cover portal structure proposed under South Circular Road Junction (for the new electrified tracks) will be constructed in two phases. This will facilitate utility diversion requirements and also ensure similar volumes of traffic flow through any proposed diversions as currently exist. The existing junction is already congested in the peak period. In both phases, the vehicles travelling along R111 southbound will be diverted in the loop along the circular link. A two-stage crossing will be developed along R148 east near R111 link. The microsimulation model was calibrated in accordance with the guidelines provided in the TII document (PE-PAG-02015) for the base year scenario for both AM and PM peak hours. For the purposes of modelling, the peak hours used were 8h00 – 9h00 and 17h00 – 18h00.

The model was then validated using the Geoffrey E. Havers (GEH) statistic for junction turning movements.

$$\mathrm{GEH} = \sqrt{\frac{(\mathrm{M}-\mathrm{C})^2}{0.5\ \times (\mathrm{M}+\mathrm{C})}}$$

The GEH static criteria is a form of chi-square statistic test which compares the modelled and observed traffic volume counts and is defined as:

Where M is the modelled traffic volume counts and C is the observed traffic volumes. The TII guidelines state that the GEH value should be less than 5 for more than 85% of all cases. For the calibration of junctions, the turning volume for each movement of the all the key junctions in the model are to be compared with the Junction Turning Count (JTC) results for both AM and PM peaks.

A DART+ Programme ERM model opening year of 2028 was considered for this assessment; which is considered to adequately reflect the impacted works period estimated to mainly occur in 2027.

The model was run 5no. times using varying random speeds for both base model calibration and other scenarios. This allows for the modelling of typical day to day variations in traffic flows and traffic patterns and more accurately models the real-world variable situation on site. The results were then collected for the average of all 5no. runs.

6.3.5.1.2. Baseline Traffic Growth for the Traffic Modelling

Due to the COVID-19 pandemic and associated restrictions there has been an accelerated transition to remote and home working and education. In response to this the National Transport Authority (NTA) have produced a report titled *Alternative Future Scenario for Travel Demand* to research the potential impact on travel behaviour and patterns post Covid-19. Based on this report, an alternative scenario is predicted for the future in which a significant reduction in the total number of trips on the transport network (approximately 8% lower than previous projections) could be expected. This is shown by the orange line in Figure 6-5 below.

Furthermore, in January 2021, the *National Remote Work Strategy* was published by the Department of Enterprise, Trade and Employment. This document lays out the long-term strategy to promote home and remote working for public sector and private sector employees. The strategy mandates that 20% of the public sector workforce move to home and remote working in 2021. The strategy notes that more than 25% of the private sector workers in Ireland are capable of working remotely.

Based on the above documents, it is considered that the application of an 8% reduction in background traffic volumes due to the transition of the work force, to remote and home working is both a reasonable and conservative assumption of future travel demand projections and thus this has been applied in forecasting travel projections for the traffic model and assessment.

The baseline traffic has then been grown in accordance with the growth of the number of trips per day as per the NTA NDFM; which is shown in Figure 6-5 below and as discussed in the following sections.

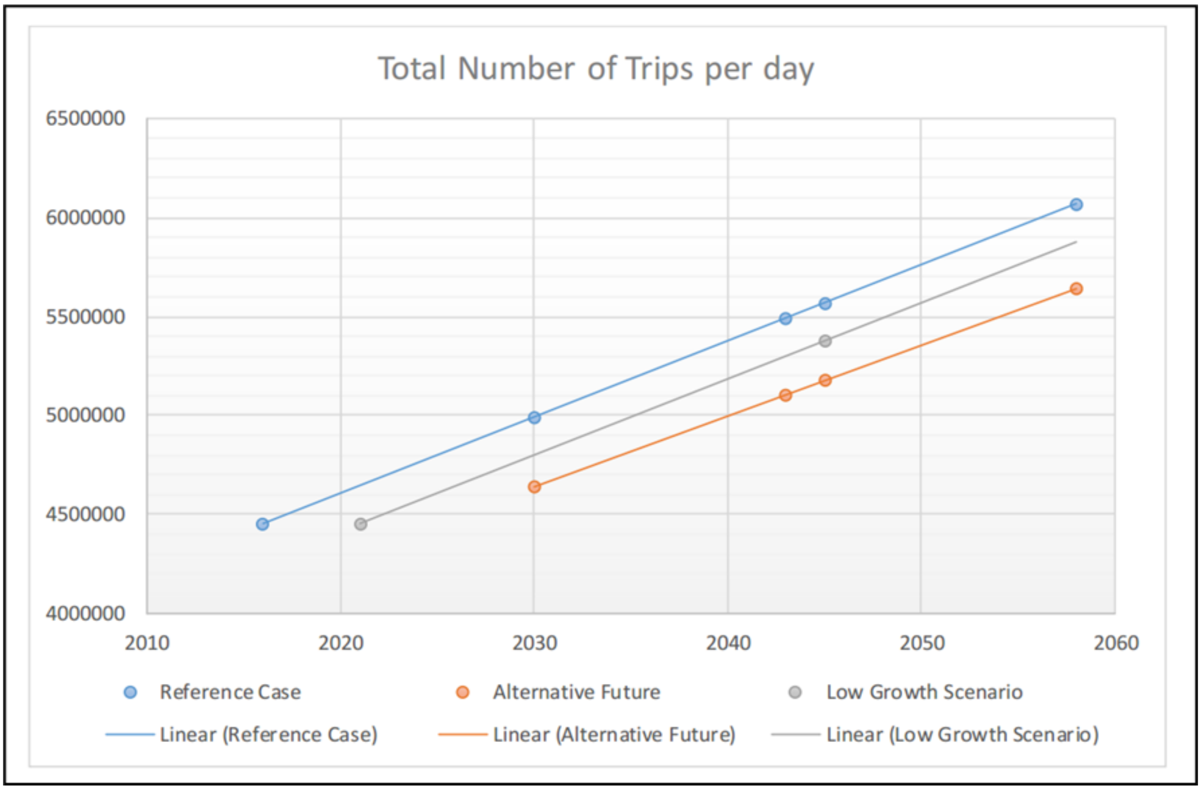


Figure 6-5 Growth in Number of Trips Per Day (NTA National Forecasting Model)

Based on the above; the growth in number of trips per day for the Reference Case (Blue line) is summarised in Table 6.3 below.

Table 6.3: Growth in Number of Trips Per Day (NTA National Forecasting Model)

Year	Person Trip	Growth Rate over 10 years
2020	4,600,000	
2030	5,000,000	0.087
2040	5,400,000	0.080
2050	5,800,000	0.074
Average growth over 10 years		**0.080**
Average growth per year		**0.008**
Growth Factor		**1.008**

Therefore, for the analysis of car and LV classifications, trips were increased by the NTA growth factor. The resultant traffic represents the travel demand in the post-COVID scenario along the construction diversion routes.

Consequently, the number of daily trips is expected to increase by a factor of 1.008 per year. The trips per day consist of all modes of transport including LV's and HGV's. It has been assumed that the overall growth factor applies to LV's and HGV's and all vehicles have been grown by a factor of 1.008 to determine the future year traffic volumes.

6.3.5.2 Modelling Parameters for Operational Assessment

Operational modelling has utilised the NTA's ERM. The traffic growth projections of the ERM changes have not been modified.

6.3.6. Assessment Criteria and Significance

The following section outlines the criteria used for the evaluation of Impact and significance.

6.3.6.1 Categorisation of Effects

Potential effects were considered during the construction and operational phases of the proposed Project. Effects during the construction phase are typically considered as either temporary or short-term, while potential effects during the operational phase are typically considered as either medium-term or long-term.

6.3.6.1.1. Impact

The impact of the effect, which occurs in the construction and / or operational phase will either be positive or negative. A positive impact will be where an improvement to the existing scenario is identified, whereas a negative will be, but not limited to, a reduction in facilities, operation or provision of services.

- Positive – provides beneficial improvement on the existing condition.
- Negative – reduces the level of service currently provided.

6.3.6.1.2. Significance

The significance of the effect is determined by the extent of impact, the magnitude and complexity of the impact, the probability of the impact and its duration, frequency, and reversibility. The rating identified for all road users is broadly categorised into Slight, Moderate or Significant. These are further defined as:

- Slight – capable of being 'designed out' during detailed design and construction. Traffic management measures and the provision of temporary infrastructure would remedy any slight impacts associated with construction given their likely short timescales in comparison to operation.
- Moderate - limited impact (by extent, duration, or magnitude) should be recorded in an assessment but are not considered significant; and
- Significant - considerable impact (by extent, duration, or magnitude), potentially of more than local significance.

The following are generally considered for evaluation of impact and effect of construction:

- The guidance set out within DMRB states the significance of vehicular traffic impact is determined by changes in traffic flows; for both the impact of the construction works as well as the construction vehicle traffic.
- In addition to traffic flows, the impacts on traffic are also measured in the terms of the effect on driver delay or travel speed and queuing.

- There will also be impacts to pedestrians and cyclists using the network and therefore affected by the proposed Project during both construction and operation.
- Severance is defined in the IEMA guidelines as "*perceived division that can occur within a community when it becomes separated by a major traffic artery*". The Guidelines note that the term is used to describe a complex series of factors that separate people from places and other people. Severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to quite minor traffic flows if they impede pedestrian access to essential facilities. The significance of severance is determined by the number of people impacted by the proposed Project and the presence of vulnerable groups such as children, the elderly or the disabled.

6.3.6.2 Impact Assessment Criteria – Zones

The proposed Project has been divided into four distinct geographic zones along the length of the corridor (Zones A to D) as outlined in Chapter 4 Project Description and summarised below. The proposed Project is described from west to east along the railway corridor.

- Zone A - Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station (refer to Section 4.6);
- Zone B - Park West & Cherry Orchard Station to Heuston Station (incorporating Inchicore Works) (refer to Section 4.7);
- Zone C – Heuston Yard & Station (incorporating New Heuston West Station) (refer to Section 4.8);
- Zone D - Liffey Bridge to Glasnevin Junction (Phoenix Park Tunnel Branch Line) (refer to Section 4.9).

The assessment criteria within this section are not evaluated equally across the project extents, owing to the distinct variations in the type, complexity and site constraints of the works across the various project geographic areas which cover Rural, and Peri-Urban to Urban in nature (Refer to Section 6.4 for the description of the relevant project geographic areas).

Below is a description of the evaluation criteria applied with reference to the specific geographic areas (zones) in order to assess the relevant impact and its significance of effect (as described in Section 6.5).

6.3.6.2.1. Zone A – Rural and Peri-Urban (Construction Vehicle Traffic)

Zone A includes mainly minor works or low construction traffic volume generating works. These works have haul routes identified which are Type 3 and/or Type 2 rural or peri-urban roads, which while generally having substantially lower Annual Average Daily Traffic (AADT) with respect to their design capacity. Putting Zone A in context; no comparative existing count data was sourced for these minor works (not typically part of an EIAR); and as such the following criteria were adopted as outlined in Table 6.4 .

Table 6.4: Significance Criteria for Contributary Construction Vehicle Traffic (AADT) for Zone A (Type 3 and/or Type 2 Rural or Peri-urban Roads)

Contributary AADT	Significance of Effect	Description
Less than 50	Slight	Where construction vehicle traffic (AADT) is estimated to be less than 50 then the increase in daily traffic will be categorised as having a Slight effect
50 -100	Moderate	Where construction vehicle traffic (AADT) is estimated to be between 50 and 100 then the increase in daily traffic will be categorised as having a Moderate effect
Greater than 100	Significant	Where construction vehicle traffic (AADT) exceeds 2% of the design capacity of the road (or greater than 100), then it will be categorised as having a Significant effect.

6.3.6.2.2. Zone B and D – Dense Urban (Construction Vehicle Traffic)

The criteria for assessment where the Project construction vehicle traffic increases the AADT will be as in Table 6.5. However, if the adjoining roads are normally congested then the 10% threshold referenced below is reduced to 5% to be considered as a Significant effect. In the case of access points adjoining onto diversion routes in Zone B & D, they will all be considered as congested and therefore a 5% threshold will apply in determining the significance of effect categorization.

Table 6.5: Significance Criteria for Contributary Construction Vehicle Traffic (AADT) for Zone B and D (Dense Urban Roads)

Contributary AADT	Significance of Effect	Description
Less than 10%	Slight	Where construction vehicle traffic (AADT) is estimated to be less than 10% of the traffic flow on the adjoining road; then it will be categorised as having a Slight effect
5 – 10%	Moderate	Where construction vehicle traffic (AADT) is estimated to be between 5 and 10% of the traffic flow on the adjoining road; then it will be categorised as having a Moderate effect
Greater than 10%	Significant	Where construction vehicle traffic (AADT) exceeds 10% of the traffic flow on the adjoining road; then it will be categorised as having a Significant effect (10% is used if not normally a congested road).

6.3.6.3 Impact Assessment Criteria - Temporary Diversions for Bridge Construction

6.3.6.3.1. Traffic Flow (AADT) Criteria

The criteria for classifying the impact of increases in traffic flows is as follows in Table 6.6.

Table 6.6: Significance Criteria for the Impact of Traffic Flow Increases

Traffic Flow Increase	Significance of Effect	Description
<10%	Slight	Traffic flow increases of <10%, directly attributable to the proposed Project are not considered likely to give rise to any potential significant effects; and as such the significance of effect categorisation will likely be Slight.
10% - 30%	Moderate	Traffic flow increases of 10% to 30% are only considered to give rise to significant effects in specifically sensitive areas (hospitals/schools etc); and as such the significance of effect categorisation will generally be Moderate.
>30%	Significant	Whereas traffic flow increases >30%, that are deemed attributable to the proposed Project are considered likely to give rise to potentially Significant effects

6.3.6.3.2. Diversion Route Length Criteria

Where diversion journey lengths are greater than 500m (particularly in an urban context) this is likely to result in journey time increases, as well as include additional junctions (controlled and uncontrolled) that will result in predicted decreases in traffic speed. A length of diversion of 500m or more is generally considered to be a Significant diversion.

6.3.6.3.3. Signalised Junctions Criteria

- **Level of Service (LoS) and Average Delay:** The average delay is that for each passenger car unit (pcu) on the lane averaged over the modelled time period. The concept of Level of service is a qualitative measure describing operational conditions; for signalised junction it is a categorization based on delay and the driver's perception in terms of travel times. Below in Table 6.7 is the comparison between a Level of Service/delay criteria and a significance of effect categorisation.

Table 6.7: Delay and Level of Servcie Categorisations Criteria for Junctions

LoS	Signalized Intersection	Unsignalized Intersection	Significance of Effect	Clarification
A	≤10 sec	≤10 sec	Slight	Low delay and good progression
B	10–20 sec	10–15 sec	Slight	Generally good progression
C	20–35 sec	15–25 sec	Moderate	Fair Progression
D	35–55 sec	25–35 sec	Moderate	Congestion becoming noticeable
E	55–80 sec	35–50 sec	Significant	Poor Progression
F	>80 sec	>50 sec	Significant	Oversaturated

- The **Degree of Saturation (DoS):** is the ratio of demand to capacity on each approach link and to a junction. **Degree** of (**Junction**) **Saturation** (DoS) is another **means** of describing the capacity of each approach road (also referred to as a "link") to a **junction.**

- A degree of saturation below 90% represents a junction that is operating in an **efficient and stable condition**. The associated categorisation of effect would be Slight.
- A degree of saturation of between 90% and 100% **may** indicate the junction is operating to an **adequate standard**, depending on the acceptability of queuing and delay. The associated categorisation of effect would be Moderate.
- A degree of saturation of above 100% is considered to be **over-capacity**. The associated categorisation of effect would be Significant.

- **Mean Maximum Queue:** The sum of the maximum queue on a link (including uniform, random and oversaturation queues) averaged over all the cycles in the modelled time period.
- **Practical Reserve Capacity (PRC):** A measure of how much additional traffic could pass through a signalised junction whilst maintaining a maximum degree of saturation of 90% on all links/lanes. It is a measure of spare capacity represented as a percentage (the equivalent measure for priority junctions and roundabouts is "Ratio of Flow to Capacity" or RFC; noted below).
  - A PCR >5% represents a junction which is operating in an **efficient and stable** condition. The associated categorisation of effect would be Slight**.**
  - A PCR >5% between 0 and 5% represents variable operation and may be said to be **operating adequately** if the queueing and delay are deemed acceptable. The associated categorisation of effect would be Moderate.
  - A negative PCR value presents an **oversaturated** condition. The associated categorisation of effect would be Significant.

6.3.6.3.4. Priority Junctions Criteria

- **Ratio of Flow to Capacity (RFC):** also referred to as Volume over Capacity (V/C) is a means to describe the capacity of each approach road to a priority junction. Priority junctions are the most common form of junction control, with the traffic on the minor road giving way to the traffic on the major road. RFC is a ratio of demand flow to capacity and the practical capacity threshold is normally approximately 0.85.
  - An RFC <0.85 represents a junction which is operating in an **efficient and stable** condition. The associated categorisation of effect would be Slight.
  - An RFC of between 0.85 and 1 represents variable operation and may be said to be **operating adequately** if the queueing and delay are deemed acceptable. The associated categorisation of effect would be Moderate.
  - An RFC >1 represents an **oversaturated** condition. The associated categorisation of effect would be Significant.
- **Queue Length**: This represents the maximum of the average queue lengths, in passenger car units (pcu) per time segment.

- **Average Delay**: This shows the average amount of traffic delay at the junction per vehicle over the peak hour period.

6.3.6.3.5. Additional South Circular Road Interchange Assessment Criteria (using PTV Vissim – Traffic Simulation Software)

- **Overall Network Performance:** Results are collected for the entire network in VISSIM to assess the impact of the proposed infrastructure on the overall network. Results include:
  - net average vehicle delay;
  - net total delay;
  - average speed; and
  - latent demand for the overall network.

6.3.6.3.6. Pedestrians and Pedal Cyclists Operation Criteria

The criteria and significance of effect categorisation for pedestrians and cyclists in the operational phase is as per Table 6.8.

Table 6.8: Significance Criteria for Pedestrians and Cyclists

Change in Cyclist/Pedestrian Numbers	Significance of Effect
0-2%	Negligible
2-5%	Slight
6-10%	Moderate
10%+	Significant

Cyclist / Pedestrian Safety: Slight / Moderate / Significant is assessed in terms of the change in cycling infrastructure.

6.3.6.3.7. Public Transport Operation Criteria

The criteria for classifying the impact of changes in public transport in the operational phase is as per Table 6.9. The below criteria has been used for change in passenger numbers, travel time and travel distance.

Table 6.9: Significance Criteria for Changes in Public Transport Operation

Change in Passenger Numbers/ Travel Time/ Travel Distance	Significance of Effect
0-2%	Negligible
2-5%	Slight

Change in Passenger Numbers/ Travel Time/ Travel Distance	Significance of Effect
6-10%	Moderate
10%+	Significant

6.3.6.3.8. Vehicular Traffic Operation Criteria

The criteria for classifying the impact of changes in traffic flow in the operational phase is outlined below in Table 6.10. The below criteria have been used for change in travel time, distance travelled and car share mode.

Table 6.10: Significance Criteria for Changes in Vehicular Traffic Flow.

Change in Travel Time	Significance of Effect
0-2%	Negligible
2-5%	Slight
6-10%	Moderate
10%+	Significant

The below criteria in Table 6.11 has been used for change in distance travelled and car share mode.

Table 6.11: Significance Criteria for Changes in Vehicular Traffic (distance travelled/ car share mode)

Change in Distance Travelled/ Car Mode Share	Significance of Effect
0-2%	Slight
2-5%	Moderate
6%+	Significant

The below criteria in Table 6.12 has been used for change in average speed.

Table 6.12: Significance Criteria for Changes in Vehicular Traffic (distance travelled/ car share mode)

Change in Average Speed	Significance of Effect
0-2kph	Negligible
2-5kph	Slight

Change in Average Speed	Significance of Effect
5-10kph	Moderate
Greater than 10kph	Significant

6.3.7. Consultation

The overall project stakeholder and public consultation undertaken in respect of the Project is set out in the Public Consultation No. 1 Findings Report (for PC1) and Public Consultation No. 2 Findings Report (for PC2) which are included in Volume 4, Appendix 1.3 and 1.4. All feedback was collated, including feedback specific to the EIAR topic 'Traffic and Transportation'. This feedback has informed this chapter including the baseline and impact assessment presented.

Specific consultation was also undertaken with key stakeholders in relation to EIA Scoping. A summary of the issues raised in relation to the scope of the EIA is included in Volume 4, Appendix 1.2. Feedback on the scope and level of detail of the assessment, data sources and methodologies as they pertain to the EIAR topic 'Traffic and Transportation' have been reviewed and have influenced this chapter of the EIAR.

Specific consultation was also undertaken with representatives of various Departments in Kildare, South Dublin and Dublin City Councils. This included a combination of presentations, workshops and meetings to discuss the project, technical design issues and environment and planning matters.

Nine pre-application meetings were held with ABP to explain the project and present technical and environmental information. A summary of the information presented, and the environmental issues discussed at the nine meetings is provided in Volume 4, Appendix 1.6. Feedback relevant to the topic 'Traffic and Transportation' has been reviewed and has influenced this chapter of the EIAR.

In addition to this broader consultation, topic specific consultation was also undertaken in the form of formal data requests, meetings, and workshops. Those related to 'Traffic and Transportation' are listed below in Table 6.13.

Table 6.13: Topic-Specific Consultation regarding Traffic & Transportation

Consultee	Summary of Consultation Response / Meeting
NTA/BusConnects	Meeting (22nd Oct 2020) with NTA/Bus Connects on Concept Design Presentation & Early Optioneering.
Dublin City Council	Meeting (27th Nov 2020) with DCC on Concept & Emerging Preferred Option Presentation (South Circular Road Junction & Memorial Road).
NTA	Meeting (1st Dec 2020) with NTA on Concept & Emerging Preferred Option Presentation.
Dublin City Council	Meeting (4th Dec 2020) with DCC on Concept & Emerging Preferred Option Presentation (Sarsfield, Kylemore & Le Fanu Roads)
Dublin City Council	Meeting (18th Dec 2020) with DCC on Emerging Preferred Option Presentation - Pre-PC1
Dublin City Council	Meeting (11th Jun 2021) with DCC on Preferred Option Presentation – Post PC1

Consultee	Summary of Consultation Response / Meeting
NTA/BusConnects	Meeting (18th Oct 2021) with NTA/Bus Connects on Preferred Option Presentation
Dublin City Council	Meeting (18th Feb 2022) with DCC on Public Consultation No.2- Preliminary Design Presentation
Dublin City Council	Meeting (19th August 2022) with DCC on Pre-Railway Order Consultation (Design Update)

6.3.8. Difficulties Encountered / Limitations

It must be noted that due to the unprecedented Covid-19 pandemic, Government restrictions during both 2020 and 2021 presented unique challenges for the project team to progress the EIAR. In March 2020, Ireland began imposing restrictions on movement in order to combat the spread of Covid-19. Most workplaces, shops and schools were closed, and all unnecessary travel beyond 5km from home was discouraged. Although most of the restrictions were lifted at the time of traffic counts in May 2021, travel patterns are still expected to have been affected. This anomaly is accounted for in Section 6.3.5.1.2 outlining the Baseline Traffic Growth parameters used.

6.4. Receiving Environment

The proposed Project has been divided into four distinct geographic zones along the length of the corridor (Zones A to D) as outlined in Chapter 4 Project Description and summarised below. The proposed Project is described from west to east along the railway corridor as shown in Figure 6-6.

- Zone A - Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station (refer to Section 4.6);
- Zone B - Park West & Cherry Orchard Station to Heuston Station (incorporating Inchicore Works) (refer to Section 4.7);
- Zone C – Heuston Yard & Station (incorporating New Heuston West Station) (refer to Section 4.8);
- Zone D - Liffey Bridge to Glasnevin Junction (Phoenix Park Tunnel Branch Line) (refer to Section 4.9).

For the purpose of the Traffic & Transportation assessment, the baseline environment is described with reference to the project zones where relevant.

Descriptions of both infrastructural provision and usage of that infrastructure by each transport mode is presented in detail along the corridor of the DART+ South West Project. This includes reference to the following modes:

- General Traffic (cars, taxis, LGVs, HGVs) & Buses;
- Light Rail & Heavy Rail (Passenger and Freight);
- Pedestrians and pedal cyclists; as well as
- Mobility impaired and disabled.

The baseline conditions have been informed by site visits of the local environment, traffic surveys, modelling data, rail service data and a desktop review of recent aerial photography.

Figure 6-6 Extent of the proposed Project

6.4.1. Current Baseline Environment

6.4.1.1 Transportation Network Description

As outlined in Chapter 4 Project Description, the total length of the proposed Project is approximately 20km and extends from Hazelhatch & Celbridge Station in the west to Glasnevin Junction in the east via Heuston Station and the Phoenix Park Tunnel. Population and land use in the vicinity of the Project are described in Chapter 7 Population.

The existing rail line along the extent of the project is not currently electrified and comprises four. tracks from Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station and two/ three tracks for the remaining section of the line to the east.

There are a number of vehicular and pedestrian crossings along the length of the railway line which are generally provided in the form of bridges / underpasses. There are no 'at grade' crossings of the railway line along the extent of the proposed Project. The bridges / underpasses in each zone are described in Table 6.14 below. The proposed works required at each of these locations is provided in Chapter 4 Project Description.

Table 6.14: Summary Description of Bridges / Underpasses

Zone	Structure. ID	Location	Chainage	Description
A	OBC25	Hazelhatch Road Bridge	24+500	Two-way road with pedestrian footpath on each side of carriageway
	OBC24A	New Hazelhatch Footbridge	24+485	Vulnerable user footbridge
	OBC24	Hazelhatch Footbridge	24+410	Vulnerable user footbridge
	OBC23B	New Footbridge Straleek	24+000	Vulnerable user footbridge
	OBC21	Stacumny Lane Bridge	22+500	Two-way road with pedestrian footpath on one side of carriageway
	OBC20E	Crowley's Bridge	20+525	Two-way road with no pedestrian footpaths.
	OBC20D	Adamstown Station Building	20+300	Station building bridging the railway and providing platform access.
	OBC19	Road R120 Near Finnstown	19+295	Two-way road with pedestrian footpath on each side of carriageway
	OBC16A	Adamstown Footbridge	18+920	Vulnerable user footbridge
	OBC14D	Kishoge Station	17+700	Station building bridging the railway and providing platform access.
	OBC14C	Kishoge Road Bridge	17+735	Two-way 4 lane road with pedestrian footpath on each side of carriageway
	OBC13D	Clondalkin/Fonthill Station Building West	16+170	Station building bridging the railway and providing platform access.
	OBC13C	Clondalkin/Fonthill Station Building East	16+100	Station building bridging the railway and providing platform access.
	OBC13A	Nangor Road Bridge	16+135	Two-way road with pedestrian footpath on each side of carriageway
	OBC13	Ninth Lock Road Bridge	15+725	Two-way road with pedestrian footpath on each side of carriageway
	OBC11	Station Road Bridge	15+325	Two-way road with pedestrian footpath on each side of carriageway
	OBC10A	M50 Motorway Bridge	14+545	Dual carriageway motorway (8 lane road incl. bus lane in each direction)
	OBC9D	Park West Station Building Bridge	14+245	Station building bridging the railway and providing platform access.
	OBC9C	Park West Station Concourse Bridge	14+245	Station Concourse (Footpath, landing and Parking)
	OBC9B	Park West Avenue Road Bridge	14+200	Two-way road with pedestrian footpath on each side of carriageway
B	OBC8B	Cherry Orchard Footbridge	13+350	Vulnerable user footbridge
	OBC7	Le Fanu Road Bridge	12+610	Two-way road (no road markings)
	OBC5A	Kylemore Road Bridge	12+140	Two-way road with pedestrian footpath on each side of carriageway
	OBC5	Khyber Pass Footbridge	10+820	Pedestrian footbridge
	UBC4	Sarsfield Road Under-Bridge	10+525	3no. rail line over Two-way road (no road markings) with pedestrian

Zone	Structure. ID	Location	Chainage	Description
				footpath on each side of carriageway.
	OBC3	Memorial Road Bridge	10+000	One-way, 2no. lane road with pedestrian footpath on each side of carriageway
	OBC1	South Circular Road Bridge	9+420	Two-way roads (2 – 3 lanes) with pedestrian footpath on each side of carriageways
	OBCOA	St John's Road Bridge	9+330	Two-way roads (2 – 3 lanes) with pedestrian footpath on each side of carriageways
D	UBO1	Liffey Bridge	8+850	Twin rail line over River Liffey
	OBO2	Conyngham Road Bridge	8+770	Two-way road + 1 lane bus lane with pedestrian footpath on one side of carriageway and one way advisory cycle lane
	OBO3	McKee Barracks Bridge	7+700	Bridge not in use.
	OBO4	Blackhorse Avenue Bridge	7+630	Two-way road with pedestrian footpath on each side of carriageway
	OBO5	Old Cabra Road Bridge	7+220	Two-way road with pedestrian footpath on each side of carriageway and advisory cycle lanes
	OBO6	Cabra Road Bridge	7+030	Two-way road with pedestrian footpath on each side of carriageway
	OBO7	Faussagh Road Bridge	6+475	Two-way road with pedestrian footpath on each side of carriageway
	OBO8	Royal Canal and Luas Twin Arch	6+045	Pedestrian and twin rail line;
	OBO9	Maynooth Line Twin Arch	5+915	Twin rail line over GSWR Twin rail line
	OBO10	Glasnevin Cemetery Road Bridge	5+645	Two-way, 1no. lane access ramps and road over bridge. Shared use with vulnerable users.

There is a comprehensive road network in the study area and in the immediate vicinity of the railway line, particularly within the city centre where there is an extremely dense road network; and the railway line passes beneath a number of regional roads. More important roads in the immediate vicinity of the railway line are detailed in Table 6.15.

Table 6.15: Roads in the Immediate Vicinity of the Railway Corridor

Zone ID	Road Name	Road No.	Works Proposed
A	Hazelhatch Road	R405	N
	Stacumny Lane	L6005	N
	Station Road	L5787	N
	Adamstown Road	R120	N

Zone ID	Road Name	Road No.	Works Proposed
	Adamstown Avenue	L1058	N
	Grange Castle Road	R136	N
	Fonthill Road North	R113	N
	Ninth Lock Road	L1015	N
	Station Road	L1006	N
	M50 - Motorway	M50	N
	Park West Avenue	-	N
B	Le Fanu Road	L1014	Y
	Kylemore Road	R112	Y
	Landen Road	-	Y
	Sarsfield Road	-	Y
	Con Colbert Road	R838	Y
	Inchicore Road	R839	N
	Memorial Road	R839	Y
	South Circular Road	R111	Y
	St. John's Road West / Chapelizod Bypass	R148	Y
D	Blackhorse Avenue	R806	N
	Old Cabra Road	R805	N
	Cabra Road	R147	N
	Faussagh Avenue	-	N

The location of where works to the road network are proposed are noted above in Table 6.15 and further detail on the road network at these locations is provided below.

- Le Fanu Road (L1014) is a single carriageway, two-way local road with no pedestrian or cycle facilities on the actual bridge crossing the railway line.

- Kylemore Road (R112) is a single carriageway, two-way regional road with pedestrian footpaths and no dedicated cycle facilities.
- Memorial Road Bridge (R839) is a single carriageway, one-way regional road with pedestrian footpaths and no dedicated cycle facilities.
- The R111 (South Circular Rd) / R148 (Con Colbert Road) interchange is a significant junction on a key radial corridor leading to / from the city centre. As can be seen in Figure 6-7 both roadways are two-way multiple lane roadways. The R111 includes cycle lanes. The R148 includes advisory / mandatory cycle lanes and a bus lane.

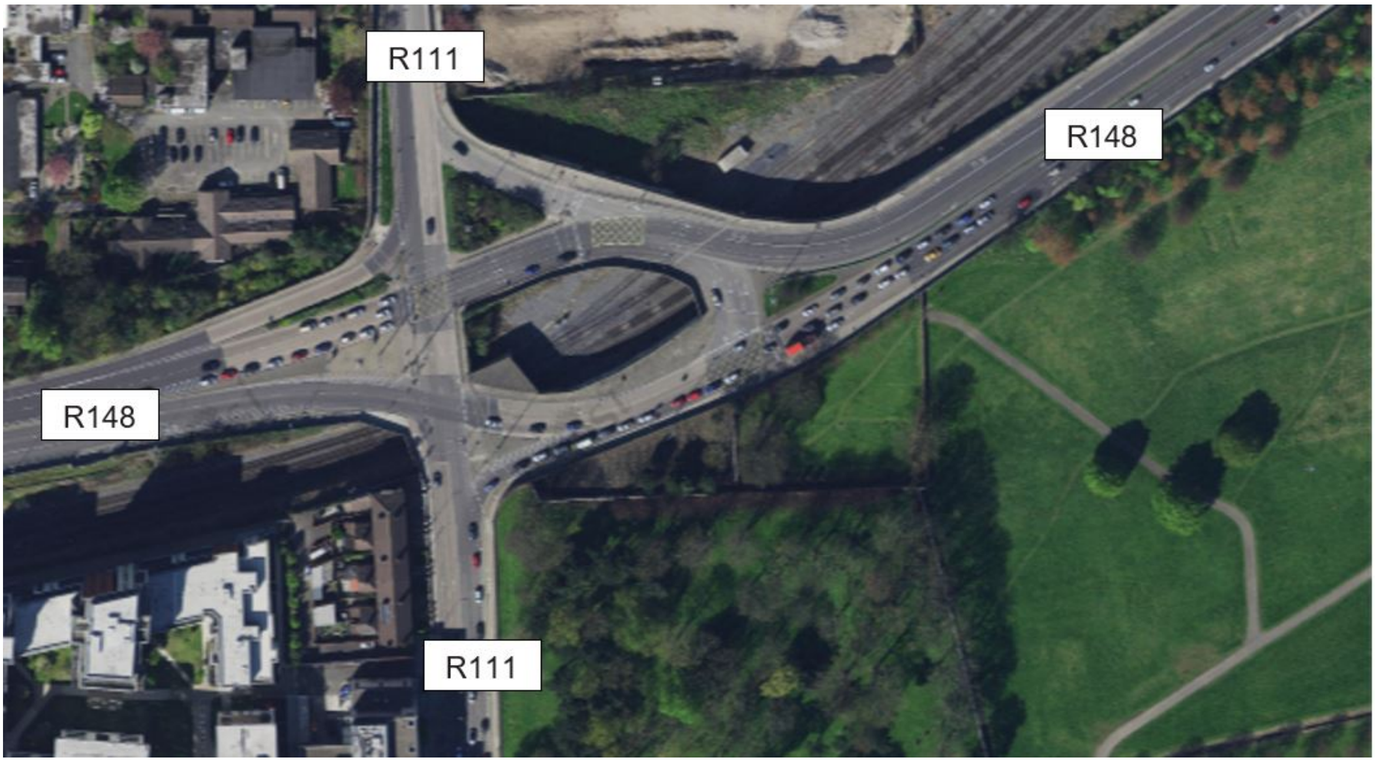


Figure 6-7 South Circular Road Junction

6.4.1.2 Network Traffic Flows

The level of existing traffic on the road network affected by bridge closure diversions (during the AM and PM peak hours[4]), within the study area, has been established. This was primarily through the review of existing traffic count data and the undertaking of traffic counts. The locations of the traffic counts have been identified and described previously in Section 6.3.2.3 (refer to Figure 6-2 and Table 6.1).

A summary of the existing morning (AM) and evening (PM) peak hour baseline traffic flows is presented in; for the junction links along the diversion routes. Refer to Volume 4, Appendix 6.1 for a reference diagram identifying the junction and link names used within this assessment.

[4] The peak AM period is typically considered to be between 07:00 and 10:00 whilst the peak PM period is typically considered to be between 16:00 and 19:00.

Table 6.16: Baseline Traffic Flows on Diversion Route Links (2021)

Zone	Junction Reference	Junction Link Reference	Junction Link Name	AM Peak			PM Peak		
				LV	HGV	Total	LV	HGV	Total
B	HC1	1	Le Fanu Road (N)	829	26	855	638	5	643
		5	Le Fanu Road (S)	564	15	579	646	15	662
		2	Ballyfermot (W)	1,172	99	1,271	1,074	100	1,174
		3	Ballyfermot (E)	980	102	1,082	1,019	107	1,126
B	HC2	3	Ballyfermot (E)	980	102	1,082	1,019	107	1,126
		20	Ballyfermot (EE)	1,037	149	1,186	1,083	72	1,155
		4	Kylemore Road (N)	1,272	89	1,361	481	25	506
		6	Kylemore Road (S)	1,333	148	1,481	1,367	76	1,444
B	JTC 2	6	Kylemore Road (S)	1,333	148	1,481	1,367	76	1,444
		7	Kylemore Ave	342	16	359	436	11	447
		9	Kylemore Road (SS)	1,301	153	1,454	1,435	85	1,520
B	JTC 1	5	Le Fanu Road (S)	564	15	579	646	15	662
		35	Raheen Park	422	18	440	593	10	593
		7	Kylemore Ave	342	16	359	436	11	447
		8	Le Fanu Road (bridge)	644	21	665	819	19	838
B	JTC 3	9	Kylemore Road (SS)	1,301	153	1,454	1,435	85	1,520
		10	Landen Road	307	46	353	405	33	437
		11	Kylemore Road (Bridge)	1,285	152	1,437	1,426	58	1,484
B	JTC 4	8	Le Fanu Road (bridge)	644	21	665	819	19	838
		12	Kylemore Park Road N	492	96	588	635	49	684
		13	L1014	932	120	1,052	1,069	70	1,139
B	JTC 5	11	Kylemore Road (Bridge)	1,285	152	1,437	1,426	58	1,484
		12	Kylemore Park Road N	492	96	588	635	49	684
		14	Kylemore Road (SSS)	1,063	131	1,193	1,190	39	1,228
B	JTC 11	16	R839 (N)	1,140	91	1,231	1,045	53	1,098
		17	R839 (S)	1,090	121	1,211	1,064	68	1,133
		18	R810 (W)	1,123	107	1,230	996	81	1,077
B	HC3	15	Sarsfield Road (Bridge)	540	57	597	315	34	349
		20	Ballyfermot (EE)	1,037	149	1,186	1,083	72	1,155
		21	Con Colbert Rd	537	96	633	802	42	844
B	JTC 6	15	Sarsfield Road (Bridge)	540	57	597	315	34	349
		16	R839 (N)	1,140	91	1,231	1,045	53	1,098
		22	Inchicore Road (W)	620	55	675	722	28	750

Zone	Junction Reference	Junction Link Reference	Junction Link Name	AM Peak			PM Peak		
				LV	HGV	Total	LV	HGV	Total
B	JTC 7	22	Inchicore Road (W)	*620*	*55*	*675*	*722*	*28*	*750*
		23	Inchicore Road (E)	*275*	*8*	*284*	*311*	*15*	*326*
		24	Memorial Road	*496*	*47*	*543*	*586*	*18*	*604*
B	HC6	21	Con Colbert Rd	*537*	*96*	*633*	*802*	*42*	*844*
		25	Chapelizod Bypass (W)	*1,980*	*321*	*2,301*	*2,051*	*238*	*2,289*
B	HC4	24	Memorial Road	*496*	*47*	*543*	*586*	*18*	*604*
		25	Chapelizod Bypass (W)	*1,980*	*321*	*2,301*	*2,051*	*238*	*2,289*
		26	Chapelizod Bypass (E)	*1,289*	*342*	*1,630*	*2,352*	*252*	*2,604*
B	HC5	26	Chapelizod Bypass (E)	*1,289*	*342*	*1,630*	*2,352*	*252*	*2,604*
		27	South Circular (S Bridge)	*1,342*	*68*	*1,411*	*1,382*	*47*	*1,429*
		28	South Circular (N Bridge)	*1,317*	*94*	*1,411*	*1,377*	*67*	*1,444*
		31	R148 (E)	*1,336*	*308*	*1,644*	*1,893*	*281*	*2,174*
B	JTC 9	29	Conyngham Road (E)	*1,171*	*118*	*1,290*	*1,118*	*86*	*1,204*
		30	Conyngham Road (W)	*775*	*71*	*846*	*842*	*53*	*895*
		31	R148 (E)	*1,336*	*308*	*1,644*	*1,893*	*281*	*2,174*
B	JTC 8	19	R111 (N)	*1,176*	*60*	*1,236*	*1,211*	*26*	*1,237*
		23	Inchicore Road (E)	*275*	*8*	*284*	*311*	*15*	*326*
		27	South Circular (S Bridge)	*1,342*	*68*	*1,411*	*1,382*	*47*	*1,429*
		32	Kilmainham Lane	*163*	*2*	*165*	*185*	*3*	*189*
B	JTC 10	19	R111 (N)	*1,176*	*60*	*1,236*	*1,211*	*26*	*1,237*
		18	R810 (W)	*1,123*	*107*	*1,230*	*996*	*81*	*1,077*
		33	R810 (E)	*835*	*123*	*958*	*483*	*68*	*551*
		34	R111 (S)	*1,002*	*68*	*1,070*	*971*	*33*	*1,004*

6.4.1.3 Walking and Cycling

There are existing pedestrian and cyclist routes located within the study area which link to the wider network and facilitate pedestrian and bicycle movement. Dedicated cycle / pedestrian facilities are generally not provided on more rural roads in Zone A, while in more urban areas such facilities are generally provided.

Pedestrian facilities are generally provided alongside the carriageways crossing the existing rail line. However, there are no dedicated cycle or pedestrian facilities along Crowley's Bridge (OBC20E) and Le Fanu Road Bridge (OBC7) which currently both require pedestrians to walk on the vehicular carriageway over the bridge. Le Fanu Road Bridge (OBC7) is being reconstructed with improved footpath and cycle facilities as part of this project. There are a number of pedestrians only, or combined vulnerable user, footbridges across the railway line within the project area (refer to Table 6.14 for further details).

Bicycle and pedestrian provisions proximate to each station are outlined below. Hazelhatch & Celbridge Station is located on the east side of the R405 Celbridge Road and on the south side of the Loughlinstown local road, south of Celbridge. In the vicinity of the station, there is a footway along the south (station) side of the Loughlinstown local road. The R405 has a continuous footway, along its west side, between Celbridge and the R405 roundabout junction, located adjacent to the station. South of this roundabout junction, the R405 has footways on both sides locally, including on the OBC25 rail overbridge, and on its west side, locally, thereafter, to the south.

Pedestrian access to the station is provided from the station Park & Ride car park and via a pedestrian link, between the station building and the R405, at a location immediately north of the Hazelhatch Road Bridge (OBC25). Bicycle parking is provided at the existing train stations, the number is represented in Table 6.18.

Adamstown Station is located on the south side of the Adamstown Station access road, west and south of Adamstown. The Adamstown Station access road has a footway along its south (station) side, while east of the station the access road has footways on both sides. East of the station, an uncontrolled crossing is provided between the access road footways, at the end of the north side footway. Controlled crossings are provided at the Adamstown Avenue/Station access road traffic signals junction. There is a cycle lane along the south side of the Adamstown Station access road, locally to the station. There is also a cycle lane along the north side of the access road, locally towards Adamstown Pedestrian access to the station is provided directly from the Adamstown Station Building and access road.

Kishoge Station (currently not in operation) is located on the east side of the Dublin Outer Ring Road (R136). The Dublin Outer Ring Road (R136) has footways on both sides, segregated from the road carriageway. Controlled pedestrian crossings are provided on all three arms at the R136/Lynch's Lane roundabout. Controlled pedestrian crossings are provided on all four arms at the R136/Adamstown Link Road roundabout. There are cycle lanes on both sides of the Dublin Outer Ring Road (R136), segregated from the road carriageway. Cycle lanes are also provided on the Link Road (R113).

Pedestrian access to the station is provided directly from the east side of the R136 Dublin Outer Ring Road at the station building. There is no crossing point for pedestrians from the west side of the R136 at the station. Pedestrian crossing movements are restricted by the central median barrier.

Clondalkin-Fonthill Station is located on the east side of the Fonthill Road (R113). Fonthill Road has footways on both sides. Controlled pedestrian crossing facilities are provided on Fonthill Road, at the traffic signal controls at Dunawley Avenue and Lucan Newlands Road. Uncontrolled pedestrian crossing points, and refuge islands, are provided at the station access junction roundabout on Fonthill Road. There are cycle lanes on both sides of Fonthill Road, with some local discontinuity. Pedestrian access to the station is provided directly from Fonthill Road at the station building, and from the station access junction roundabout, via dedicated internal pedestrian footways.

Park West & Cherry Orchard Station is located off Park West Avenue. Park West Avenue includes footways on both sides. There are no controlled crossing facilities, or uncontrolled crossing points, on

Park West Avenue in the vicinity of the station. Uncontrolled crossing movements were observed, during the site inspection, at the traffic calming speed ramps. There is a controlled crossing on Park West Avenue, immediately south of its roundabout junction with Park West Road. There are cycle lanes on both sides of Park West Avenue.

Pedestrian access to the station is from the existing station plaza area, located on the west side of Park West Avenue. Direct pedestrian access is also provided between the station plaza and the existing Park West residential development, located immediately south of the station, via a stepped pedestrian link.

The proposed location for the Heuston West Station is located within Zone C to the west of the existing main Heuston Station and will occupy the former Platform 10. There is currently very limited public pedestrian or cyclist access to Platform 10. Neither are there dedicated cycling linkages to this platform. Bicycle Parking Provision at the existing train stations is presented in Table 6.17 below.

Table 6.17: Bicycle Parking Provision at Existing Train Stations

Train Station	No. Cycle Parking Spaces
Hazelhatch & Celbridge	40
Adamstown	100
Kishoge (not in operation)	0
Clondalkin-Fonthill	21
Park West & Cherry Orchard	0
Heuston	320 (including 52 bicycle locker spaces)

In addition to the above a further 69 no. bicycle lockers are available for rent at Heuston Station. Designated cycle hire scheme parking racks are provided at Heuston Station Car Park, Heuston Station Central and Heuston Bridge South.

Pedal Cycle counts were undertaken at locations where public road bridge closures are required to facilitate their reconstruction. The counts were done at the same time as the vehicular counts (May 2021) and are summarised in Table 6.18 below.

Table 6.18: Pedal Cycle Counts at Bridges (2021)

Zone	Junction / Link	Survey Date	Mode Type	Direction	AM Peak	PM Peak
B	Le Fanu Road Bridge (OBC7)	06/05/2021	p/c	Northbound	2	13
			p/c	Southbound	15	5
			p/c	Both Directions	17	18
B	Kylemore Road Bridge (OBC5A)	06/05/2021	p/c	Northbound	12	28
			p/c	Southbound	32	14
			p/c	Both Directions	44	42
B	Sarsfield Road Bridge (UBC4)	06/05/2021	p/c	Northbound	11	28
			p/c	Southbound	16	12

Zone	Junction / Link	Survey Date	Mode Type	Direction	AM Peak	PM Peak
			p/c	Both Directions	27	40
B	Memorial Road Bridge (OBC3)	06/05/2021	p/c	Northbound	12	11
			p/c	Southbound	3	0
			p/c	Both Directions	15	11
B	South Circular Road Bridge (OBC1)	06/05/2021	p/c	Northbound	41	41
			p/c	Southbound	62	40
			p/c	Both Directions	103	81

The lowest level of cycling is recorded at Le Fanu Road and Memorial Road with Sarsfield Road having almost double the number of users. None of these bridge approaches have dedicated provision for cyclists, in addition Le Fanu Road Bridge (OBC7) is narrow, on a dog-leg alignment and lacking footpaths.

The R148 Con Colbert Road/Chapelizod By-pass is a multi-lane highly trafficked dual carriageway, with limited segregated provision for cyclists (while acknowledging that there is a shared use bus lane).

Pedestrian counts have also been undertaken at locations where public road bridge reconstruction closures are required. The counts were done at the same time as the vehicular counts (May 2021) and are summarised in Table 6.19 below.

Table 6.19: Pedestrian Counts for Bridges (2021)

Zone	Junction / Link	Survey Date	Mode Type	Direction	AM Peak	PM Peak
B	Le Fanu Road Bridge (OBC7)	06/05/2021	ped	Northbound	4	18
			ped	Southbound	6	11
			ped	Both Directions	10	29
B	Kylemore Road Bridge (OBC5A)	06/05/2021	ped	Northbound	31	63
			ped	Southbound	4	12
			ped	Both Directions	35	75
B	Sarsfield Road Bridge (UBC4)	06/05/2021	ped	Northbound	33	12
			ped	Southbound	133	56
			ped	Both Directions	166	68
B	Memorial Road Bridge (OBC3)	06/05/2021	ped	Northbound	49	29
			ped	Southbound	47	24
			ped	Both Directions	96	53
B	South Circular Road Bridge (OBC1)	06/05/2021	ped	Northbound	10	8
			ped	Southbound	4	4
			ped	Both Directions	14	12

6.4.1.4 Public Transport

6.4.1.4.1. Bus

There are a large number of bus services operating within the study area and many bus stops within a short walking distance of a train station. The train station with the largest volume of bus connectivity, along the Project route, is Heuston Station. Details on the services and bus stops located within 100m of the train stations in the study area are set out below in Table 6.20. Where the study area covers Dublin city centre there are additional bus routes within walking distance of a train station.

Table 6.20: Bus Routes with stops within 100m of existing stations within Study Area

Train Station	Bus Route No.	Bus Route	Location of Bus Stop Closest to Train Station	Frequency of Service
Hazelhatch & Celbridge	1029 (L58)	River Forest Towards Hazelhatch Station	Train Station Car Park, c. 150 from train station building.	30 mins peak hours
Hazelhatch & Celbridge	1030 (L59)	River Forest Towards Hazelhatch Station	Train Station Car Park, c. 150 from train station building.	30 mins peak hours
Adamstown	968 (L53)	Adamstown Station Towards Liffey Valley Shopping Centre	Station Road, c. 50m from train station	20 – 30 mins peak hours
Adamstown	1018 (C1)	Adamstown Station Towards Sandymount	Station Road, c. 50m from train station	7 – 15 mins peak hours
Adamstown	1020 (C3)	Adamstown Station Towards Sandymount	Station Road, c. 50m from train station	5 – 10 mins peak hours
Adamstown	229 (P29)	Adamstown Station Towards Ringsend Road	Station Road, c. 50m from train station	4 services per day in each direction
Kishoge	151	Docklands (East Rd.) To Foxborough (Balgaddy Rd.)	R136 Dublin Outer Ring Road, c. 150m from train station	15 – 20 mins peak hours
Clondalkin-Fonthill	954 (L54)	River Forest to Red Cow Luas	Fonthill Road, c. 20m from station	30 mins peak hours
Park West & Cherry Orchard	79A	Aston Quay Towards Spiddal Park / Park West	Park West Avenue, c. 100m from station	10 – 15 mins peak hours
Heuston Station	1016 (145)	Heuston Station to Kilmacanogue	Inside Station Complex	15 – 20 mins peak hours
Heuston Station	1011 (79)	Aston Quay Towards Park West Hotel	St John's Road. (outside station building)	30 mins peak hours
Heuston Station	1011 (79A)	Aston Quay Towards Park West Hotel	St John's Road. (outside station	30 mins peak hours

Train Station	Bus Route No.	Bus Route	Location of Bus Stop Closest to Train Station	Frequency of Service
			building)	
Heuston Station	1018 (C1)	Adamstown Station to St John's Road Church Sandymount	St John's Road. (outside station building)	30 mins peak hours
Heuston Station	1019 (C2)	Adamstown Station to St John's Road Church Sandymount	St John's Road. (outside station building)	30 mins peak hours
Heuston Station	1020 (C3)	Rings End to Hayfield	St John's Road. (outside station building)	30 mins peak hours
Heuston Station	1021 (C4)	Rings End to Straffan Road	St John's Road. (outside station building)	30 mins peak hours
Heuston Station	4	Dublin Airport to Waterford Station	St John's Road. (outside station building)	60-120 mins peak hours
Heuston Station	115	UCD to Mullingar Station	St John's Road. (outside station building)	Hourly
Heuston Station	120	Dublin to Edenderry	St John's Road. (outside station building)	40-60 mins peak hours
Heuston Station	126	Dublin to Rathnangan	St John's Road. (outside station building)	30-60 mins from 9:30am
Heuston Station	X25	UCD to Maynooth (Straffan Road)	St John's Road. c. 100m from station	10 – 25 mins morning peak
Heuston Station	X27	UCD to Celbridge (Salesian College)	St John's Road. c. 100m from station	20mins; 3 times and only in the peak hour
Heuston Station	X31	River Forest to Earlsfort Terrace	St John's Road. c. 100m from station	15-20mins; 3 times and only in the peak hour
Heuston Station	1202 (120b)	Dublin to Newbridge	St John's Road. (outside station building)	2 -3 hourly 3 times a day from 10am
Heuston Station	782	Dublin City to Dublin Airport	Inside Station Complex	30 mins peak hours
Heuston Station	768 (245X)	Busaras to Cork Bus Station	Inside Station Complex	2 -4 hourly 4 times a day from 8am

A review was undertaken of existing bus services that would be affected temporarily by the reconstruction of aforementioned bridges associated with the proposed Project and these are listed in Table 6.22 and implementation of BusConnects in Table 6.22.

Table 6.21: Bus Routes Affected by Bridge Construction – Existing Bus Routes

Zone	Structure ID	Road Bridges (Temporary Closure)	Number of Bus Routes	Cause of Delay	Bus Route ID
B	OBC7	Le Fanu Road	0	None	None
B	OBC5A	Kylemore Road	1	Diversion	79A, 79, 18
B	UBC4	Sarsfield Road	3	Diversion	79, 40
B	OBC3	Memorial Road	3	Diversion	79, 69, 69X
B	Proposed New OBC1A	South Circular & St John's Roads	24	Temporary Lane Modification	C1, C2, C3, C4, X25, X27, X31, P29, 4, 115, 120, 120A, 120B, 126, 717, 768, 782, 79A

Table 6.22: Bus Routes affected by Bridge Construction – if After BusConnects Implementation

Zone	Structure ID	Road Bridges (Temporary Closure)	Number of Bus Routes	Cause of Delay	Bus Route ID
B	OBC7	Le Fanu Road	0	None	None
B	OBC5A	Kylemore Road	1	Diversion	G1, G2, C4
B	UBC4	Sarsfield Road	3	Diversion	G1, G2 & 60
B	OBC3	Memorial Road	3	None	None
B	Proposed New OBC1A	South Circular & St John's Roads	24	Temporary Lane Modificatio n	C1, C2, C3, C4, X25, X27, X31, P29, 58, 60, 52, 4, 115, 120, 120A, 120B, 126, 717, 768, 782

6.4.1.4.2. Rail

As outlined previously in Chapter 4 Project Description, the project consists of the electrification of the existing Cork Mainline from Hazelhatch & Celbridge Station to Heuston Station on the Cork Mainline and Heuston Station to Glasnevin Junction via the Phoenix Park Tunnel Branch Line. The existing railway line forms part of the mainline rail network connecting Dublin to Westport / Ballina, Galway, Limerick, Cork and Waterford. Diesel powered intercity and commuter services currently operate on these routes.

There are currently 6 no. existing stations located along the length of the proposed Project with connections to the Luas Red line at Heuston Station.

- Hazelhatch and Celbridge;
- Adamstown;
- Kishoge (currently not in operation);
- Clondalkin / Fonthill;

- Park West & Cherry Orchard; and
- Heuston.

An additional station is proposed as part of the Project at Heuston West at the existing Platform 10 within Heuston complex. It is envisaged that DART+ South West Project will directly deliver increased rail capacity and improve integration of the rail service with other modes of transport such as the proposed MetroLink at Glasnevin.

Existing train services are detailed in Table 6.23 below. Existing capacity of the trains between Hazelhatch and Dublin Heuston and Connolly is limited, and trains are operating at capacity during peak periods.

Table 6.23: Existing Train Services and Passenger Numbers

Current Single Peak Hour per Direction		
Commuter route	**Number of services**	**Capacity**
PPT (Hazelhatch - Connolly)	2	800
Heuston Commuter	4	1600
Heuston Intercity (Including services calling at Kildare, Newbridge & Sallins)	6	2700
Total	12	5,100

Journey time from Hazelhatch and Celbridge Station to Heuston Station and Connolly Station is c. 21mins and c. 35mins respectively.

There are limited rail freight services operating within the study area. Freight trains serve the Ballina - Dublin Port Route.

6.4.1.4.3. Car Parking / Park and Ride

Car parking / Park and Ride facilities are provided at a number of the train stations along the line. These enhance the ability for users of the railway line to travel from wider areas and use the rail services rather than drive to their end location. Existing car parking provision at each of the stations is set out in below.

Table 6.24: Existing Car Parking Provision at Existing Train Stations

Train Station	Total Car Parking Spaces	Disabled Car Parking Spaces
Hazelhatch & Celbridge	395	21
Adamstown	264	16
Kishoge (currently not in operation)	0	0
Clondalkin-Fonthill	204	12
Park West & Cherry Orchard	0	0

Train Station	Total Car Parking Spaces	Disabled Car Parking Spaces
Heuston Station (excl. staff parking)	460	16

6.4.1.5 Road Safety

This section provides a review of the accident data obtained from the RSA website. The study area for the proposed Project is much larger than the limited areas where associated roadworks are necessary. The proposed road works are typically confined to the new (replacement) bridge crossings and approaches to these crossings.

The data provided on the RSA website is only available for between 2005 and 2016 and therefore the five-year period between 2011 and 2016 has been reviewed. This represents the most recently available five-year data. The data for the years identified was obtained through the use of the options on the website. Table 6.25 below sets out the number of accidents at each of the bridge reconstruction locations or in the immediate vicinity by classification of their severity i.e. minor, serious, and fatal.

Table 6.25: Road Safety – Historical Accident Profile on Bridge Reconstruction Roads (2011-2016)

Zone	Level / Bridge Crossing	Accident Severity			Total
		Minor	Serious	Fatal	
B	Le Fanu Rd (N)	5	0	0	5
B	Le Fanu Rd (S)	3	0	0	3
B	Kylemore Rd (N)	9	0	0	9
B	Kylemore Rd (S)	4	1	0	5
B	Sarsfield Rd (W)	9	0	0	9
B	Sarsfield Rd (E)	0	1	0	1
B	Memorial Rd (N)	10	0	0	10
B	Memorial Rd (S)	0	0	0	0
B	South Circular (N)	5	0	0	5
B	South Circular (S)	10	0	0	10
B	R148 (W)	5	1	0	6
B	R148 (E)	2	0	0	2

6.4.2. Evolution of the Environment in the Absence of the Project (Do Nothing)

Annex IV of the EIA Directive sets out the information required to be included in an EIAR. This includes:

‘a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the Proposed Project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge’.

In the event that the proposed Project does not proceed, an assessment of the future baseline conditions has been carried out and is described within this section.

The subject scheme is a major engineering project and will require a significant amount of construction works, generating traffic and disrupting existing road capacity. In the "do-nothing" scenario, the interventions for the modernisation of the railway corridor and areas outside of CIÉ lands for the Project would not be undertaken and includes the continued use of the existing railway line. As such, all temporary construction impacts will be avoided in the absence of the Project.

Under the "do-nothing" scenario the significant increase in capacity on the rail network will not be delivered. Neither will associated relatively minor changes to the road network including pedestrian and cycle upgrades proceed. It can therefore be expected that there will continue to be a high level of dependence on private motor vehicle transport and there will be no significant increase in rail transport. Any increase in private motor vehicle transport will further increase road congestion and can be expected to impact negatively on journey time for private and public road transport.

6.5. Description of Potential Impacts

6.5.1. Potential Construction Impacts

The construction of the proposed Project is envisaged to take place over approximately 54 months (inclusive of advanced utility diversion contracts and long lead item procurement). The construction programme has been developed considering how efficiently the works may be undertaken and to reduce the potential for environmental impacts.

The approximate duration of the main activities between each bridge crossing of the railway corridor (in the four-tracking section) of the Project, are as follows:

- Retaining walls and bridge abutments (approximately 200-300 days)
- Excavation of embankments for widening and track lowering (approximately 80-200 days)
- Each bridge and its associated approach road reconstruction (approximately 120-180 days).
- Track, OHLE and SET (combined duration approximately 40-60 days)
- Bridge Utility Diversion – Temporary /Preparatory and Final (Approximately 40 days in advance of bridge closures and 10-40 days after bridge and road reinstatement)

Other main works that are not defined by bridge sections but rather discrete locations in and of themselves are:

- The 6 no. traction electrical substations (approximately 120-140 days)
- Phoenix Park Tunnel slab track and works along Phoenix Park Tunnel Branch Line (approximately 110-130 days)
- Heuston West Station works (approximately 110-130 days)

As identified in Chapter 5 Construction Strategy, the construction works range from those that are located outside of the railway boundary (thus, having no impact or minimal impact on train operations) to those that will require a temporary closure of a section of track that normally occurs during night-time track possession works or full weekend possession works to limit the impact on rail services.

The effect of construction activity on vehicles, pedestrians and cyclists is likely to be at its greatest at the locations of bridges which have been identified as the main permanent way corridor access and egress points. In addition, they are location for the full bridge and associated approach road reconstruction works. It is at these locations where temporary traffic diversions have been identified in Chapter 5 and presented within this chapter of the EIAR.

The Project area by virtue of its constrained topology and adjacent land ownership has been sectioned into distinct areas based on existing railway corridor bridge crossing points and proposed bridge works. These physical constraints as well as rail operational staging constraints have defined the sequence of the works and work item dependencies; also identified in Chapter 5.

Vehicular traffic will be generated during the construction phase and will generally comprise of trips made by HGVs with a proportion of LVs for smaller tasks and works supervision.

This section provides an assessment of the impact of additional AADT on external haul routes emanating from construction vehicles (both HGV and LV inclusive). The construction vehicle traffic generated by the proposed Project is outlined in Table 6.27.

In addition, an assessment of the impact on the junctions and their links is presented dealing with the main temporary traffic management diversions identified to facilitate temporary bridge closures. With particular emphasis on public road bridge closures anticipated to last longer than 7 days.

The projected number and duration of the temporary bridge closures across the Project area are listed in Table 6.26 below.

Table 6.26: Projected Durations for the Temporary Bridge Closures and/or Diversions

Structure Id	Location	Closure and/or Diversion	Anticipated Duration of Closure
OBC7	Le Fanu Road Bridge	Closure	140 days
OBC5A	Kylemore Road Bridge	Closure	250 days. (temporary northbound vehicular bridge will be available)
OBC5	Khyber Pass Footbridge (Private Access)	Closure	1150 days
UBC4	Sarsfield Road Underpass Bridge	Closure	5-7 days (3no. separate occasions)
OBC3	Memorial Road Bridge	Closure	95 days
OBC1 & OBC0A	South Circular Road and St John's Road Bridges	Phase 1 - Diversion across the same bridges but with change to routing patterns and lane usage	260 days
OBC1 & OBC0A	South Circular Road and St John's Road Bridges	Phase 2 - Diversion across the same bridges but with change to routing patterns and lane usage	250 days

Structure Id	Location	Closure and/or Diversion	Anticipated Duration of Closure
OBO10	Glasnevin Cemetery Bridge (Private Access)	Closure	21 days

6.5.2. Construction Vehicle Impact on Public (External Haul) Roads

In addition to the full bridge closures, the approach roads to the bridges may require temporary lane closures or lane width reductions (where the latter allows for the same). These could last 1hr to 14 no. days and would be done in the months prior to or immediately following, the main full closure. The impact of bridge closures and associated vehicular diversions is described in greater detail in the following sections.

However, to limit the impact of the required road closures durations for bridge reconstruction, certain bridge works have been made dependent on the completion and reopening of others:

- The reconstruction and re-opening of Le Fanu Road Bridge (OBC7) is to be completed before works on the reconstruction of Kylemore Road Bridge can commence.
- Memorial Road also cannot be closed concurrently with either the South Circular Road main traffic diversion strategy required for construction of the proposed new cut and cover structure (buried portal) nor concurrently with Sarsfield Road closures.

The percentage change in Average Annual Daily Traffic (AADT) on Public Roads, along with the proportionate increase in HGV traffic, is represented in the Tables in the below sections for each bridge closure analysis.

The linear nature of the project, the complexity of its urban location and therefore constrained access points, necessitates several temporary construction compounds to be provided along the length of the line, local to the works sites for shorter periods. The locations of these construction compounds, the land on which they are located, and their function are set out in Chapter 5. Each of these locations will generate vehicular trips which will contribute to road traffic on the local road network. The external and internal haul routes proposed to facilitate these construction vehicles are also illustrated in Chapter 5.

The increase in AADT generated by construction vehicles on external haul routes to work sites or compounds is noted in Table 6.27 below. Where these Access Points (AP) are for a compound, they have also been represented in the Chapter 5 - Compound Drawings presented in Volume 3A of this EIAR.

Table 6.27: AADT Increase from Construction Vehicles and Significance of Effect on Public Roads – Full Route

Zone	Public Road (access/egress points)	Summary of Works Served by the access	Usage (days)	Adjoin. Road AADT % Increase	AADT (min. – max)
A	The Lords Road – Existing Iarnród Éireann Compound and track Access (West of bridge) Ch25+000	**Track Access**. Materials handling Localised Track work & Line Electrification and SET	1490 (40@ Peak)	<10%	22
A	Loughlinstown Road existing access to Hazelhatch Station Carpark	**Hazelhatch Station Carpark** Parapet modifications to Station Footbridges	15	<10%	6-10
A	Loughlinstown Road existing access to Iarnród Éireann Derelict housing	**Hazelhatch Track work & Substation Compounds & Track Access**. (Localised Track work, Substation Construction, Line Electrification	1490 (120@ Peak)	<10%	22
A	Loughlinstown Road – Through Celbridge Golf Club (North of Track) 24+025	Access route & undergrounding of overhead MV lines & reinstate as required	15	<10%	6-10
A	Stucumny Lane (North West of Rail Corridor)	**Track Access** Undergrounding of overhead MV lines & reinstate as required	15	<10%	6-10
A	Stucumny Lane (South West of Rail Corridor) – Iarnród Éireann Existing Track Access	Access route & Undergrounding of overhead MV lines & reinstate as required for both Stucumny and Golf Course Crossings	30	<10%	6-10
A	Existing Iarnród Éireann Access Road - South east of Stucumny Lanebridge. Compound for Substation and track access.	**Adamstown Substation Compound & Track Access** Construction of Adamstown Substation, Track, Fencing and access road improvement works,	120	<10%	6-10
A	Station Road (Adamstown) Existing Access gate to Perway Corridor Ch19+590	**Track Access** Line Electrification and track works	40	<10%	6-10
A	Adamstown Avenue - Existing ESB vehicle tracks (North of Track) Ch19+475.	Access route & undergrounding of overhead MV lines & reinstate as required	15	<10%	6-10
A	ESB Substation service road off R120 (South of Track) Ch19+475.			<10%	6-10

Zone	Public Road (access/egress points)	Summary of Works Served by the access	Usage (days)	Adjoin. Road AADT % Increase	AADT (min. – max)
A	R120 Rail crossing bridge (OBC19) CH19+300	Parapet Modifications to (OBC19)	30	<10%	6-10
A	Adamstown Avenue (East of Tullyhall Development)- existing entrance to Private lands Ch18+075	**Kishoge Substation Compound & Track Access** Substation construction (Inc. Electro-mechanical installations) and OHLE electrification. undergrounding of overhead MV lines & reinstate as required	120	<10%	6-10
A	Off roundabout (immediately South of Track) from R136 and adjacent to existing Halting Site CH17+900	Temporary Access Track undergrounding of overhead MV lines & reinstate as required	15	<10%	6-10
A	Existing Kishoge Station and Track Access Off Lynch Lane adjacent to Kishoge Community College CH17+750	Temporary Access Track for OHLE support works and any station OHLE works	15	<10%	6-10
A	Existing Clondalkin Fonthill Station telecommunication and Track Access Off R113 Fonthill Road Ch16+150	Temporary Access Track for OHLE support works and any station OHLE works	15	<10%	6-10
A	Clondalkin Fonthill Station Pedestrian Accesses Off R113 Fonthill Road Bridge CH16+150	Station Parapet Modifications	30	<10%	6-10
A	Station Road (Clondalkin) – Existing Access to existing Track access and materials handling Compound	**Station Road Compound & Track Access** OHLE electrification support, and materials storage, Track Access.	40	<10%	6-10
A	Cloverhill Industrial Estate off Station Road (Clondalkin) – Existing Access to Polonez and Deante Doors Site	**Station Road Compound & Track Access** Fencing modifications for OHLE masts	30	<10%	6-10
A	Park West Avenue (Junction with Barn Walk – North of Station)	**Park West Substation Compound and Track Access** Substation Construction (Inc. Electro-mechanical installations) and OHLE electrification, storage and works.	120	<10%	6-10

Zone	Public Road (access/egress points)	Summary of Works Served by the access	Usage (days)	Adjoin. Road AADT % Increase	AADT (min. – max)
A	M50 Bridge	Parapet Modifications to M50 bridge	30 nights	<5%	12
A	Barnville Park (Temp access on bend to North East of Park West Station)	**Undertrack Drilling compounds** Materials and drilling machine storage. Access route & 38kv undertrack drilling and cable laying	15	<10%	6-10
A	Park West Road (Existing access and across open land to South East of Park West Station)			<10%	6-10
B	Lavery Avenue (Park West Industrial Estate) – onto vacant plot at end of cul-de-sac.	**Compound & Track Access** Materials Deliveries, retaining walls track, bulk excavation, and SET	791	=>10%	10-35
B	Cherry Orchard Avenue Ch13+200	**Compound (Minor) & Track Access** Materials Deliveries, retaining walls track, bulk excavation, OHLE & SET	1746	=>10%	10-35
B	Friel Avenue (Park West Industrial Estate) – onto vacant plot	**Main Contractors Project Compound** Main Site Offices, material and vehicle storage	1740	<10%	62
B	Le Fanu Road (South of Bridge- East and West)	**Compound & Track Access** Materials storage, track, retaining and boundary walls and bridge. HGV Storage & 38kV diversion. Foul Sewer Diversion	1740 (650@ peak)		10-70
B	Le Fanu Road (North East of Bridge)	**Compound & Track Access** Materials storage, track, retaining and boundary walls and bridge. HGV Storage OHLE & SET	700 (450@ peak)	<10%	10-70
B	Le Fanu Road (North West of Bridge)	**Compound & Track Access** Materials storage, track, retaining and boundary walls and bridge. HGV Storage OHLE & SET	1746 (700@ peak)	<10%	10-70

<table>
<tr><th>Zone</th><th>Public Road (access/egress points)</th><th>Summary of Works Served by the access</th><th>Usage (days)</th><th>Adjoin. Road AADT % Increase</th><th>AADT (min. – max)</th></tr>
<tr><td>B</td><td>Kylemore/Landen Road (North of Bridge - East and West)</td><td>Compound & Track Access
Bridge and Road, retaining and boundary walls, Utilities</td><td>1746 (700@ peak)</td><td><5%</td><td>10-70</td></tr>
<tr><td>B</td><td>Kylemore Road (South of Bridge- East and West)</td><td>Compound & Track Access
Bridge and Road, retaining and boundary walls, Utilities</td><td>1746 (800@ peak)</td><td><5%</td><td>10-70</td></tr>
<tr><td rowspan="2">B</td><td rowspan="4">Jamestown Road – Existing Iarnród Éireann Inchicore Yard Track Works Entrance. Reachable via Kylemore way (either directly from the Nass Road or via Kylemore Road, the latter also being from the Naas Road)

It was clear during public consultation that construction traffic should as much as possible be kept clear from Tyrconnell Park and Inchicore Terrace; both of which are narrow and service residential areas that have limited on plot parking.

All haul routes between Inchicore and Sarsfield Road Compounds and accesses to the compounds must be through the Inchicore Yard Property.

With Tyrconnell Park and Inchicore Terrace used only for emergency egress procedures.</td><td>Inchicore (Main) Compound and Track Access
Demolitions to buildings, track work, retaining and boundary walls and Material sorting and stick piling and attenuation Tank OHLE & SET.</td><td>1712 (850@ Peak)</td><td rowspan="3"><5%</td><td>22-70</td></tr>
<tr><td>Kylemore Substation Compound Substation Construction (Inc. Electro-mechanical installations)</td><td>120</td><td>6-10</td></tr>
<tr><td rowspan="2">B</td><td>Inchicore (Central) Compound and Track Access
Demolitions to buildings, track work, retaining and boundary walls and Khyber Pass (South) Construction OHLE & SET.</td><td>100</td><td>6-12</td></tr>
<tr><td>Sarsfield Road Bridge (South West) Compound and Track Access
Craning site for lifting and pouring Southern deck of UBC4, as well as track work, retaining and boundary walls and attenuation tank. OHLE & SET</td><td>1131 (750@ Peak)</td><td><5%</td><td>10-70</td></tr>
<tr><td>B</td><td>Khyber Pass Footbridge Service and Fire Tender Road onto Ballyfermot Road R833</td><td>Compound & Track Access
Bridge and Road, retaining and boundary walls, Utilities</td><td>1746 (800@ peak)</td><td><10%</td><td>10-70</td></tr>
</table>

Zone	Public Road (access/egress points)	Summary of Works Served by the access	Usage (days)	Adjoin. Road AADT % Increase	AADT (min. – max)
B	Con Colbert Road (North East of UBC4)	**Sarsfield Road Crane Compound** Craning site for lifting and pouring northern deck of UBC4	90	<10%	6-10
B	Sarsfield Road (Dan Ryan's Truck Rental Plot)	**Sarsfield Road Bridge (South West Compound and Track Access** Craning site for lifting and pouring Southern deck of UBC4, as well as track work, retaining and boundary walls. OHLE & SET	1341 (250@ Peak)	<10%	22-80
B	Con Colbert Road Compound and Works Access (East of Horse Sanctuary)	**Con Colbert Road Compound and Track Access** Track work, bulk excavations, retaining walls and boundary walls OHLE & SET	1341	<10%	22-80
B	Con Colbert Road (Bus Lane West of Memorial Road)	**Con Colbert Road Compound and Track Access** Bridge, Retaining and boundary walls, bulk excavation, material deliveries	365	<10%	40-70
B	Con Colbert Road (Bus Lane East of Memorial Road	**Con Colbert Road Compound and Track Access** Retaining and boundary walls, bulk excavation, material deliveries	1166		40-70
B	Memorial Road (Accessed from Inchicore & Sarsfield Roads and Grattan Crescent)	**Memorial Road Compound and Works Access** Bridge construction (temp and future), Road, abutments and both retaining and boundary walls, utilities	220	<5%	25-45
B	St John's Road (eastbound)	**Heuston Substation Compound and Track Access** Construction (Inc. Electro-mechanical installations) & retaining walls	120	<5%	6-10
D	Heuston Station Access Road	**Heuston Yard and Heuston West Compounds** All works in Heuston Yard, Heuston West Station and including PPT	472 (120@ Peak)	<5%	22-56

Zone	Public Road (access/egress points)	Summary of Works Served by the access	Usage (days)	Adjoin. Road AADT % Increase	AADT (min. – max)
D	Conyngham Road Bridge (OBO2)	Parapet Modifications to Bridge as well as River View Apartment Carpark Access ramp	40	<10%	6-10
D	North Road (An Garda Síochána service entrance)	Construction emergency egress corridor fencing gates and paving from Tunnel Emergency Egress Stairway No.1.	30	<10%	10-15
D	Marlborough Road (end of cul-de-sac)	Parapet Modifications to McKee Barracks Bridge (OBO3) and construction emergency egress corridor fencing gates and paving from Tunnel Emergency Egress Stairway No.2.	30	<10%	10-15
D	Black Horse Avenue (existing Irish Rial Access north east of bridge-OBO4)	Parapet Modifications to McKee Barracks Bridge (OBO3) and Black Horse Avenue Bridge (OBO4), Pump Station Construction and utility diversion. Including Demolition of Pipe Bridge	60	<10%	6-10
D	Old Cabra Road Bridge (OBO5)	Parapet Modifications	30	<10%	6-10
D	Cabra Road (existing Iarnród Éireann access and private development construction access)	**Cabra Compound and Track Access** All works also GSWR track including PPT, Track, retaining walls, OHLE & SET, Parapet Raising	120	<5%	98
D	Fassaugh Road Bridge (OBO7)	**Cabra Compound Secondary Access (Emergency Egress)** Parapet Modifications of (OBO7)	60	<10%	6-10
D	Glasnevin Cemetery Carpark	**Glasnevin Cemetery Bridge Compound** Glasnevin Cemetery Bridge (OBO10) and partial carpark reconstruction (Minimum 20 public parking spaces to remain operational throughout construction)	100	<10%	6-10

To allow for contractor programming flexibility the compounds have been listed as being required for longer durations than will likely be the case. In many instances they are required for use intermittently and may in fact have multiple peak periods of use; therefore, the AADT values as represented in the above table are considered to be a robust estimate and represent the worst-case scenario. It is likely to be overstating the impact, as the AADT represented is based on the works packages producing the greatest contributary volume of construction vehicle traffic; which may not be an item of works with the longest duration and not even lasting a year (i.e. an overstated AADT).

6.5.2.1 Summary Findings of Construction Vehicle Impact Assessment

The largest contribution of construction traffic to the peak hour volumes as opposed to AADT will likely be construction personnel arriving and leaving the Main Construction Compounds sites in the morning and evening. Typically, the bulk of construction personnel on large infrastructure projects arrive before the morning peak and leave in phases during the course of the afternoon, and past the evening peak. It should be noted that construction material deliveries will be restricted to between 9am and 3pm in Zones B, C and D; however this restriction is not considered a requirement in Zone A.

6.5.2.1.1. Zone A – Hazelhatch to Park West

The general observation has been that traffic volumes in Zone A are low relative to their capacity, particularly those relative to works areas of the project. These roads are mainly Type 3 roads leading on to Type 2 roads; where Type 3 roads are typically 6m wide and have a capacity for 5000 AADT; these are the more rural or 'peri urban/urban edge' roads between Park West and Hazelhatch.

The smaller Project works packages in this Zone A will not likely even moderately impact traffic flows on external haul routes between the N7 and the N4. Many of these works' packages will also have either non concurrent implementation dates or are in remote locations from each other with different haul routes to reach the main arterial road material supply/removal routes of the N4 & N7. Track Bed excavation work in Zone A is minimal with the average AADT for track works local to an Access Point being 10-25 in Zone A.

The significance of effect associated with traffic flow increase is categorised as Slight.

6.5.2.1.2. Zone B – Park West & Cherry Orchard Station to Heuston Station Yard and Zone D; Liffey Bridge to Glasnevin Junction

The most intensive works Zone is in the highly urbanised four-tracking Zone B between Park West & Cherry Orchard Station to Heuston Station. The contribution of construction vehicle traffic volumes to public road flows even in the most intensive works areas (at their peak) within Zones B and D only results in an additional 5-12 no. vehicles per hour (across the general working day). The varied significance of effect, associated with construction vehicle AADT flow increase on receiving roads, at access points, is highlighted in Table 6.27. The significance of effect associated with flow increase is categorised as Slight.

These roads are in the main well serviced by bus routes and given the impact of the proposed traffic diversions, it is reasonable to assume that some construction personnel may switch to public transport in order to reach the construction sites. While smaller to medium subcontractors typically travel in group share vehicles.

The contractor will be instructed to schedule its personnel to arrive at site by 7am and leave before the afternoon peak at 4pm (or wait until after 7pm) in Zones B, C and D. Refer to Section 6.6 for further details of mitigation measures to regulate peak period traffic.

6.5.2.2 Impact Of Le Fanu Road Bridge (OBC7) Closure on Traffic

A full road closure has been considered necessary to facilitate the track widening and electrification clearances. While it is a local road the road closure will nevertheless be minimised as much as possible. 7 no. Junctions in the vicinity of Le Fanu Road Bridge (OBC7) would be impacted by the proposed diversion route required to facilitate the bridge closure. The junctions are as follows:

- Raheen Park - La Fanu Road - Kylemore Avenue (JTC 1);
- Kylemore Avenue - Kylemore Road (JTC 2);
- Kylemore Road - Landen Road (JTC 3);
- La Fanu Road - Kylemore Park North (JTC 4);
- Kylemore Road - Kylemore Park North (JTC 5);
- Ballyfermot Road – Le Fanu Road (HC 1); and
- Ballyfermot Road – Kylemore Road (HC2).

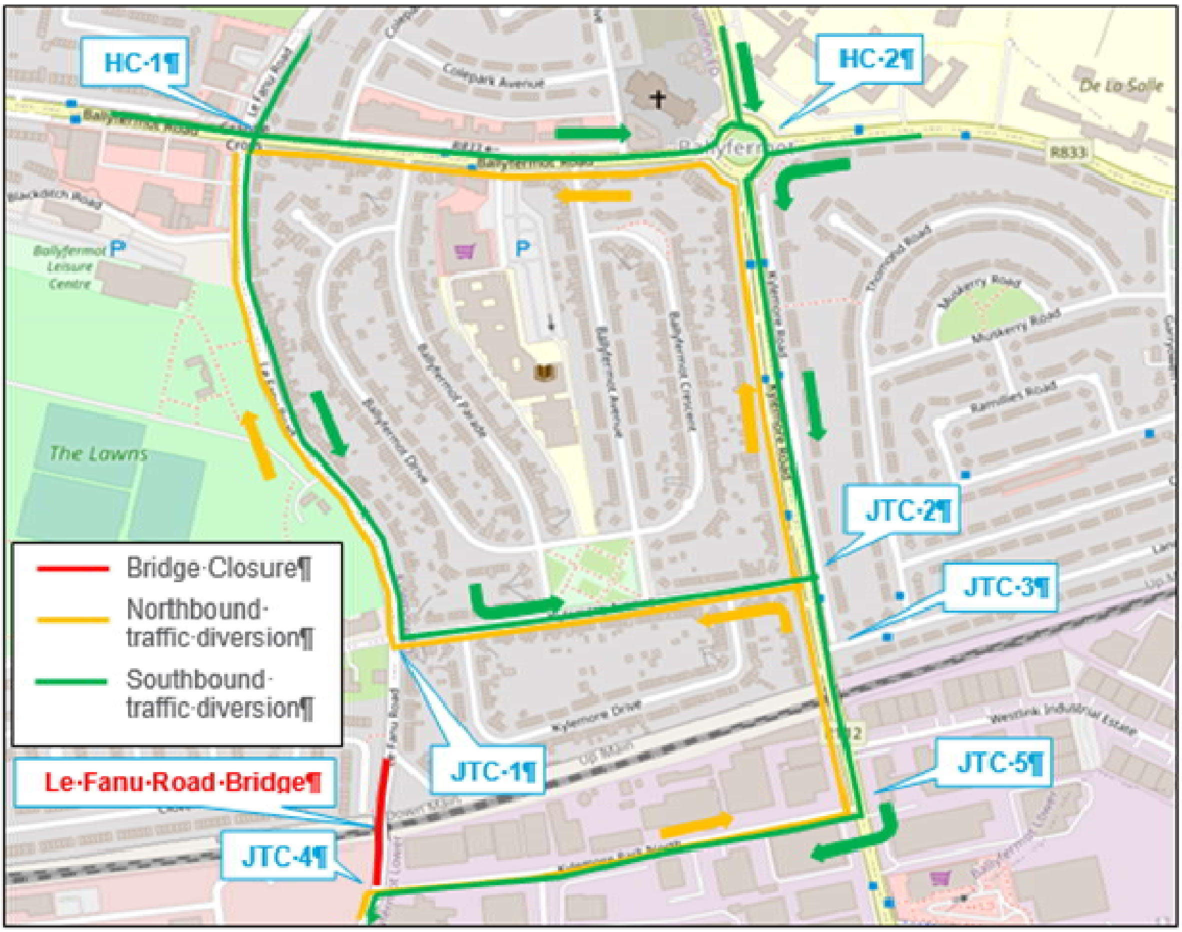


Figure 6-8 Le Fanu Road Bridge (OBC7) Traffic Diversion

This closure would have an impact on traffic distribution within the surrounding road network. It is assumed that 30% of the traffic coming from the north along Le Fanu Road towards Le Fanu Road Bridge (OBC7) will turn left to Kylemore Avenue and then right on junction JTC 2 towards Kylemore Road Bridge (OBC5A). This assumption is in line with the overall traffic volumes on Ballyfermot Rd & Kylemore Avenue. 70% of traffic will divert earlier on Junction HC1 using Ballyfermot Road towards roundabout junction HC2 with Kylemore Road and then will proceed straight through junctions JTC 2 & JTC 3. This diversion is shown in Figure 6-8 and illustrates the extent to which the construction phase diversion (associated with the temporary bridge closure) results in a change in AADT.

6.5.2.2.1. Base Year Assessment (2022) - Le Fanu Road Bridge (OBC7) Closure

The flow diagrams for Le Fanu Road Bridge (OBC7) Closure 2022 Scenario and results for each junction in this scenario are included in Volume 4, Appendix 6.4 and summarized below.

JTC 1

In this scenario the Le Fanu Road Bridge (OBC7) closure will not have a negative impact on JTC 1. The majority of traffic coming to JTC 1 from north will be redistributed on junction HC 1 along Ballyfermot Road giving JTC1 a lesser degree of saturation and smaller delay in the AM peak and PM peak. All traffic coming from Le Fanu Road Bridge from the south will now be redistributed earlier onto junction JTC 4 with no impact on JTC 1.

The bridge closure results in decreased Mean Max Queue delays at the junction with PRC greater than 100% given that junction is operating well above capacity in this scenario.

JTC 2

There is a significant impact on JTC2 in the case of Le Fanu Road Bridge (OBC7) closure resulting in a significant increase in queues with a more than 155 pcu in the AM and more than 160 pcu in PM peak.

The bridge closure results in a significant increase in delays at the junction with a maximum of 1750s in the AM peak and 2920s in the PM peak.

The maximum RFC at the junction as a result of the closure is 2.0 in the AM peak and 2.68 in the PM peak indicating that the junction is well over capacity with F level of service.

Giving that JTC 2 is priority junction, an exercise was undertaken to test the junction as a signalised junction.

The introduction of temporary signals is expected to significantly increase capacity in AM Peak with maximum degree of saturation of 77.6% and around 100% in PM peak.

Mean Max Queue was 20 pcus in AM Peak and 84 pcus in PM Peak, with delay of 42.9 s/pcus and in AM Peak and 134.0 s/pcus in PM Peak.

The junction is still expected to be at full capacity in the AM Peak with PRC 13.1% and slightly beyond capacity in PM Peak with PRC -17.9%.

JTC 3

The bridge closure is expected to result in an increase in queues with a maximum increase of 27 pcu in the AM peak and 30 pcu in the PM peak when compared with the “Do Nothing Scenario”.

The bridge closure is expected to result in a significant increase in delays at the junction with a maximum of 131 s/pcu in the AM peak and PM peak.

The maximum degree of saturation at the junction as a result of the bridge closure is 97.0% in the AM peak and 97.3% in the PM peak indicating that the junction is operating with full capacity.

JTC 4

The Le Fanu Road Bridge (OBC7) closure will not have a negative impact on this junction taking into account that junction's Le Fanu Road arm on the north connecting with bridge will be closed and this junction will become a two way road formed from Kylemore North Park arm on the east and Killeen Road arm on the south. As a result, no impact is expected.

JTC 5

There is expected to be a significant impact on JTC 5 in case of Le Fanu Road Bridge, closure resulting in a significant increase in queues, delays and saturation. The junction is expected to perform at an "F" level of service and indicating that junction is well over capacity.

Given that JTC 5 is priority junction, an exercise has been undertaken in order to assess this junction as a signalised junction.

With the introduction of temporary signals, the capacity is expected to improve with a maximum degree of saturation of 120% in the AM peak and approximately 140% in PM peak, but still over capacity.

Mean Max Queue was 138pcus in AM Peak and 179pcus PM Peak, with delay of 412 s/pcus in AM Peak and 644 s/pcus in PM Peak.

Junction is expected to be over capacity in AM Peak with PRC -33.3% and in PM Peak with PRC -59.7%.

HC 1

In this scenario, the Le Fanu Road Bridge (OBC7) closure will not have a negative impact on HC 1. The majority of traffic heading from HC 1 towards JTC 1 and Le Fanu Road bridge will be redistributed on junction HC 1 along Ballyfermot Road. All northbound traffic on the Le Fanu Road Bridge will now be redistributed earlier on junction JTC 4 with no impact on HC 1.

The bridge closure is expected to result in a decrease in Mean Max Queue delays with a PRC greater than 100%.

HC 2

There is expected to be a negligible increase of 0.5 pcu in queue length in three of the four arms for both AM and PM. Arm 4: Ballyfermot Road eastbound is expected to experience increased queue lengths of 7.9 pcu as result in AM Peak and 2.4 pcu in PM Peak.

The bridge closure is expected to result in a negligible increase in delays at the junction with a maximum of 2.7 s and 0.8 s respectively for the AM and PM Peak scenarios excluding arm 4 which has an increase of 38 s and 13.5 respectively.

The maximum RFC value of 0.93 in the AM Peak and 0.84 in the PM Peak are related to arm 4 giving arms F and D level of service respectively, while the other three arms have maximum values of 0.61 in AM Peak and 0.65 in the PM peak giving rise to a level of service A.

6.5.2.2.2. Future Year Assessment (2028) - Le Fanu Road Bridge (OBC7)

The flow diagram for the Le Fanu Road Bridge (OBC7) Closure 2028 Scenario is included in Volume 4, Appendix 6.2 and results for each junction in this scenario are included in Volume 4, Appendix 6.4 and summarized below.

JTC 1

In this future scenario (2028), the Le Fanu Road Bridge (OBC7) closure will not have negative impact on JTC 1. The majority of traffic coming to JTC 1 will be redistributed on junction HC 1 along Ballyfermot Road giving JTC 1 a lesser degree of saturation and smaller delay in the AM and PM peaks. All traffic coming from Le Fanu Road Bridge from the south will now be redistributed earlier onto junction JTC 4 with no impact on JTC 1.

The bridge closure results in decreased Mean Max Queue delays at the junction with PRC greater than 100% giving that junction is operating well above capacity in this scenario.

JTC 2

The introduction of temporary signals is expected to significantly increase capacity in AM Peak with maximum degree of saturation of 83% and around 110% in PM peak.

Mean Max Queue was 20 pcus in AM Peak and 84 pcus in PM Peak, with delay of 42.9 s/pcus and in AM Peak and 134.0 s/pcus in PM Peak.

The junction is still expected to be at full capacity in the AM Peak with PRC 8.4% and slightly beyond capacity in PM Peak with PRC -22.8%.

JTC 3

The bridge closure is expected to result in an increase in queues with a maximum increase of 55 pcu in the AM peak and 64 pcu in the PM peak when compared with the “Do Nothing Scenario”.

The bridge closure is expected to result in a significant increase in delays at the junction with a maximum of 175 s/pcu in the AM peak and PM peak.

The maximum degree of saturation at the junction as a result of the bridge closure is 101.7% in the AM peak and 102.1% in the PM peak indicating that the junction is operating at full capacity.

JTC 4

The Le Fanu Road Bridge (OBC7) closure will not have a negative impact on this junction taking into account that junction’s Le Fanu Road arm on the north connecting with bridge will be closed and this junction will become a two way road formed from Kylemore North Park arm on the east and Killeen Road arm on the south. As a result, no impact is expected.

JTC 5

There is expected to be a significant impact on JTC 5 in case of Le Fanu Road Bridge, closure resulting in a significant increase in queues, delays and saturation. The junction is expected to perform at an “F” level of service and indicating that junction is well over capacity.

Given that JTC 5 is priority junction, an exercise has been undertaken in order to assess this junction as a signalised junction.

With the introduction of temporary signals, the capacity is expected to improve with a maximum degree of saturation of 131.4% in the AM peak and approximately 155% in PM peak, but still over capacity.

Mean Max Queue was 184 pcu in AM Peak and 215 pcu PM Peak, with delay of 553 s/pcus in AM Peak and 644 s/pcu in PM Peak.

Junction is still expected to be over capacity in AM Peak with PRC -46% and in PM Peak with PRC -73.2%.

HC 1

In this scenario, the Le Fanu Road Bridge (OBC7) closure will not have negative impact on HC 1. The majority of traffic heading from HC 1 towards JTC 1 and Le Fanu Road Bridge will be redistributed on junction HC 1 along Ballyfermot Road. All northbound traffic on the Le Fanu Road Bridge will now be redistributed earlier on junction JTC 4 with no impact on HC 1.

The bridge closure is expected to result in a decrease in Mean Max Queue delays with a PRC greater than 100%.

HC 2

There is expected to be a negligible increase of 2.5 pcu in queue length in three of the four arms for both AM and PM. Arm 4: Ballyfermot Road eastbound is expected to experience increased queue lengths of 20 pcu as result in AM Peak and 7 pcu in PM Peak.

The bridge closure is expected to result in a negligible increase in delays at the junction with a maximum of 13.6 s and 8.8 s respectively for the AM and PM Peak scenarios excluding arm 4 which has an increase of 93s and 43s respectively.

The maximum RFC value of 1.00 in the AM Peak and 0.90 in the PM Peak are related to arm 4 giving arms F and E level of service respectively, while the other three arms have maximum values of 0.68 in AM Peak and 0.71 in the PM peak giving rise to a level of service A and A respectively.

6.5.2.2.3. Sensitivity Analysis (2028) - Le Fanu Road Bridge (OBC7) Closure

As has been noted, it is unlikely that 100% of traffic will be redistributed onto the local road network. For this reason, a sensitivity analysis has been undertaken, presuming that 80% of the redistributed traffic will use the routes in the given scenario and 20% of the redistributed traffic will be diverted outside of the immediate road network. These junctions are as follows: JTC2, JTC 3, JTC 5, HC 2.

The sections below represent Le Fanu Road Bridge Closure (2028) with 80% of redistributed traffic.

Flow diagram for Le Fanu Road Bridge (OBC7) Closure 2028 Sensitivity Analysis Scenario is summarized below.

JTC 2

The junction has been modelled as a temporary signalised junction and mean max queue was 19 pcu in AM Peak and 55 pcu in PM Peak, with an overall delay of 43 s/pcu and 64 s/pcu respectively.

The maximum degree of saturation is expected to be 77.6% in AM Peak and approximately 100.3% in PM peak.

The junction is still expected to be within capacity in AM Peak with a PRC of 16.1.% and just over capacity in PM Peak with a PRC of -11.4%.

JTC 3

The impact on JTC 3 is still expected to be significant with a maximum queue of 36 pcu in the AM peak and 38 pcu in the PM peak

The delay at the junction is a maximum of 107 s/pcu in the AM peak and 118 s/pcu in PM peak.

The maximum degree of saturation is expected to be 96.4% in the AM peak and 95.5% in the PM peak indicating that the junction in this case is operating on full capacity.

PRC is still negative (just over capacity) with values of -7.1`% in AM Peak and -6.1% in PM Peak.

JTC 5

The impact on JTC 5 is also expected to be significant with a maximum queue of 96 pcu in the AM peak and 140 pcu in the PM peak with delay of 256 s/pcu in AM Peak and 496 s/pcu in PM Peak.

In this case, maximum degree of saturation is approx.110% in the AM Peak and 130% in PM peak, indicating that the junction is still expected to be over capacity.

The PRC is still negative with values of -22.9% in AM Peak and -43.7% in PM Peak.

HC 2

There is expected to be a negligible increase of 2.1 pcu in queue length in three of the four arms for both AM and PM. Arm 4: Ballyfermot Road eastbound is expected to experience increased queue lengths of 11 pcu as result in AM Peak and 5 pcu in PM Peak.

The bridge closure is expected to result in a negligible increase in delays at the junction with a maximum of 12.7s and 7.6s respectively for the AM and PM Peak scenarios excluding arm 4 which has an increase of 93s and 13.5s respectively.

The maximum RFC value of 0.94 in the AM Peak and 0.85 in the PM Peak are related to arm 4 giving arms F and D level of service respectively, while the other three arms have maximum values of 0.66 in AM Peak and 0.68 in the PM peak giving rise to a level of service A.

6.5.2.2.4. Summary of the Le Fanu Road Bridge (OBC7) Closure Impact

The closure of the Le Fanu Road Bridge (OBC7) is anticipated to result in significant congestion on the immediate road network to the bridge. During the closure, it is recommended that temporary signals are installed at the following two junctions:

- Kylemore Avenue - Kylemore Road (JTC 2); and
- Kylemore Road - Kylemore Park North (JTC 5)

Temporary signals are considered to be the best operational form of the junctions during the diversion and improves the capacity of each significantly. Even with the implementation of these measures, it is anticipated that the local network may be over capacity. The sensitivity analysis does, however, indicate a significant improvement to the network conditions and is expected to be the case as vehicles are likely to avoid this area during the peak periods. The 20% reduction used in the sensitivity analysis below is conservative and will likely be larger. As a result, it is anticipated that the closure will result in significant short-term delays (first few days) after which vehicles will avoid the area and reduce congestion for the remainder of the closure. Table 6.28 and Table 6.29 represent the impact of bridge closure on Average Annual Daily Traffic (AADT) generated by construction vehicles. It is noted that the bridge closures will not span the full duration of the works programme for the area.

Table 6.28: Increase in AADT on Diversion Routes Associated with Le Fanu Road Bridge Closure

Link Arm ID	Road Name	Existing			Le Fanu Bridge Closure				
		Peak Hour	AADT	HGV %	Peak Hour	Redist. AADT	AADT	HGV %	AADT % Diff.
1	Le Fanu Road (N)	1,497	9,130	2.1	-216	-1,316	7,814	2.1	-14.4
2	Ballyfermot (W)	2,445	14,906	8.8	-32	-198	14,708	8.8	-1.3
3	Ballyfermot (E)	2,208	13,464	11.6	183	1,114	14,578	10.8	8.3
4	Kylemore Road (N)	1,867	11,386	6.5	151	921	12,307	6.1	8.1
5	Le Fanu Road (S)	1,240	7,564	2.5	-648	-3,948	3,616	2.5	-52.2
6	Kylemore Road (S)	2,924	17,831	8.3	793	4,833	22,664	8.0	27.1
7	Kylemore Ave	806	4,916	3.5	516	3,147	8,062	3.4	64.0
8	Le Fanu Road (bridge)	1,503	9,164	2.7	-1,463	-8,920	244	2.7	-97.3
9	Kylemore Road (SS)	2,974	18,136	8.7	1,557	9,497	27,633	8.4	52.4
10	Landen Road	790	4,817	11.1	0	0	4,817	11.1	0.0
11	Kylemore Road (Bridge)	2,921	17,813	7.7	1,589	9,689	27,502	7.5	54.4
12	Kylemore Park Road N	1,272	7,754	12.8	978	5,961	13,715	11.9	76.9
13	L1014	2,191	13,357	9.5	-67	-410	12,947	9.5	-3.1
14	Kylemore Road (SSS)	2,422	14,767	7.5	162	987	15,754	7.1	6.7

The analysis above and in Table 6.29 below should be read conjunction with Volume 4, Appendix 6.4 which clearly displays, in tabular form, the increase or decrease in RFC, PCR, DOS, queuing and delays between the baseline year as well as the 2028 and the 2028 with sensitivity analysis scenarios.

Table 6.29: Summary of Impact & Significance of Le Fanu Road Bridge (OBC5A) Closure Diversion

Category Assessed	Impact	Significance of Effect	Clarification
Vehicular Traffic Volumes	Negative	Significant	Refer to Summary Narratives & Volume 4, Appendix 6.4
Driver (Journey Time Increase)	Negative	Significant	Diversion length greater than 500m
Driver (Junction Delay)	Negative	Significant	Refer to Summary Narratives & Volume 4, Appendix 6.4
Vehicular (Safety)	Negative	Slight	Lack of familiarity with diversion; Potential for driver frustration leading to unsafe driving responses

6.5.2.3 Impact of Kylemore Road Bridge (OBC5A) Closure on Traffic

The traffic management strategy for Kylemore Road Bridge (OBC5A) is to have a partial closure to minimise the impact of the proposed bridge replacement and associated roadworks on each side of the bridge. This approach involves the temporary closure of a single lane, in this case southbound traffic, in order to complete a portion of the associated roadworks leading up to the bridge on either side.

During this period 7 no. junctions in vicinity of Kylemore Road Bridge (OBC5A) would be impacted. The junctions are as follows:

- Raheen Park - La Fanu Road - Kylemore Avenue (JTC 1);
- Kylemore Avenue - Kylemore Road (JTC 2);
- Kylemore Road - Landen Road (JTC 3);
- La Fanu Road - Kylemore Park North (JTC 4);
- Kylemore Road - Kylemore Park North (JTC 5);
- Ballyfermot Road – Le Fanu Road (HC 1); and
- Ballyfermot Road – Kylemore Road (HC 2).

This closure would have an impact on traffic distribution within surroundings road network. It has been assumed that 30% of the diverted traffic going southbound from Ballyfermot roundabout junction HC 2 with Kylemore Road will go along Kylemore Road to Junction with Kylemore Avenue and will turn right along Kylemore Avenue towards JTC 1 where is to take left turn along Le Fanu Road towards Le Fanu Road Bridge (OBC7) and junction north along Le Fanu Road towards Le Fanu Road Bridge (OBC7) will turn left to Kylemore Avenue and then right on junction JTC 2 towards Kylemore Road Bridge (OBC5A) and junction with Kylemore Park North (JTC4). From JTC 4 it has been assumed that 20% of traffic will go northbound along Le Fanu Road and 80% of traffic will turn left and will use Kylemore Park North to reach junction with Kylemore Road (JTC5

Also it has been assumed that 70% of total diverted traffic will be from Ballyfermot roundabout junction with Kylemore Road (HC2) and will continue along Ballyfermot Road towards its junction with

Le Fanu Road (HC1) and will take left turn, using Le Fanu Road to reach with Kylemore Avenue (JTC1). From here it will go further south towards Le Fanu Road Bridge (OBC7) and junction JTC4.

It has been assumed that diverted traffic on JTC 4 will take the same route as the other 30% total diverted traffic, which means that 20% of traffic will continue northbound along Le Fanu Road and 80% of traffic will turn left to Kylemore Park North and finally reaching Junction with Kylemore Road (JTC5).

This diverted traffic is shown on Figure 6-9 below. Table 6.30 illustrates the extent to which the construction phase diversion (associated with the temporary bridge closure) results in a change in AADT volumes.

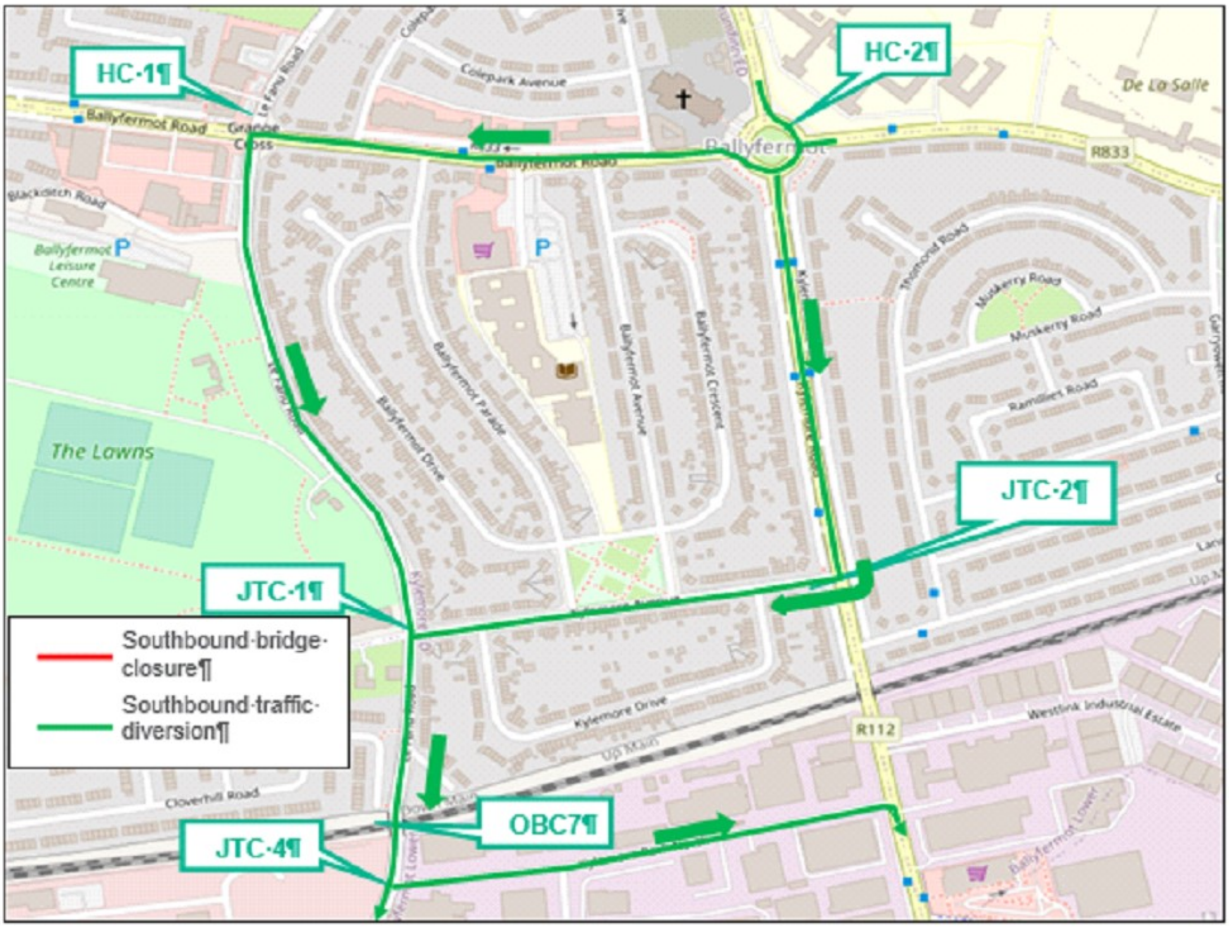


Figure 6-9 Kylemore Road Bridge (OBC5A) Traffic Diversion

6.5.2.3.1. Base Year Assessment (2022) - Kylemore Road Bridge (OBC5A) closure

Flow diagram for Kylemore Road Bridge (OBC5A) Closure 2022 Scenario is included in Volume 4, Appendix 6.2 and results for each junction in this scenario are included in Volume 4, Appendix 6.4 and summarised below.

JTC 1

This closure will have a significant impact on junction JTC 1 resulting in an increase in queues with a maximum of 26 pcu in the AM peak and 15 pcu in the PM peak.

The bridge closure is expected to result in an increase in overall delay at the junction with a maximum of 68 s/pcu in the AM peak and 64 s/pcu in the PM peak.

The maximum degree of saturation at the junction as a result of the bridge closure is 88.6% in the AM peak and 79.1% in the PM peak indicating that the junction is expected to operate within capacity.

The capacity is supported with PRC values of 1.6% and 13.8% in AM Peak and PM Peak respectively.

JTC 2

In this scenario, the Kylemore Road Bridge (OBC5A) closure will not have negative impact on JTC 2. The majority of traffic inbound towards JTC 2 from the north and heading towards Kylemore Road Bridge (OBC5A) will be redistributed on junction HC 2 along Ballyfermot Road, reducing the load and delay on JTC 2 in the AM peak and in PM peak periods. Northbound traffic will remain due to northbound lane closing on Kylemore Road Bridge.

The bridge closure results in a decrease in queue length from 3.4 pcu to 0.5 pcu on Kylemore Ave, delays from 57s to 14 s and improved RFC from 0.80 to 0.33, while Kylemore Rd Northbound arm will slightly deteriorate in queues maximum from 1.2 pcus to 2.1 pcus and increase in delays from 7s to 22s.

Overall, level of service is expected to remain the same or improve.

JTC 3

In this scenario, no negative impact is expected on JTC 3. The majority of traffic coming to JTC 3 from the north will be redistributed on junction HC 2 along Ballyfermot Road and junction JTC 2, giving JTC 3 less degree of saturation and less delay in the AM peak and in PM peak. While northbound traffic will go straight through due to right turn restrictions on JTC 3.

The bridge closure results in a decrease of Mean Max Queue and delays at the junction with PRC improving from 49.3% to 80.1% in AM Peak and from 38.8 to 41.4% in PM Peak.

This shows that junction is expected to perform better as a result of the closure.

JTC 4

A significant impact is expected as a result of the bridge closure with significant increases in queues, delays and RFC factor. This results in an F level of service and indicates that the junction is well over capacity.

Given that JTC 4 is priority junction, an exercise has been undertaken in order to assess this junction as a signalised junction.

This results in an improved capacity with a maximum degree of saturation of 176% in AM Peak and around 108% in PM peak.

The mean max queue was 124 pcu in the AM Peak and 50 pcu in the PM Peak, with an overall delay of 923 s/pcu in AM Peak and 210 s/pcu in PM Peak.

This junction is expected to perform significantly beyond capacity in AM Peak with PRC -95.5% and in PM Peak with PRC -20%.

JTC 5

There is significant impact on JTC 5 in case of Kylemore Road Bridge (OBC5A) closure especially at Kylemore Park North resulting in a significant increase in queues with a more than 224 pcu in the AM and more than 155 pcu in PM peak.

The bridge closure results in a significant increase in delays at the junction with a maximum of 1842s in the AM peak and 1361s in the PM peak.

The maximum RFC at the junction as a result of the closure is 1.7 in the AM peak and 1.58 in the PM peak indicating that the junction is well over capacity with F level of service with regardless that Kylemore Road southbound arm will be closed.

Given that JTC 4 is a priority junction, an exercise has been undertaken in order to assess this junction as a signalised junction.

In case of temporary introducing signals on this junction the capacity was significantly improved in AM Peak with maximum degree of saturation of 80.7% and around 81.3% in PM peak.

Mean Max Queue was 18 pcus in AM Peak and 33 pcus in PM Peak, with delay of 35.5 s/pcus in AM Peak and 33.4 s/pcus in PM Peak.

The introduction of temporary signals is expected to fully resolve the capacity of the junction with PRC values of 11.5% in AM Peak and 10.7% in PM Peak.

HC 1

There is significant impact on HC 1 in case of Kylemore Road Bridge (OBC5A) closure and is as a result of the AM peak period where the junction expected to operate close to capacity with a maximum degree of saturation of 89.9%.

There is a significant increase in queues with a more than 42 pcu in the AM Peak and more than 20 pcu in PM peak.

The bridge closure is expected to result in a significant increase in delays at the junction with a maximum of 221s in the AM peak and 65s in the PM peak.

The maximum degree of saturation is expected to be 107.2% in AM Peak and 76.9% in PM Peak.

Junction is expected to operate over capacity in AM Peak with a PRC -19.1% and under capacity in PM Peak with PRC 16.7%.

HC 2

No impact is expected for HC 2 as a result of the Kylemore Road closure. The majority of traffic. Queues are expected to decrease from 2.4 pcu to 1.3 pcu in AM Peak and 2.5 pcu to 1.8 pcu in PM Peak. The bridge closure is also expected to result in decreased delays from 15s to 10s in AM Peak and from 15s to 12s in PM Peak.

The maximum RFC at the junction as a result of the closure is 0.58 in the AM peak and 0.63 in the PM peak indicating that the junction is operating well under capacity with A and B level of service in AM Peak and PM Peak respectively.

6.5.2.3.2. Future Year Assessment (2028) - Kylemore Road Bridge (OBC5A) Closure

Flow diagram for Kylemore Road Bridge (OBC5A) Closure 2028 Scenario is included in Volume 4, Appendix 6.2 and results for each junction in this scenario are included in Volume 4, Appendix 6.4 and summarized below.

JTC 1

This closure will have a significant impact on junction JTC 1 resulting in an increase in queues with a maximum of 28 pcu in the AM peak and 18 pcu in the PM peak.

The bridge closure is expected to result in an increase in overall delay at the junction with a maximum of 90 s/pcu in the AM peak and 79 s/pcu in the PM peak.

The maximum degree of saturation at the junction as a result of the bridge closure is 92.6% in the AM peak and 87.4% in the PM peak indicating that the junction is expected to operate within capacity.

The capacity is supported with PRC values of -2.9% and 3.0% in AM Peak and PM Peak respectively.

JTC 2

In this scenario, the Kylemore Road Bridge (OBC5A) closure will not have negative impact on JTC 2. The majority of traffic inbound towards JTC 2 from the north and heading towards Kylemore Road Bridge (OBC5A) will be redistributed on junction HC 2 along Ballyfermot Road, reducing the load and delay on JTC 2 in the AM peak and in PM peak periods. Northbound traffic will remain due to northbound lane closing on Kylemore Rd Bridge.

Overall, level of service is expected to remain the same or improve.

JTC 3

This shows that junction in this scenario is still operating well under capacity.

In this scenario, no negative impact is expected on JTC 3. The majority of traffic coming to JTC 3 from north will be redistributed on junction HC 2 along Ballyfermot Road and junction JTC 2, giving JTC 3 less degree of saturation and less delay in AM peak and in PM peak. While northbound traffic will go straight through due to right turn restrictions on JTC 3.

This shows that junction is expected to perform better as a result of the closure.

JTC 4

A significant impact is expected as a result of the bridge closure significant increases in queues, delays and RFC factor. This results in an F level of service and indicates that the junction is well over capacity.

Given that JTC 4 is priority junction, an exercise has been undertaken in order to assess this junction as a signalised junction.

This results in an improved capacity with a maximum degree of saturation of 176% in AM Peak and around 108% in PM peak.

The mean max queue was 167 pcu in the AM Peak and 83 pcu in the PM Peak, with an overall delay of 1204 s/pcu in AM Peak and 386 s/pcu in PM Peak.

This junction is expected to perform significantly beyond capacity in AM Peak with PRC -156% and in PM Peak with PRC -34%.

JTC 5

Given that JTC 4 is a priority junction, an exercise has been undertaken in order to assess this junction as a signalised junction.

In case of temporary introducing signals on this junction the capacity was significantly improved in AM Peak with maximum degree of saturation of 84.8% and around 85.4% in PM peak.

Mean Max Queue was 18 pcus in AM Peak and 33 pcus in PM Peak, with delay of 35.5 s/pcus in AM Peak and 33.4 s/pcus in PM Peak.

The introduction of temporary signals is expected to fully resolve the capacity of the junction with PRC values of 6.1% in AM Peak and 5.4% in PM Peak.

HC 1

There is significant impact on HC 1 in case of Kylemore Road Bridge (OBC5A) closure and is as a result of the AM peak period where the junction expected to operate close to capacity with a maximum degree of saturation of 89.9%.

There is a significant increase in queues with a more than 42 pcu in the AM Peak and more than 20 pcu in PM peak.

The bridge closure is expected to result in a significant increase in delays at the junction with a maximum of 351s in the AM peak and 72s in the PM peak.

The maximum degree of saturation is expected to be 118.6% in AM Peak and 84.8% in PM Peak.

Junction is expected to operate over capacity in AM Peak with a PRC -31.5% and under capacity in PM Peak with a PRC of 6.1%.

HC 2

In this future 2028 scenario the Kylemore Road Bridge (OBC5A) closure will not have negative impact on HC 2. Majority of traffic coming to HC 2 from HC 1 to get to the Kylemore Road Bridge will be redistributed earlier, on junction HC 1, to get to the Le Fanu Road Bridge (OBC7); while the rest of the traffic, which intend to cross Kylemore Road Bridge, will be redistributed along Ballyfermot Road to HC 2 and further north towards Le Fanu Road Bridge.

In this 2028 future scenario maximum queue is 2.5 pcus in AM Peak and 14 pcus in PM Peak, with delay of 11s in AM Peak and 14 s in PM Peak.

The maximum RFC at the junction as a result of the closure is 0.70 in the AM peak and 0.68 in the PM peak indicating that the junction is still operating under capacity with B level of service.

No impact is expected for HC 2 as a result of the Kylemore Road closure. The maximum RFC at the junction as a result of the closure is expected to be 0.70 in the AM peak and 0.68 in the PM peak indicating that the junction is operating well under capacity with a level of service B for both peak periods.

6.5.2.3.3. Sensitivity Analysis (2028) - Kylemore Road Bridge (OBC5A) Closure

As mentioned earlier, it is unlikely that 100% of traffic will be redistributed onto the local road network. For this reason, a sensitivity analysis has been undertaken presuming that 80% of the redistributed traffic will use the routes in the given scenario and 20% of the redistributed traffic will be diverted outside of the immediate road network. The only junctions to be assessed as part of the sensitivity analysis are the junctions which were expected to be over capacity in the previous section.

The sections below represent Kylemore Road Bridge Closure (2028) with 80% of redistributed traffic.

Flow diagram for Kylemore Road Bridge (OBC5A) Closure 2028 Sensitivity Analysis Scenario is included in Volume 4, Appendix 6.2 and results for each junction in this scenario are included in Volume 4, Appendix 6.4 and summarized below.

JTC 4

Following the sensitivity analysis, a reduced impact is expected on JTC 4. This junction was modelled as a temporary signalised junction which yielded a Mean Max Queue of 94 pcu in AM Peak and 36 pcu in PM Peak, with delays of 641 s/pcu and 114 s/pcu respectively.

This results in an improved capacity with a maximum degree of saturation of 176% in AM Peak and around 108% in PM peak.

The mean max queue was 167 pcu in the AM Peak and 83 pcu in the PM Peak, with an overall delay of 1204 s/pcu in AM Peak and 386 s/pcu in PM Peak.

This junction is still expected to perform beyond capacity in AM Peak with PRC -156% and in PM Peak with PRC -34%.

HC 1

Following the sensitivity analysis, a reduced impact is expected on HC 1. The overall delay was reduced to 161 s/pcu in the AM Peak and 62 s/pcu in PM Peak. The maximum degree of saturation is 98.3% in AM Peak and 75.5% in PM Peak.

As a result, junction is expected to improve improvement but is still at capacity during the AM Peak with a PRC of -10.3% and some spare capacity in PM Peak with PRC 19.2%.

6.5.2.3.4. Summary Of Kylemore Road Bridge (OBC5A) Closure Impact

The closure of the Kylemore Road Bridge (OBC5A) is anticipated to result in significant congestion on the road network immediately proximate to the bridge. During the closure, it is recommended that temporary signals are installed at the following two junctions:

- Le Fanu Road - Kylemore Park North (JTC 4); and
- Kylemore Road - Kylemore Park North (JTC 5)

Temporary signals are considered to be the best operational form of the junctions and improve the capacity of each significantly. Even with the implementation of these measures, it is anticipated that the local network may be over capacity. The sensitivity analysis does, however, indicate a significant improvement to the network conditions and is expected to be the case as vehicles are likely to avoid this area during the peak periods. The 20% reduction used in the sensitivity analysis is conservative and will likely be larger. As a result, it is anticipated that the closure will result in significant short-term delays (first few days) after which vehicles will avoid the area and reduce congestion for the remainder of the closure.

Table 6.30: Increase in AADT on Diversion Routes Associated with Kylemore Road Closure

ID	Road Name	Existing			Kylemore Road Bridge Closure				
		Peak Hour	AADT	HGV %	Peak Hour	Redist. AADT	AADT	HGV %	AADT % Diff.
1	Le Fanu Road (N)	1,497	9,130	2.1	-26	-157	8,973	2.1	-1.7
2	Ballyfermot (W)	2,445	14,906	8.8	-7	-46	14,860	8.8%	-0.3
3	Ballyfermot (E)	2,208	13,464	11.6	286	1,742	15,207	11.3 %	12.9
4	Kylemore Road (N)	1,867	11,386	6.5	0	0	11,386	6.5%	0.0
5	Le Fanu Road (S)	1,240	7,564	2.5	612	3,733	11,297	3.1%	49.4
6	Kylemore Road (S)	2,924	17,831	8.3	-645	-3,935	13,896	8.3	-22.1
7	Kylemore Ave	806	4,916	3.5	338	2,061	6,977	4.2	41.9
8	Le Fanu Road (bridge)	1,503	9,164	2.7	1,270	7,741	16,906	3.1	84.5
9	Kylemore Road (SS)	2,974	18,136	8.7	-861	-5,247	12,889	8.7	-28.9
10	Landen Road	790	4,817	11.1	0	0	4,817	11.1	0.0
11	Kylemore Road (Bridge)	2,921	17,813	7.7	-1,352	-8,245	9,568	7.7	-46.3
12	Kylemore Park Road (N)	1,272	7,754	12.8	823	5,021	12,775	12.4	64.7
13	Le Fanu/Killeen Road (L1014)	2,191	13,357	9.5	254	1,548	14,906	9.3	11.6
14	Kylemore Road (SSS)	2,422	14,767	7.5	48	292	15,059	7.5	2.0

The analysis above and in Table 6.31 below should be read conjunction with Volume 4, Appendix 6.4 which clearly displays, in tabular form the increase or decrease in RFC, PCR, DOS, queuing and delays between the baseline year as well as the 2028 and the 2028 with sensitivity analysis scenarios.

Table 6.31: Summary of Impact & Significance of Kylemore Road Bridge (OBC5A) Closure

Category Assessed	Impact	Significance of Effect	Clarification
Vehicular Traffic Volumes	Negative	Significant	Refer to Summary Narratives & Volume 4, Appendix 6.1
Driver (Journey Time Increase)	Negative	Significant	Diversion length greater than 500m
Driver (Junction Delay)	Negative	Significant	Refer to Summary Narratives & Volume 4, Appendix 6.4
Vehicular (Safety)	Negative	Slight	Lack of familiarity with diversion; Potential for driver frustration leading to unsafe driving responses

6.5.2.4 Impact Of Memorial Road Bridge (OBC3) Closure on Traffic

The Memorial Road Bridge (OBC3) is to be upgraded and conform where possible to the requirements of the proposed BusConnects Scheme, specifically, Route 6 – Lucan to City Centre.

The traffic management strategy includes full closure of the bridge, as necessitated for the bridge reconstruction. During this period 6 no. junctions in the vicinity of Memorial Road Bridge (OBC3) would be impacted. The junctions are as follows:

- Chapelizod Bypass – Memorial Road (HC 4);
- Inchicore Road – Sarsfield Road – Grattan Cres (JTC 6);
- Inchicore Road – Memorial Road (JTC 7);
- Grattan Cres – Tyrconnell Road – Emmet Road (JTC 11);
- Emmet Road – Old Kilmainham – South Circular Road (JTC 10);
- South Circular Road – Inchicore Road – Kilmainham Lane (JTC 8); and
- Chapelizod Bypass – South Circular Road (HC 5).

This closure would have an impact on traffic distribution within the surrounding road network. Taking into account that Memorial Road is a one-way road all traffic turning from Inchicore Road to Memorial Road to reach Chapelizod Bypass will be diverted straight through on JTC 7 along Inchicore Road and straight through JTC 6 along Grattan Cress (R839). Also, traffic coming from Sarsfield Road towards Inchicore Road on JTC 6 and further towards Memorial Road will be diverted right on JTC 6 along Grattan Cress (R839).

Both of these two diverted traffic flows will go southbound along Grattan Cres (R839) towards its junction with Emmet Road (JTC 11) and will turn left using Emmet Road to reach junction with South Circular Road (JTC10). From Emmet road on JTC 10, the diverted traffic will turn left and along South Circular Road passing through JTC 8 and finally reach Chapelizod Bypass on junction HC5. Here it will turn left to reach the final destination using the Chapelizod Bypass (R148). This diverted traffic is shown on Figure 6-10 below. Table 6.23 illustrates the extent to which that the construction phase diversion (associated with the temporary bridge closure) results in a change in AADT.

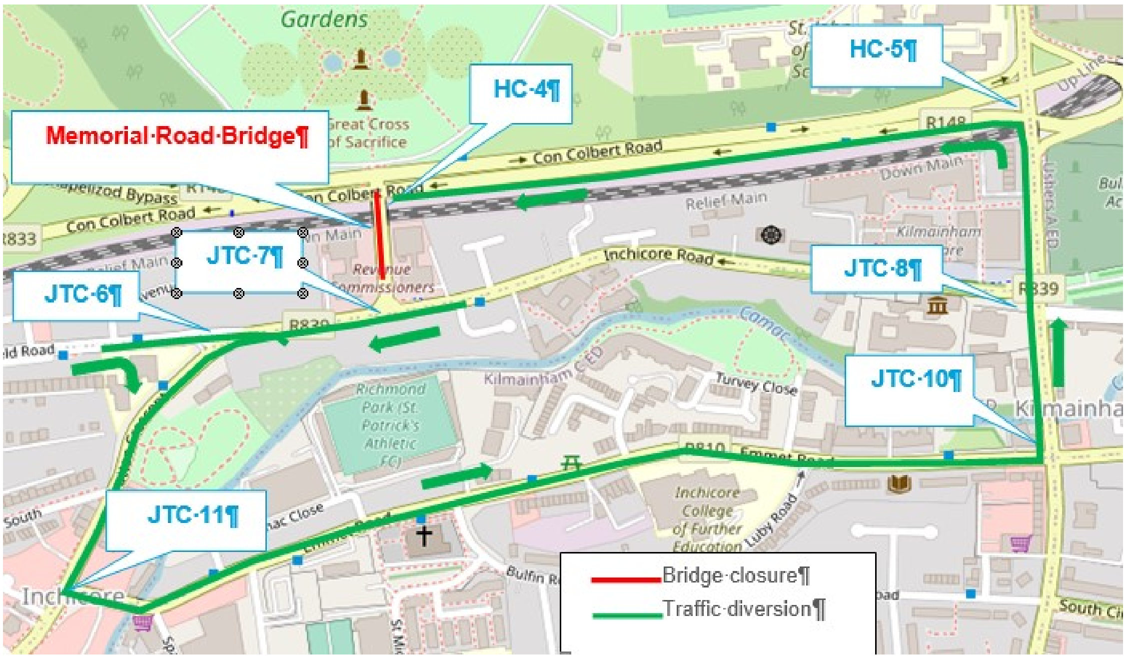


Figure 6-10 Memorial Road Bridge (OBC3) Traffic Diversion

6.5.2.4.1. Base Year Assessment (2022) - Memorial Road Bridge (OBC3) Closure

Flow diagram for Memorial Road Bridge (OBC3) Closure 2022 Scenario is included in Volume 4, Appendix 6.2 and results for each junction in this scenario are included in Volume 4, Appendix 6.4 and summarized below.

JTC 6

In this scenario, the Memorial Road Bridge (OBC3) closure will not have negative impact on JTC 6. Most of the traffic coming from south Grattan Cres arm will be redistributed earlier on junction JTC 11, bringing less traffic to JTC 6 from the south.

The bridge closure is expected to result in a decrease in Mean Max Queue and delays at the junction with PRC improving from 42.7% to 74.8% in AM Peak and from 72.3% to 146.2% in PM Peak.

This shows that junction performance will improve.

JTC 8

This closure is expected have a significant impact on junction JTC 8, resulting in an increase in queues with a maximum of 36 pcu in the AM peak and 164 pcu in the PM peak.

Increased delays are expected at the junction with a maximum of 71 s/pcu in the AM peak and 135 s/pcu in the PM peak.

The maximum degree of saturation at the junction as a result of the bridge closure is 91.4% in the AM peak and 102.7% in the PM peak indicating that the junction is operating close to capacity in the AM peak and slightly over capacity during the PM peak.

PRC values are expected to be -1.6% and -14.1% in AM and PM Peaks respectively.

JTC 10

A significant impact is expected, resulting in increased queues with a maximum of 26 pcu in the AM peak and 25 pcu in the PM peak.

The bridge closure is expected to result in an increase in delay with a maximum of 52 s/pcu in the AM peak and 53 s/pcu in the PM peak.

The maximum degree of saturation at the junction as a result of the bridge closure is 89.7% in the AM peak and 88.9% in the PM peak indicating that the junction is operating within capacity.

PRC values are 0.4% and 1.3% in AM Peak and PM Peak respectively.

JTC 11

A significant impact is expected, particularly during the AM Peak while the PM Peak is still under capacity.

There is a significant increase in queues with a more than 34 pcu in the AM Peak and more than 54 pcu in PM peak.

The bridge closure results in a significant increase in delays at the junction with a maximum of 133s in the AM peak and 57s in the PM peak.

The maximum degree of saturation is 102.1% in AM Peak and 77.1% in PM Peak.

Junction is expected to operate slightly over capacity in the AM Peak with a PRC of -13.4% and close to capacity in the PM Peak with a PRC of 7.1%.

6.5.2.4.2. Future Year Assessment (2028) - Memorial Road Bridge (OBC3) Closure

Flow diagram for Memorial Road Bridge (OBC3) Closure 2028 Scenario is included in Volume 4, Appendix 6.2 and results for each junction in this scenario are included in Volume 4, Appendix 6.4 and summarized below.

JTC 6

In this scenario, the Memorial Road Bridge (OBC3) closure will not have negative impact on JTC 6. Most of the traffic coming from south Grattan Cres arm will be redistributed earlier on junction JTC 11, bringing less traffic to JTC 6 from the south.

The bridge closure results in decrease Mean Max Queue and delays at the junction with PRC 67.8% in AM Peak and 134.4% in PM Peak.

This shows that junction performance will improve.

JTC 8

This closure is expected have a significant impact on junction JTC 8, resulting in an increase in queues with a maximum of 43 pcu in the AM peak and 93 pcu in the PM peak.

Increased delays are expected at the junction with a maximum of 74 s/pcu in the AM peak and 196 s/pcu in the PM peak.

The maximum degree of saturation at the junction as a result of the bridge closure is 97.2% in the AM peak and 108.2% in the PM peak indicating that the junction is operating close to capacity in the AM peak and slightly over capacity during the PM peak.

PRC values are expected to be -8% and -20.3% in AM and PM Peaks respectively.

JTC 10

A significant impact is expected, resulting in increased queues with a maximum of 30 pcu in the AM peak and 29 pcu in the PM peak.

The bridge closure is expected to result in an increase in delay with a maximum of 62 s/pcu in the AM peak and 61 s/pcu in the PM peak.

The maximum degree of saturation at the junction as a result of the bridge closure is 93.9% in the AM peak and 93.2% in the PM peak indicating that the junction is operating within capacity.

PRC values are -4.3% and 3.6% in AM Peak and PM Peak respectively.

JTC 11

A significant impact is expected, particularly during the AM Peak while the PM Peak is still under capacity.

There is a significant increase in queues with a more than 48 pcu in the AM Peak and more than 20 pcu in PM peak.

The bridge closure results in a significant increase in delays at the junction with a maximum of 201s in the AM peak and 62s in the PM peak.

The maximum degree of saturation is 107.2% in AM Peak and 88.3% in PM Peak.

Junction is expected to operate slightly over capacity in the AM Peak with a PRC of -19.1% and close to capacity in the PM Peak with a PRC of 2.0%.

6.5.2.4.3. Sensitivity Analysis - Memorial Road Bridge (OBC3) Closure

As mentioned earlier, it is unlikely that 100% of traffic will be redistributed onto the local road network. For this reason, a sensitivity analysis has been undertaken presuming that 80% of the redistributed traffic will use the routes in the given scenario and 20% of the redistributed traffic will be diverted outside of the immediate road network. These junctions are as follows: JTC2, JTC 3, JTC 5, HC 2.

The sections below represent Memorial Road Bridge Closure (2028) with 80% of redistributed traffic.

The Flow diagram for Memorial Road Bridge (OBC3) Closure 2028 Sensitivity Analysis Scenario is included in Volume 4, Appendix 6.2 and results for each junction in this scenario are included in Volume 4, Appendix 6.4 and summarized below.

JTC 8

For the future 2028 scenario Sensitivity Analysis has been undertaken and there is a reduced but still significant impact on JTC 8 in case of Memorial Road Bridge (OBC3) closure.

The improvement has been made but the main impact is related with PM Peak where Mean Max Queue was 42 pcus AM Peak was 32 pcus. Delay was reduced to 71 s/pcus in AM Peak and 162 s/pcus in PM Peak.

The maximum degree of saturation is 88.6% in AM Peak and 100.7% in PM Peak.

Giving this, junction is now operating with some improvement but still in almost full capacity in AM Peak with PRC 1.6% and beyond capacity in PM Peak with PRC -11.9%.

JTC10

For the future 2028 scenario Sensitivity Analysis has been undertaken and there is a reduced but still significant impact on JTC 10 in the case of Memorial Road Bridge (OBC3) closure.

The improvement has been made but there is an impact related with AM Peak where Mean Max Queue was 25 pcus and PM Peak was 23 pcus. Delay was reduced to 54 s/pcus in AM Peak and 51 s/pcus in PM Peak.

The maximum degree of saturation is 89.3% in AM Peak and 83.9% in PM Peak.

Giving this, junction is now operating with some improvement but still very close to full capacity in AM Peak with PRC 0.7% and 7.2% in PM Peak with.

JTC 11

A significant impact is expected, particularly during the AM Peak while the PM Peak is still under capacity.

There is a significant increase in queues with a more than 35 pcu in the AM Peak and more than 17 pcu in PM peak.

The bridge closure results in a significant increase in delays at the junction with a maximum of 153s in the AM peak and 52s in the PM peak.

The maximum degree of saturation is 103.4% in AM Peak and 83.6% in PM Peak.

Junction is expected to operate slightly over capacity in the AM Peak with a PRC of -14.9% and close to capacity in the PM Peak with a PRC of 7.7%.

6.5.2.4.4. Summary Of Memorial Road Bridge (OBC3) Closure Impact

The closure of the Memorial Road Bridge (OBC3) is anticipated to result in congestion on the road network in the immediate proximity of the bridge.

It is anticipated that the local network may be over capacity, particularly at JTC 8 and JTC 11. The sensitivity analysis does, however, indicate a significant improvement to the network conditions and is expected to be the case as vehicles are likely to avoid this area during the peak periods. The 20% reduction used in the sensitivity analysis is conservative and will likely be larger. As a result, it is anticipated that the closure will result in significant short-term delays (first few days) after which vehicles will avoid the area and reduce congestion for the remainder of the closure.

Table 6.32: Increase in AADT on Diversion Routes Associated with Memorial Road Closure

Link Arm ID	Road Name	Existing			Memorial Road Bridge Closure				
		Peak Hour	AADT	HGV %	Peak Hour	Redist.	AADt	HGV %	AADT % Diff
15	Sarsfield Road (Bridge)	946	5,765	10.6	0	0	5,765	10.6	0.0
16	R839 (N)	2,330	14,205	6.6	-750	-4,575	9,630	6.6	-32.2
17	R839 (S)	2,344	14,290	8.8	0	0	14,290	8.8	0.0
18	R810 (W)	2,307	14,065	8.9	134	814	14,879	7.9	5.8
19	R111 (N)	2,473	15,080	3.6	927	5,654	20,734	4.2	37.5
20	Ballyfermot (EE)	2,341	14,277	10.4	0	0	14,277	10.4	0.0
21	Con Colbert Rd	1,477	9,005	10.3	0	0	9,005	10.3	0.0
22	Inchicore Road (W)	1,425	8,688	6.2	-750	-4,575	4,113	6.2	-52.7
23	Inchicore Road (E)	610	3,716	4.0	0	0	3,716	4.0	0.0
24	Memorial Road	1,147	6,993	6.0	-1,147	-6,993	0	6.0	-100.0
25	Chapelizod Bypass (W)	4,590	27,988	13.9	0	0	27,988	13.9	0.0
26	Chapelizod Bypass (E)	4,234	25,815	12.9	514	3,136	28,951	11.6	12.1
27	South Circular (S Bridge)	2,840	17,315	4.2	927	5,654	22,969	4.6	32.7
28	South Circular (N Bridge)	2,855	17,410	6.0	413	2,518	19,928	6.0	14.5
29	Conyngham Road (E)	2,494	15,205	8.2	0	0	15,205	8.2	0.0
30	Conyngham Road (W)	1,741	10,615	7.1	0	0	10,615	7.1	0.0
31	R148 (E)	3,817	23,275	18.2	0	0	23,275	18.2	0.0
32	Kilmainham Lane	353	2,155	1.4	0	0	2,155	1.4	0.0
33	R810 (E)	1,509	9,201	14.5	-374	-2,280	6,921	14.5	-24.8
34	R111 (S)	2,074	12,645	5.1	374	2,280	14,926	5.4	18.0
35	Raheen Park	1,033	6,300	2.8	0	0	6,300	2.8	0.0

The analysis above and in Table 6.33 below should be read conjunction with Volume 4, Appendix 6.4 which clearly displays, in tabular form, the increase or decrease in RFC, PCR, DOS, queuing and delays between the baseline year as well as the 2028 and the 2028 with sensitivity analysis scenarios.

Table 6.33: Summary of Impact & Significance of Memorial Road Bridge (OBC3) Closure Diversion

Category Assessed	Impact	Significance of Effect	Clarification
Vehicular Traffic Volumes	Negative	Significant	Refer to Summary Narratives & Volume 4, Appendix 6.4
Driver (Journey Time Increase)	Negative	Significant	Diversion length greater than 500m
Driver (Junction Delay)	Negative	Significant	Refer to Summary Narratives & Volume 4, Appendix 6.4
Vehicular (Safety)	Negative	Slight	Lack of familiarity with diversion; Potential for driver frustration leading to unsafe driving responses

6.5.3. Impact of South Circular Road Interchange (R111 & R148) Temporary Junction Modifications on Traffic

The section includes the impact of the works on the South Circular Road (R111)/Con Colbert Road (R148) junction. Due to the sensitivity of the junction, full closure has not been considered. The new cut and cover structure (buried portal) for DART+ South West electrified tracks is proposed to be constructed in two phases; with the layout of the junction being temporarily modified for each phase. The junction modifications are summarised in Figure 6-11 below. In both of the phases, the vehicles travelling along the R111 southbound will be diverted through the anti-clockwise loop of the gyratory link (over St John's Road Bridge (OBC0A).

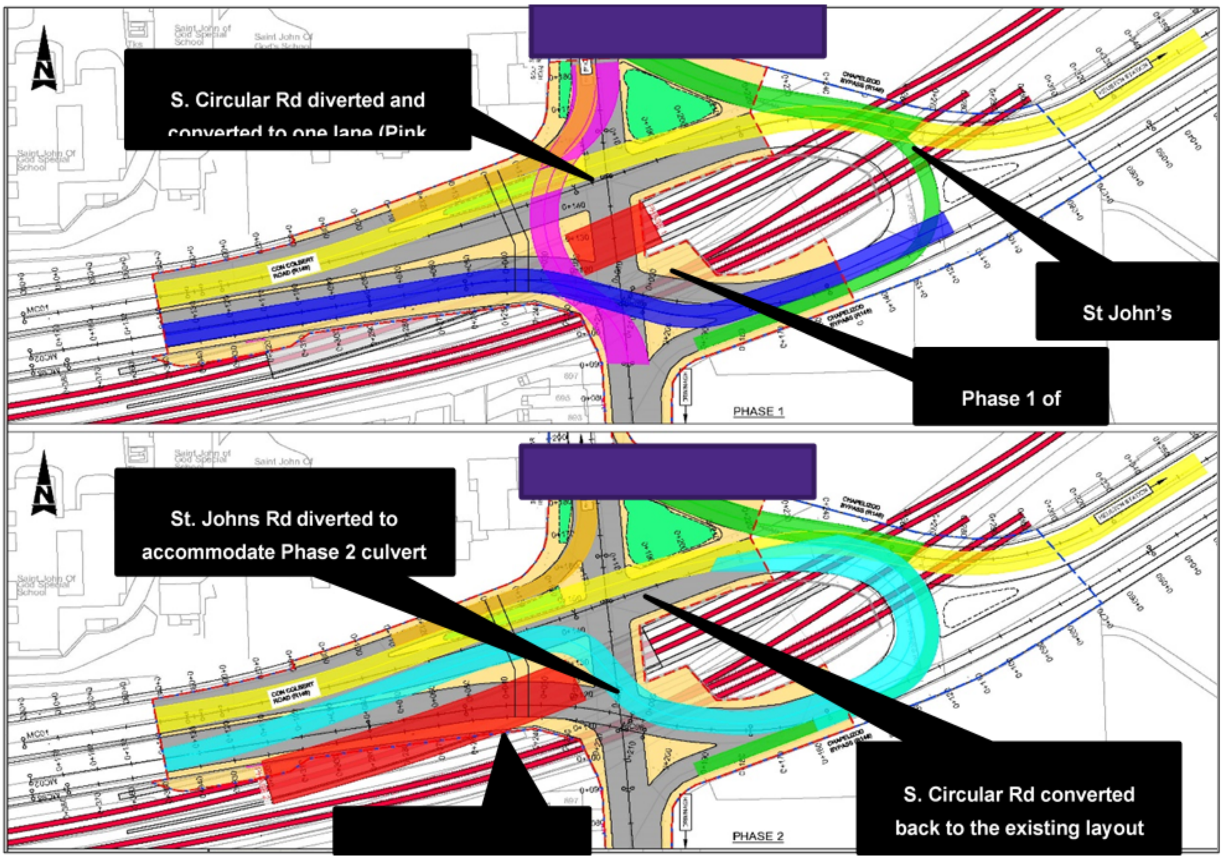


Figure 6-11 Anticipated Construction Phasing at South Circular Rd

A microsimulation VISSIM model was developed to determine the impact of both phases of construction.

The extent of the microsimulation model is shown in the Figure 6-12 (the various colours represent flow paths i.e. eastbound or westbound). In addition to the R148-R111 junction, the model includes Inchicore Road/South Circular Road junction located south of the junction. It was to take account of the backing up of the queue along the South Circular Road southbound arm to R148/R111 junction.

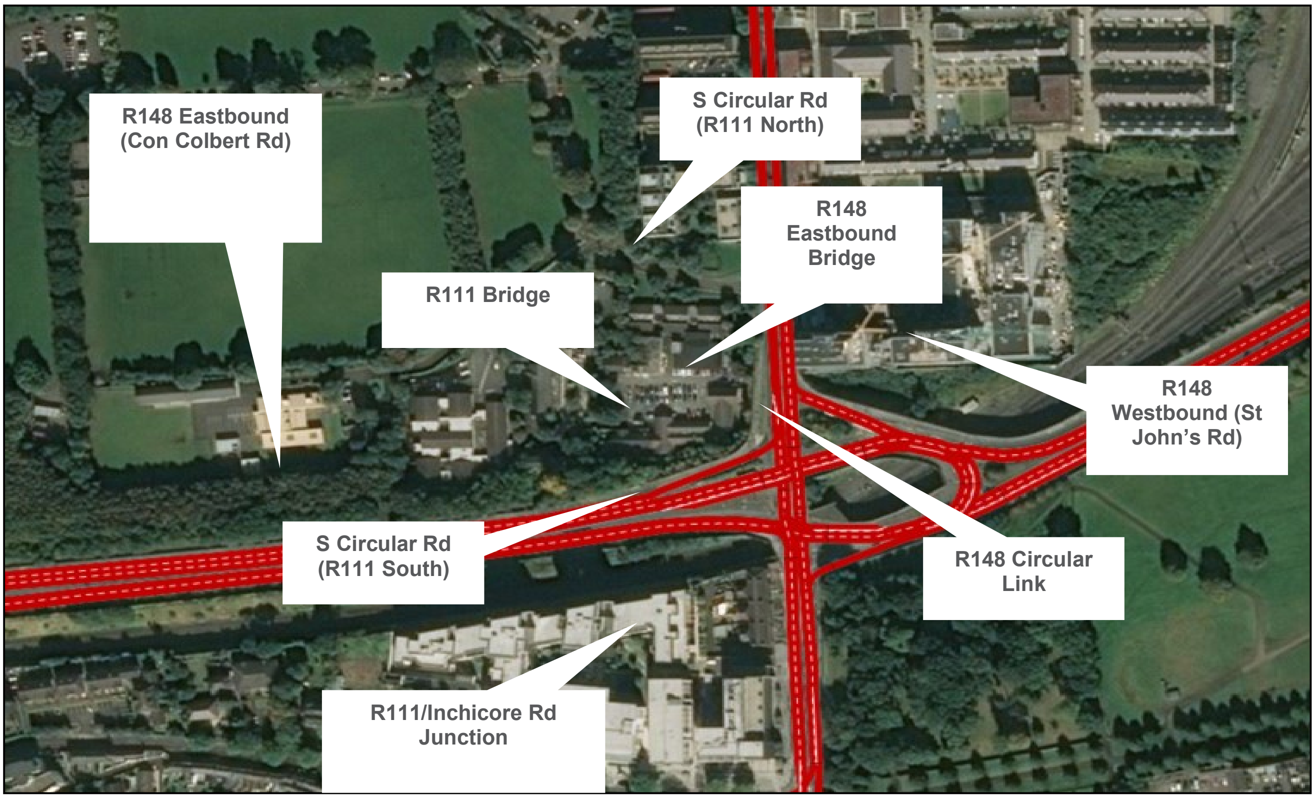


Figure 6-12 Extent of VISSIM Model

6.5.3.1 Stage Sequencing

The stage sequence for both the R148-R111 and the R111-Inchicore Road junctions were coded in accordance with the SCATs data provided by DCC. (SCATS is a traffic control system designed to optimise traffic flow and is in operation with Dublin City Council). The stage sequence and signal groups for Inchicore junction is summarised below in Figure 6-13 and Figure 6-14.

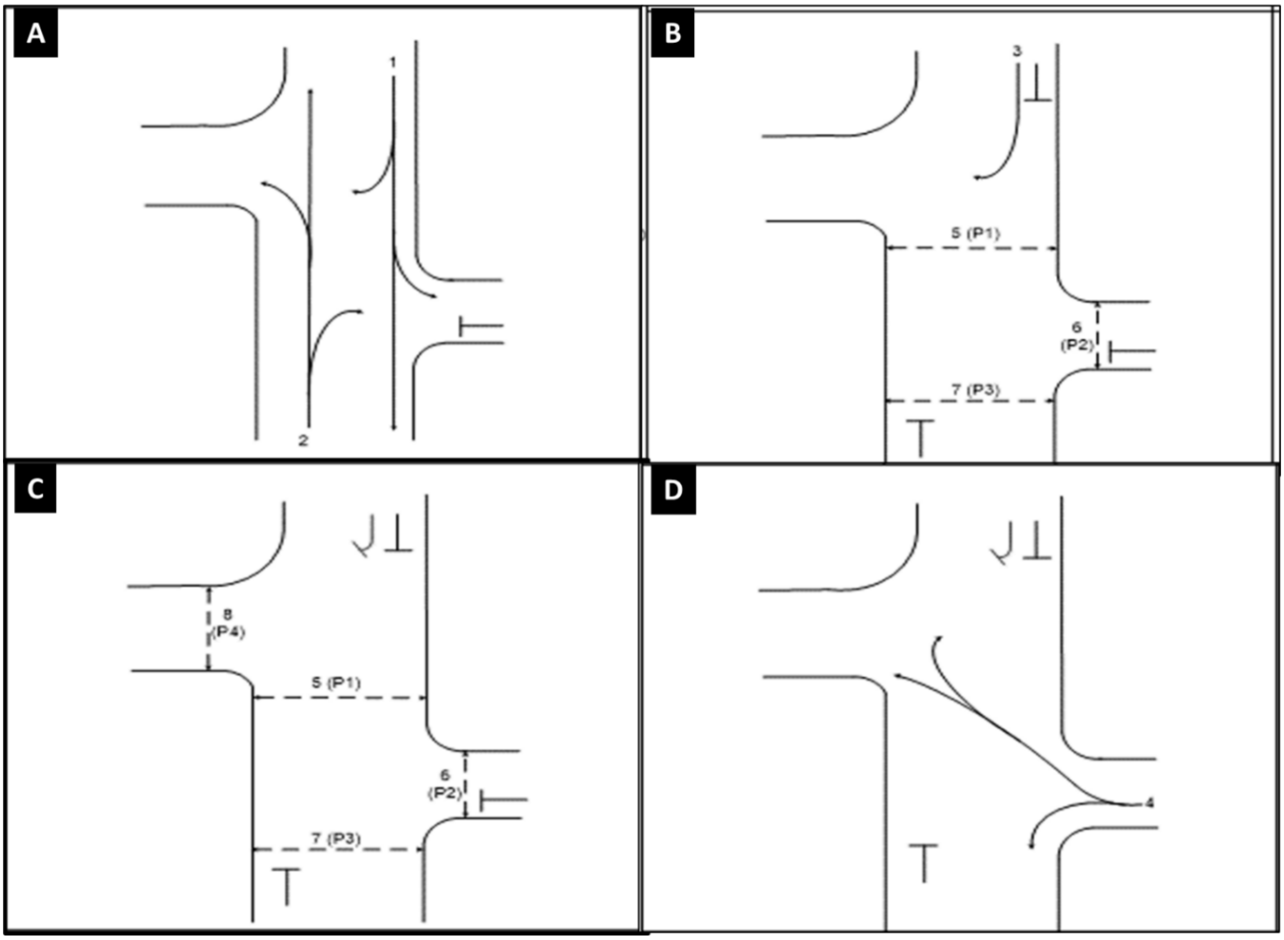


Figure 6-13 Stage Sequence (R111 - Inchicore Road Junction)

Stages B and D are not called in every cycle. Stage B is generally called by SCATS on a schedule subject to a demand for vehicles along R148 eastbound which will require extra green time for signal group 2 and 4. The signal stage D is called when pedestrian signal group P1 (10) is called.

As per the data available from SCATS, Stage B is called every cycle during the AM peak and once in every two cycles during the PM peak. Stage D is called once in every three cycles during the AM peak and once in every two cycle during PM peak. Based on that the stage sequence modelled for both the AM and PM peak. The stage sequences for the junction are as follows in Figure 6-14.

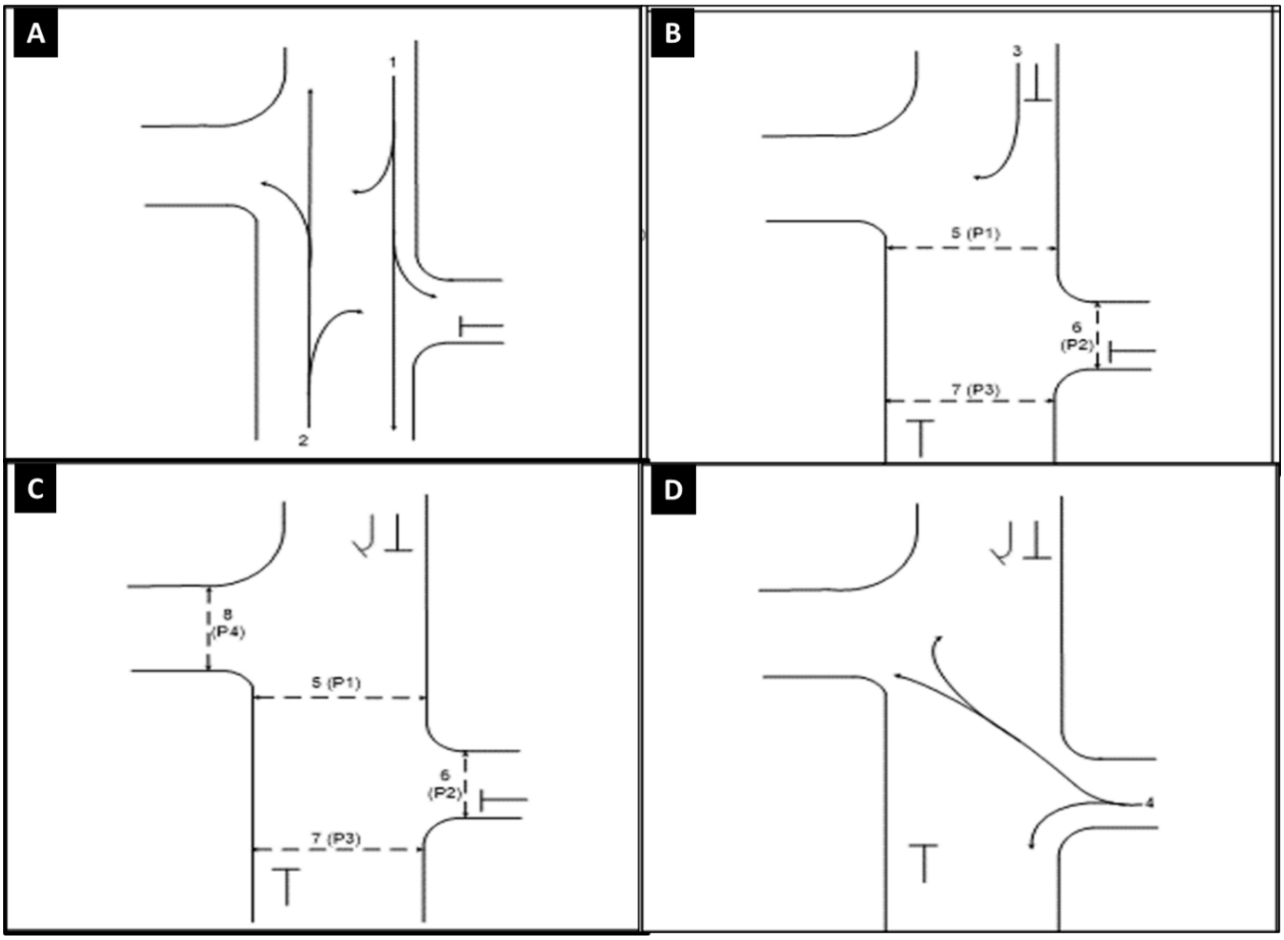


Figure 6-14 Stage Sequence (R111 - Inchicore Road Junction)

Similar to the R148-R111 junction, not all the stages were called every cycle. Stage C was called only when signal group P4 was called. In accordance with the data available from SCATs, stage C is called once in every three cycles during the AM peak and once in every two cycles during PM peak. Based on that, the stage sequence was coded for both the AM and PM peak.

Both the signals were coded using Vehicle Actuated Programming which optimises the efficiency of the signal. As many of the signals will be temporarily relocated as part of the space proofing for the temporary traffic management phase layouts, the same actuation will need to be provided in the temporary arrangement to achieve the levels of efficiency required for the complexity of operations. The minimum and maximum signal green time for all the stages were coded from the respective data received from SCATs for both the peaks. The maximum cycle was also coded using the Active Cycle Time data available for both the peaks.

Model Calibration & Validation

The microsimulation model was calibrated in accordance with the guidelines provided in the TII document (PE-PAG-02015) for the base year scenario considering both the morning and evening peak hour.

The model has been validated using the GEH statistic for junction turning movements as outlined below. The model was run 5 times using varying random speeds for both base model calibration and other scenarios. This allows for modelling of a typical day to day variations in traffic flows and traffic patterns and more accurately models the real-world variable situation on site. The results were then collected for the average of all 5 runs.

For calibration of Junctions, the turning volume for each movement of all the key junctions in the model has been compared with the JTC results for both AM and PM peak. The result for the JTC calibration is detailed in Table 6.34 below.

Table 6.34: JTC GEH Calibration

Movement	AM Peak			PM Peak		
	Observed	Modelled	GEH	Observed	Modelled	GEH
R111 South to R111 North	277	278	**0.06**	330	334	**0.22**
R111 South to R148 West	182	183	**0.07**	280	285	**0.30**
R111 North to R148 East	33	33	**0.00**	23	23	**0.00**
R111 North to R111 South	580	581	**0.04**	446	447	**0.05**
R111 North to R148 West	101	101	**0.00**	126	126	**0.00**
R148 West to R111 North	483	483	**0.00**	480	478	**0.09**
R148 West to R148 East	1073	1058	**0.46**	546	543	**0.13**
R148 West to R111 South	471	469	**0.09**	238	241	**0.19**
R148 East to R111 North	19	18	**0.23**	104	104	**0.00**
R148 East to R111 South	78	77	**0.11**	141	142	**0.08**
R148 East to R148 West	593	591	**0.08**	1439	1427	**0.32**

The results from the Table 6.34 indicate that the GEH values for turning movements are well within the acceptable limits for all cases for both AM and PM peaks.

Subsequent to the GEH Junction Turning Movement calibration, the Phase 1 & 2 scenarios (as outlined in Section 6.3.3.2.2) were modelled.

6.5.3.2 Signal Staging

6.5.3.2.1. Signal Staging – Do Something Phase 1

The stage sequence for Do Something scenarios were modified to increase the efficiency of the network. The stage sequence for both AM and PM peak are shown in Figure 6-15 and Figure 6-16.

For both peaks, in Stage 1 east west movements are given green. In Stage 2, during AM Peak an early cut-off is provided for R148 westbound movement and during evening peak early cut-off is provided for R148 eastbound movement. Stage 3 is the clearance stage. In Stage 4, R111 north and south movements are given green for both peaks. Stage 5 is again clearance stage. Stage 6 is similar to Stage 1 with the exception that ped stage on the R148 westbound left slip lane is provided green. This stage is coded once in every two cycles for both AM and PM peak. The maximum cycle time for both peaks was coded as 140 seconds.

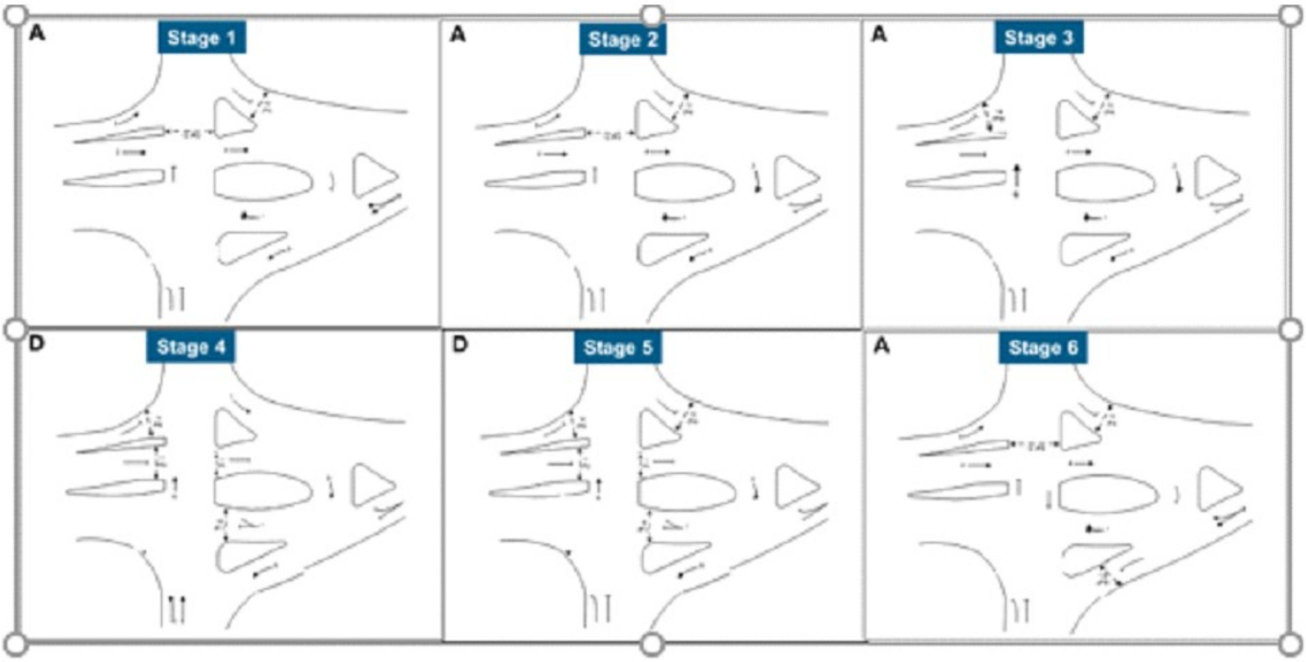


Figure 6-15 Stage Sequence - Do Something Scenario Phase 1 (AM Peak)

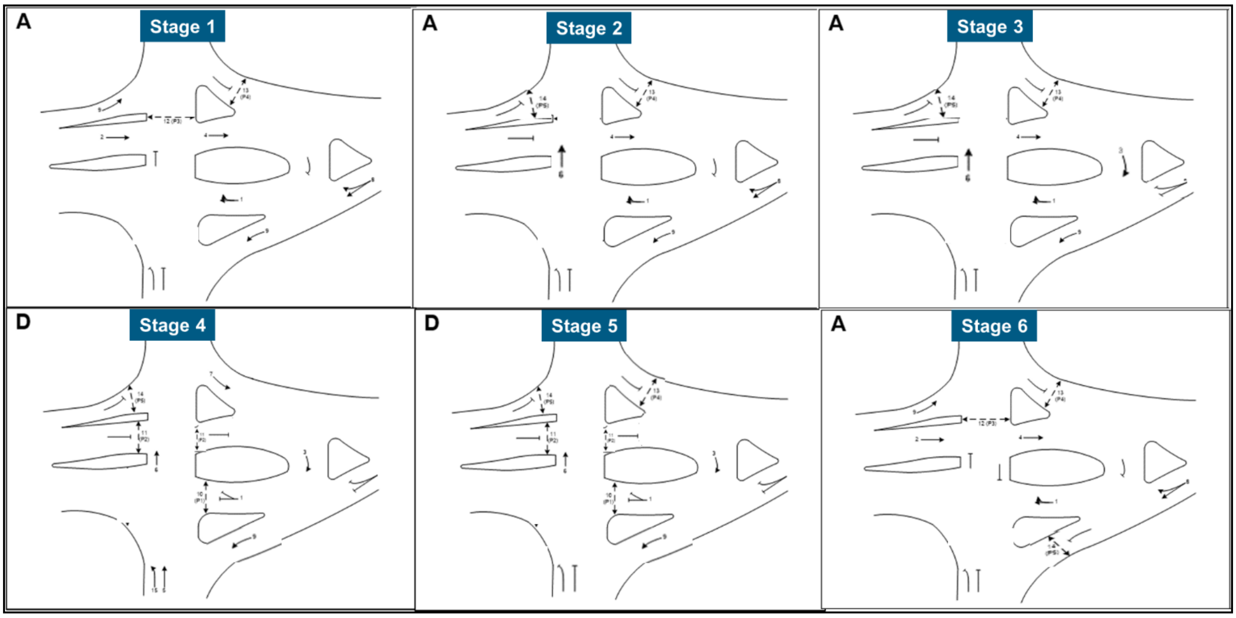


Figure 6-16 Signal Staging - Do Something Scenario Phase 1 (PM Peak)

6.5.3.2.2. Signal Staging – Do Something Phase 2

The stage sequence for both AM and PM peak are shown below in Figure 6-17 and Figure 6-18. For both peaks, in Stage 1 east west movements are given green. In Stage 2, during AM Peak an early cut-off is provided for R148 westbound movement and during evening peak early cut-off is provided for R148 eastbound movement. Stage 3 is the clearance stage. In Stage 4, R111 north and south movements are given green for both peaks. However, left turning movements along R111 northbound movements are held and pedestrian along R148 western arm is provided green. Also ped stage on the R148 westbound left slip lane is provided green in this stage. In Stage 5, both pedestrian stages of stage 4 become red; and the respective vehicular movements are provided green time. Stage 6 is again clearance stage. The Stage 4 is coded once in every two cycles for both AM and PM peak. The maximum cycle time for both peaks were coded as 140 seconds.

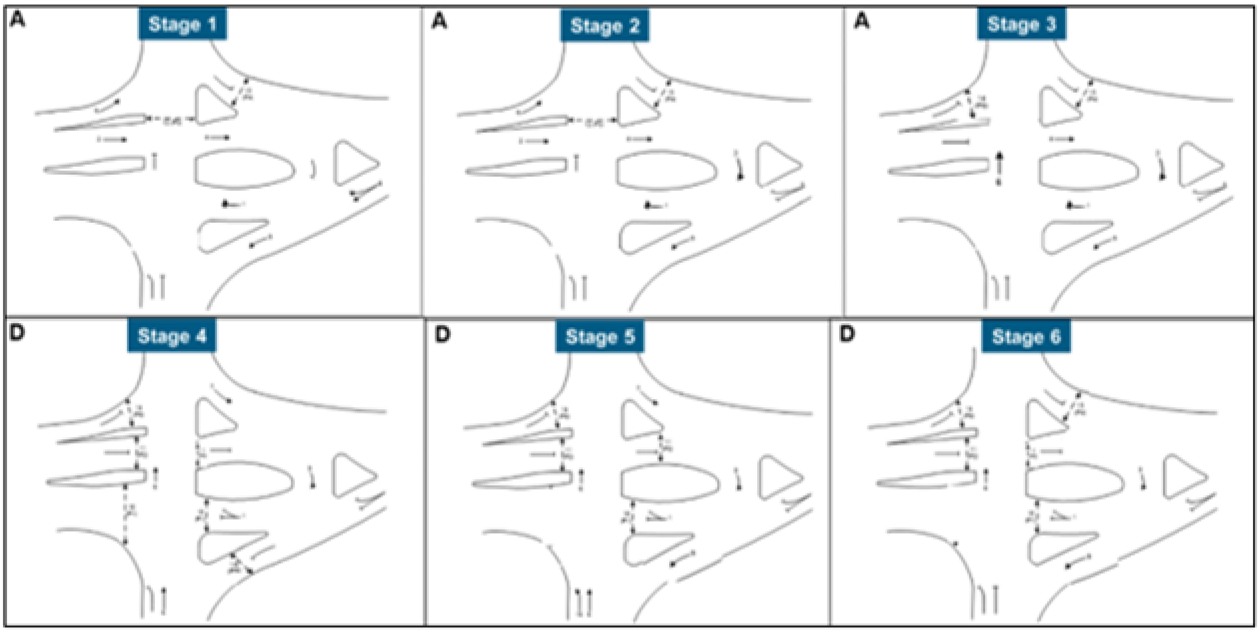


Figure 6-17 Stage Sequence - Do Something Scenario Phase 2 (AM Peak)

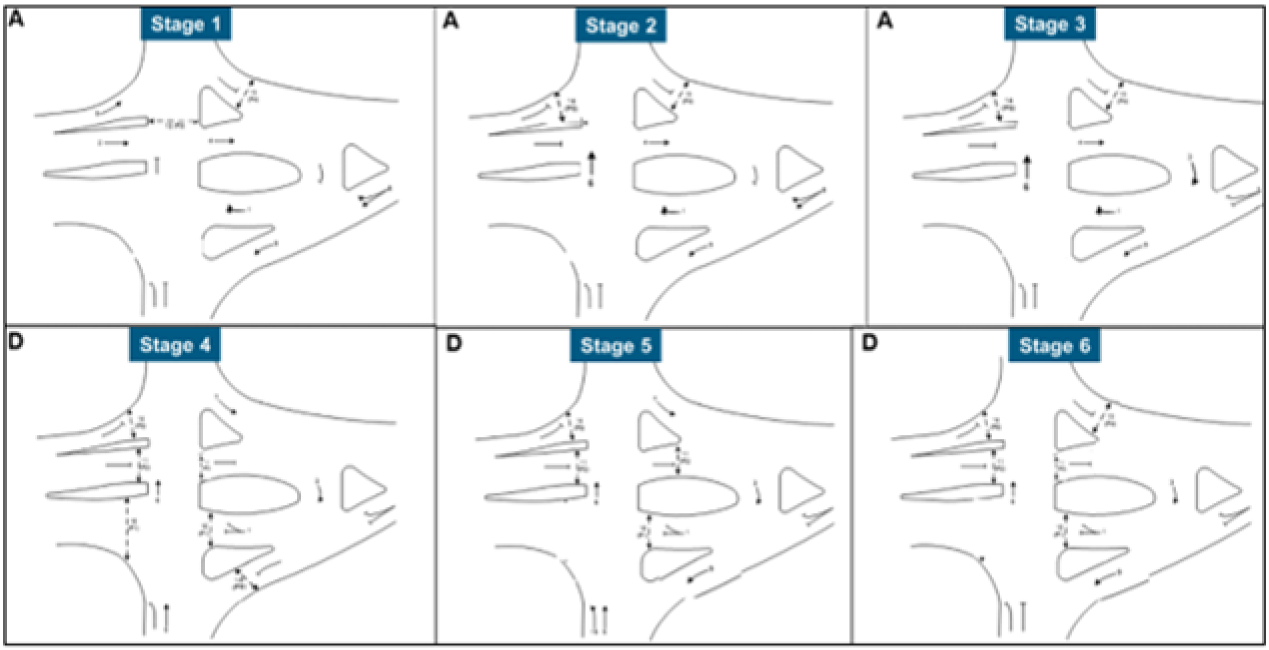


Figure 6-18 Stage Sequence - Do Something Scenario Phase 2 (PM Peak)

6.5.3.3 Traffic Impact

Similar to base year model calibration, for each future year scenario, the model was run 5 times with varying random speeds and the results were then collected for the average of all 5 runs. The data collected for each scenario includes the following:

- **Overall Network Performance –** Results were collected for the entire network in VISSIM to assess the impact of the proposed infrastructure on the overall network. Results and key indicators for overall network performance include net average vehicle delay, net total delay, average speed and latent demand for the overall network.

- **Junction Impact Assessment –** This includes the average queue lengths (in pcu) and average delays for each arm at each junction.

The Overall Network Performance and Junction Impact Assessment results for each scenario are summarised in the following sections.

Net total delay for each scenario is calculated by latent delay and total delay for each hour which are added together to obtain the net total delay. Thereafter, average delay per vehicle for each scenario is computed by dividing net delay by the total number of vehicles passing through the network in the entire modelled period. This gives an estimate of the delay experienced by vehicles across the network and those waiting to enter the modelled cordon. This is particularly important in congested scenario where there may be a large volume of vehicles unable to access the modelled section of the network but still experiencing delays to their journeys.

Latent demand determines the number of vehicles that cannot enter the model cordon during the designated hour. This signifies the congestion within the network.

The overall network performance results are detailed in the Table 6.35 and summarised for all the scenarios in the section below.

6.5.3.3.1. Traffic Impact (AM peak)

For Do Something Scenario Phase 1, the average delay throughout the network was observed to be 2 min 33 seconds. For Do Something Scenario Phase 2, the average delay was observed to be 2 min 15 seconds. The average speed for the network was found out to be 23 km/hr for both the scenarios. The latent demand was 100 and 46 vehicles for both the phases respectively.

6.5.3.3.2. Traffic Impact (PM peak)

The average delay for Do Something Scenario Phase 1 was observed to be 3 min 14 seconds, while for Phase 2 it was 2 min 15 seconds. The total delay for both the scenarios were found to be 261 and 186 hrs respectively. The latent demand for Do Something Scenario Phase 1 was 139 vehicles while for Phase 2 it was 14 vehicles.

6.5.3.3.3. Traffic Impact Summary

The latent demand was high for both phases during AM and PM peak except for the Do Something Scenario Phase 2 (PM peak). During the morning peak, it is mainly attributed to the congestion observed along R111 southbound movement through the junction. During the evening peak, for the latent demand for Phase 1 is attributed to congestion along both R111 northbound and southbound movements while for Phase 2 it was mainly due to congestion along R111 northbound movements.

The congestion along the R111 northbound movement is mainly attributed to the backing of the traffic along R111 southbound lane, at Inchicore Road Junction, which blocks the movement along R148 circular loop; this in turn blocks the R111 southbound movement. For Phase 2, initially the R111 southbound movement was allowed to continue straight. However, due to backing up of the queue, the eastbound and westbound movement along R148 was getting blocked and long queues for both arms were observed. Hence, the movement along the R111 southbound lane was modelled to move along the circular lane (St John's Road Bridge) in Phase 2 of the construction. In Phase 1, due to limited space available, the straight movement along R111 southbound lane was not possible.

The congestion observed in Phase 1 was more than Phase 2. This is because of the length of right turning lane the R148 eastbound relative to the R111 southbound movement was less than when compared with Phase 2, again due to limited availability of space. This reduced the stacking capacity of R148 eastbound lane and hence, it is asserted that more green time will need to be provided for R148 east-west movements which in turn reduced the green time for the R111 north-south movements and hence the reason for the higher congestion observed in Phase 1.

6.5.3.4 Junction Impact Analysis

The results for the Junction Impact Analysis are detailed in the Volume 4, Appendix 6.4 and summarised below for both the peaks.

6.5.3.4.1. Junction impact analysis (AM peak)

The average queue along the R148 eastbound road (Con Colbert Road) was found to be in order of 18 and 22 pcu respectively for Phase 1 and 2. The maximum queues observed were 54 and 65 pcu respectively with a delay in the order of 40-50 seconds being observed.

The average queue along R148 westbound road (St. Johns Road W) was found to be in the order of 26 and 20 pcu respectively for Phase 1 and Phase 2. The maximum queue was found to be in order of 50 pcu for both phases. A delay of over 2 minutes was observed for both the scenarios.

Along the R111 southbound lane, a significant queue of around 60 and 50 pcu was observed for both phases respectively with maximum queue of over 70 pcu experienced for both the scenarios. An average delay of over 1 min 20 sec was observed for both the scenarios.

The average queue for the R111 northbound lane was observed to be in order of 3 to 4 pcu for both the scenarios, with maximum queue of 17.5 pcu observed for both the scenarios. The average delay of 35-40 seconds was observed for both the scenarios.

At Inchicore Road Junction, the average queue along R111 southbound lane was observed to be 7 and 10 pcu respectively for Phase 1 and 2. The maximum queue in the order of 23 pcu was observed for both the phases. The delay experienced was around 20 seconds for both the scenarios. The average queue along R111 northbound lane was found out to be in the order of 5 pcu with a maximum queue of 30 pcu observed for both phases. The delay experienced was under 30 seconds for both the scenarios.

6.5.3.4.2. Junction impact analysis (PM peak)

Along the R148 eastbound movement (Con Colbert Road), the average queue was observed to be 41 pcu for Phase 1, while 46 pcu for Phase 2. The max queue for both the scenarios were observed to be in order of 85-90 pcu. The average delay for Phase 1 was observed to be 1 min 30 sec for Phase1, while 1 min 13 sec for Phase 2.

Along the R148 westbound movement (St. Johns Road W), the average queue was observed to be 31 pcu and 46 pcu respectively for Phase 1 and Phase 2. The max queue was found out to be 73 and 91 pcus respectively. The average delay was in the order of 50 seconds for both the scenarios.

The average queue along the R111 southbound movement was observed to be 64 pcus for Phase 1 while 6 pcus for Phase 2. The maximum queue was found out to be 73 pcu and 42 pcu respectively. The average delay experienced was 2 minimum and 46 seconds respectively for both the phases.

The average queue along the R111 northbound arm was found out to be 7 pcus for Phase 1 and 6 pcus for Phase 2. The maximum queue was found to be in the order of 22-24 pcus for both the scenarios. The average delay experienced was in the order of 45-50 seconds.

At Inchicore Road junction, the average queue along the R111 southbound lane was observed to 4 pcu and 8 pcu respectively for Phase 1 and 2. The maximum queue observed was in the order of 22 pcu for both the scenarios. The average delay experienced was 20 and 30 seconds respectively. The average queue along the R111 northbound lane was observed to be 28 pcus with max queue of around 45-50 pcu was observed for both the scenarios. The average delay experienced was around 50 seconds for both the scenarios.

6.5.3.4.3. Junction Impact Analysis Summary

During the morning peak, the average queue along both the R148 eastbound and westbound movement was observed to be in order of 20-30 pcus with a delay of around 50 seconds observed for R148 eastbound movement while a delay in the order of 2 minutes was observed for the R148 westbound movement. The delay is more for the latter because of less green time provided for westbound movement. For both the peaks, a significant queue and delay were observed along the R111 northern arm. At Inchicore Road junction, the average queue of around 10 pcu and max queue of 23 pcu along the R111 southbound arm suggest that the queue backs up to the R148-R111 junction and blocks the vehicles travelling along the R148 westbound left slip and the R148 circular lane. The average queue along the R111 northbound arm was observed to be minor.

During the evening peak, the average queue along the R148 arms was observed to be in the order of 30-50 pcus with the delay in the order of 50 seconds for the westbound movement and over 1 minute for the eastbound movement. The delay was higher for the latter because of lesser green time provided. In phase 1, along the R111 northern arm, a large queue and delay was observed for Phase 1 only. For both the phases, the average queue along the R111 northbound arm was observed to be small. At Inchicore Road junction, it was found to be backing up along R111 southbound arm and blocking the flow of traffic, similar to the AM peak queue. The average queue along the R111 northbound arm was found to be high in order of 27 pcus.

During the AM peak, the queue along the R111 northern arm was found to be substantial due to the backing up of the queue along the R111 southern arm; which in turn blocks the movement along R148 westbound left slip as well as the R148 circular lane. During the Phase 1 PM peak, scenario, the large queue along northern arm can be attributed to two factors. The first reason is queuing of the vehicles along R111 southbound arm at the Inchicore Road junction. The second reason is that in Phase 1, the length of the right turning lane for the R148 eastbound to the R111 southbound movement is small; with the stacking capacity reduced. Hence, more traffic signal green time was needed during modelling of the R148 movements and this resulted in a shorter duration of green time for R111 movements. As a result, the queue length was found to be more substantial than Phase 2.

For the evening peak, the average queue along the R111 northbound at the South Circular Road Junction (R148-R111) was observed to be small. However, the queue along the R111 northbound arm was high. As no changes have been proposed to the Inchicore junction design, the queue is mainly attributable to the background growth observed over the period of time. Hence, the congestion for both the phases is attributed to both the change in the lane structure and also background growth.

Table 6.35: Overall Network Performance Result

Parameters	Do Something Scenario Phase 1	Do Something Scenario Phase 2
AM Peak		
Average Delay	2 min 40 sec	2 min 24 sec
Total Delay	190 hrs	170 hrs
Average Speed	23 km/hr	23 km/hr
Latent Demand	100 veh	46 veh
PM Peak		
Average Delay	3 min 14 sec	2 min 15 sec
Total Delay	261 hrs	186 hrs
Average Speed	20 km/hr	22 km/hr
Latent Demand	139 veh.	14 veh.

It was clear during the optioneering phases that there were limited solutions available for increasing the number of rail tracks and providing electrification of them without impacting on this already congested junction. The proposed phased construction diversions required to build the cut and cover structure (buried portal) are considered a negative and significant impact, however, this is within acceptable tolerances of the junction geometry. The duration of the impact of both phases of the cut and cover structure (buried portal) construction (including junction reinstatement works) is anticipated to be over a period of approximately 15-22 months.

6.5.3.5 Categorisation of impact and significance of diversions at south circular road junction

The analysis above and in Table 6.36 below should be read conjunction with Volume 4, Appendix 6.4 and it displays in tabular form the increase or decrease in queuing and delays for Phase 1 and Phase 2 junction modifications.

Table 6.36: Categorisation of Impact and Significance of Diversions at South Circular Road Junction

Category Assessed	Impact	Significance of Effect	Clarification
Vehicular Traffic Volumes	Negative	Moderate	The traffic volumes will remain unchanged as it is not an offline diversion

Category Assessed	Impact	Significance of Effect	Clarification
Driver (Journey Time Increase)	Negative	Significant	Junction Delay in this instance rather than diversion distance having the greatest bearing on journey time
Driver (Junction Delay)	Negative	Significant	Refer to Summary Sections 6.5.3.3.3 and 6.5.3.4.3 & Volume 4, Appendix 6.4
Vehicular (Safety)	Negative	Slight	Lack of familiarity with diversion; Potential for driver frustration leading to unsafe driving responses

6.5.4. Construction Impact on Pedestrians and Cyclists

6.5.4.1 All Overbridge Closure Diversions (Durations Greater Than 3 Weeks)

A core basis of the design principle for the bridge reconstruction works was to limit the impact of construction on pedestrians and cyclists. Based on the pedestrian and cycle counts, the lengthy duration of route closures, as well as the limited options for crossing over the railway corridor; it is deemed necessary to provide temporary vulnerable user rail corridor crossing bridges in instances where the bridge closures are expected to last more than 3 weeks (refer to Figure 6-3for locations).

The additional journey time for these categories of users is deemed negligible, as they are all located within 2-5m of the existing bridge. Journey time delays are more likely to emanate from user uncertainty of the route and perceptions of safety (particularly on initial commencement of the diversion but will improve with communication and time). Appropriate safe work practices and communication (as outlined 6.6.1 is hoped to further limit potential for journey time increases. An exception is noted below for Sarsfield Road short duration closures.

6.5.4.2 Sarsfield Road Underpass Closure (Less Than A Week)

Sarsfield Road closures are deemed to be relatively short in duration. The closures associated with the bridge deck removal and replacement will be programmed to commence during the weekends to limit the number of users impacted; and where possible also in the low peak (summer) season. The additional journey time for those still preferring to walk or cycle and/or unable to change modes, will be approximately 5-10 mins for cyclists and 6-15 mins for pedestrians. The journey time is as a result of the additional length of 550-900m for both pedestrians and cyclists (depending on their final destination). At times the diversion may require vulnerable users to cross the Con Colbert Road/Chapelizod Bypass twice (walking on the Memorial Park side of the dual carriageway) to get back into Inchicore Road.

6.5.4.3 Categorisation of Impact and Significance of Temporary Diversions on Pedestrians, Cyclist And Mobility Impaired

A summary of the impact and significance of the temporary diversions on vulnerable users (pedestrians, cyclists and mobility impaired) is provided in Table 6.37.

Table 6.37: Categorisation of Impact and Significance of Temporary Diversions on Pedestrians, Cyclist and Mobility Impaired

Category Assessed	Impact	Significance	Clarification
Le Fanu Road Bridge (OBC7) Temporary Closure and Temporary Diversion Bridge Provision			
Pedestrians, Cyclists & Mobility Impaired – Volumes	Negative	Slight	Users' perception of construction diversions being less safe may initially deter users of temporary bridge.
Pedestrians, Cyclists & Mobility Impaired - Journey Time	Negative	Slight	Marginally longer route to cross the railway being that the temporary diversion bridge is adjacent to existing bridge.
Pedestrians and Cyclist (Safety)	Positive	Slight	The temporary diversion bridge provides segregation from traffic currently not available.
Kylemore Road Bridge (OBC5A) Temporary and Provision Temporary Diversion Bridge			
Pedestrians, Cyclists & Mobility Impaired - Volumes	Negative	Slight	Users' perception of construction diversions being less safe may deter users of temporary bridge initially
Pedestrians, Cyclists & Mobility Impaired - Journey Time	Negative	Slight	Marginally longer route to cross the railway being that the temporary diversion bridge is adjacent to existing bridge.
Pedestrians and Cyclist (Safety)	Negative	Slight	Diversions are immediately adjacent to the works areas and introduces a change to crossing points.
Khyber Pass Pedestrian Footbridge (OBC5) Bridge Temporary Closure – Private Bridge for Iarnród Éireann staff (not general public use)			
Pedestrians, Cyclists & Mobility Impaired - Volumes	Negative	Significant	While a diversion route is available for those without alternative options it is likely to result in fewer pedestrians and may also discourage less confident cyclists as the diversion would be on Sarsfield Road
Pedestrians, Cyclists & Mobility Impaired - Journey Time	Negative	Significant	Longer route for staff to yard likely to result in modal shift. Compounded during the week Sarsfield Road is closed
Pedestrians and Cyclist (Safety)	Negative	Slight	Longer journeys introduce additional potential locations for incidences to occur; compounded during the week Sarsfield Road is closed
Sarsfield Road Under-Bridge (UBC4) Closure (5-7 Days)			
Pedestrians, Cyclists & Mobility Impaired - Volumes	Negative	Significant	While a diversion route is available for those without alternative options it is likely to result in fewer pedestrians and may also discourage less confident cyclists as the diversion would be on the Chapelizod Bypass dual carriageway
Pedestrians, Cyclists & Mobility Impaired - Journey Time	Negative	Significant	Longer route to cross the rail line & additional signals to cross.
Pedestrians and Cyclist (Safety)	Negative	Moderate	Additional junctions to cross and being that it is a multilane dual carriageway increases risk from before. However, the underpass substandard

Category Assessed	Impact	Significance	Clarification
			footpaths are already a point of risk, but vehicular speeds are lower
Memorial Road Bridge (OBC3) Temporary Closure and Provision of Temporary Diversion Bridge			
Pedestrians, Cyclists & Mobility Impaired - Volumes	Negative	Slight	Users' perception of construction diversions being less safe may deter users of temporary bridge initially
Pedestrians, Cyclists & Mobility Impaired - Journey Time	Negative	Slight	Marginally longer route to cross the railway being that the temporary diversion bridge is adjacent to existing bridge.
Pedestrians and Cyclist (Safety)	Negative	Slight	Diversions are immediately adjacent to the works areas and introduces a change to crossing points.
South Circular Road Interchange Temporary Junction Modifications			
Pedestrians, Cyclists & Mobility Impaired - Volumes	Negative	Slight	Users' perception of construction diversions being less safe may deter from their usual routes and possibly mode. However, as the main phases are over a long period it is expected to improve.
Pedestrians, Cyclists & Mobility Impaired - Journey Time	Negative	Moderate	A longer route for all directions in addition to an extra set of signals to navigate.
Pedestrians and Cyclist (Safety)	Negative	Moderate	Diversions are immediately adjacent to the works areas and introduces a change to crossing points.
Glasnevin Cemetery Road Bridge (OBCO10) Temporary Closure and Provision of Temporary Diversion Bridge – Cemetery User Access			
Pedestrians, Cyclists & Mobility Impaired - Volumes	Negative	Moderate	Users' perception of construction diversions being less safe may deter from their usual routes and possibly mode. In addition, reduced parking capacity
Pedestrians, Cyclists & Mobility Impaired - Journey Time	Negative	Moderate	Marginally longer route to cross the railway being that the temporary diversion bridge is adjacent to existing bridge. However vulnerable users would be further inconvenienced.
Pedestrians and Cyclist (Safety)	Negative	Slight	Diversions are immediately adjacent to the works areas. Traffic volume and speeds are low

6.5.5. Construction Impact on Bus Services

A review was undertaken of existing and future bus services within the study area to identify if any routes would be disrupted due to the construction works proposed at any of the existing bridges along the rail line. The number of routes currently passing through proposed temporary traffic diversions required for the bridge and approach road reconstructions works are listed in Table 6.38. Indicative bus route diversions have been provided in Chapter 5.

Table 6.38: Impact of Bridge or Lane Closures and Diversions on Existing Bus Routes

Zone	Structure ID	Works Required	Road Bridges along the rail line	No. of Bus Routes	Bus Route ID	Journey Time Impact	Duration Bus route is Affected
B	OBC7	Closure to Reconstruct Road Bridges and approaches to raise bridge.	Le Fanu Road Bridge/Kylemore Park North	N/A	N/A	N/A	No days affecting buses
B	OBC5A		Kylemore Road/Landen Road/ Kylemore Park North	3	60, 18 (South)	5-8 min.	250 days. (Northbound buses not affected)
B	OBC5	Closure to Reconstruct Footbridge	Khyber Pass Footpath	N/A	N/A	N/A	No days affecting buses
B	UBC4	Closure to Reconstruct Rail Bridge	Sarsfield Road	3	25n, G1, G2, 60	5-8 min.	5-7 days on 3no. occasions and periodically for 30mins – 2hrs
B	OBC3	Closure to Reconstruct Road Bridge and approaches to raise bridge.	Memorial Road	3	60, 69, 69X	5-8 min.	95 days
B	OBC1A + New Retaining Wall	Con Colbert Road (R148) westbound Bus Lane Closure for piled and H4a boundary wall construction	Con Colbert Road (SCR to Sarsfield)	19	51D, 52, 60, 69, 69X, C1, C2, C3, C4, P29, X25, X26, X27, X28, X30, X31, X32, 845, 847	5-8min	250 days
B	OBC1A	Phased Diversions through SCR Junction to Construct OBC1A new cut and cover buried portal	South Circular Road/ Con Colbert Road/ St John's Road	19 (Dublin Bus)	51D, 52, 60, 69, 69X, C1, C2, C3, C4, P29, X25, X26, X27, X28, X30, X31, X32, 845, 847	5-8min	510 days (260 days Ph1 and 250 days Ph2) Concurrent with Wall Works above

Zone	Structure ID	Works Required	Road Bridges along the rail line	No. of Bus Routes	Bus Route ID	Journey Time Impact	Duration Bus route is Affected
				23 (intercity or private)	4, 22, 115, 120, 120-1, 120-2, 120-6, 120-9, 126, 126-1, 126-4, 126-9, 130, 735, 717, 736, 763, 768, 817, 824, 842, 845, 863	5-8 min.	potentially for entire duration of wall works
D	OBO10	Closure to Reconstruct Road Bridge to raise bridge.	Glasnevin Cemetery Access Driveway	N/A	N/A	N/A	No days affecting buses

The impact on bus users for each closure/diversion is outlined in Section 6.5.5.1 to Section 6.5.5.3. Kylemore Road Bridge closure (incl. Landen Road Junction).

The anticipated increase journey time for buses and cars as a result of the Kylemore Road Bridge (OBC5A) closure and the closure of Landen Road/Kylemore Road junction will partly be as a consequence of an additional 500-1000m being added to the route length associated with the diversion of the southbound bus route 18 over Le Fanu Road Bridge (OBC7) via Kylemore Avenue and returning to Kylemore Road via Kylemore Park North. The bus route 60 could still use Kylemore/Landen Road junction for the majority of the bridge closure period. However, during a portion of the road works at the junction the bus 60, to continue service to its last stop in Decies, would then need to head east turning into Garyowen Road. From here heading north to join Ballyfermot Road (R833) and again heading west Kylemore Road roundabout and its original route. To do so will result in the temporary non-use of the northbound Kylemore Road bus stops (2652 and 2653), as well as the southbound bus stops (2700 and 2701) for a period of several weeks. However, it is also estimated that the potential diversion routes are likely to add approximately 2 no. additional signal controlled and/or unsignalized junctions to the bus routes. In the case of unsignalized (priority) junctions it is conservatively assumed that they may result in similar wait times as to the signalised of 40-60s (accounting for congested operation) and additional 500-1000m to the journey length.

6.5.5.1 Sarsfield Road Bridge Closure

With Routes 60 & 69 not being able to service the Woodfield Place (Stop 2719) during a Sarsfield Road closure, bus users wishing to access or exit the Inchicore area could use Memorial Gardens (Stop 7435) resulting in an additional pedestrian journey time of 5-10 minutes for the 420-490m (approx.) additional walking distance. Route G1 & G2 will also not service Woodfield Place (Stop 2719) and all their eastbound stops in Emmet Road between Sarsfield Road and South Circular Road. Unless alternative arrangements can be made this could result in additional walking time for those with a destination in this section of Emmet Road of 1-15mins. Those that would typically depart from Emmet Road stops will need to consider walking to stops off South Circular Road to board Bus Routes 13 or 68, subject to their destination of choice. It should be noted that any such closure at this location will be scheduled for the weekends and where anticipated to be longer than 48 hours it will include full weekend working to minimize impact posed by peaks in the working week.

6.5.5.2 Memorial Road Bridge Closure

The are 3 no, bus routes (60, 69 & 69X) that use Memorial Road Bridge (OBC3); and would be directly affected by the closure of the Memorial Road but only in their city centre bound direction. The city centre bound directions of these routes could be diverted through Inchicore Village via Emmet Road to South Circular Road (SCR) and rejoin their original routes at SCR/R148 junction. For this route change it is recommended that the lay-by on SCR, outside the Hilton Hotel, be provided as an offline temporary bus stop. This diversion will increase the buses journey time by at least 5min, owing to the additional signal-controlled junctions enroute; and potentially up to 10mins initially during peak hours. This proposed temporary diversion would also result in the temporary non-use of Memorial Gardens (7435) and Islanbridge/SCR (2722) stops, for these specific route directions. For passengers that would currently board and alight at either Memorial Gardens, Sarsfield Road and/or Inchicore Road the walking distance will increase between 400m & 800m (Approx. 5-12mins) depending on location of start/end of journey. For the routes 69/X , the Grattan Crescent (2642) stop could potentially still be serviced by converting the Sarsfield/Inchicore Road junction into a turning point for the buses and returning again to the Emmet Road diversion route. This would have the potential of reducing the passenger walking time by approx. 5-8mins but potentially increase the again the bus journey time by a further 3-5min, the latter affecting more people.

It is worth noting that proposed BusConnects Liffey and Lucan Schemes if implemented in advance of this Project, will result in restricting non-public vehicular transport from going north bound, past Inchicore Terrace South/Grattan Crescent junction, towards Sarsfield & Memorial Roads, with non-public vehicular transport to Memorial Road only emanating from Con Colbert, Inchicore and Sarsfield Roads (not from the Inchicore village).

6.5.5.3 South Circular Road Junction (Phased Construction Diversions for New OBC1A) and Con Colbert Road Bus Lane closure

The westbound bus lane and the bus stops (7012 & 2721) on the west bound carriageway between South Circular Road junction and the slip road off the R148 to Sarsfield Road are proposed to be closed for more than a year to facilitate piled and boundary wall reconstruction as well as for bulk excavation haulage. . It is proposed that where feasible that buses serviced by (7012 and 2721) consider a diversion route for a portion of fhe time past Kilmainham jail and along Inchicore Road and re-join Con Colbert Road via Memorial Road, The bus re-routing if deemed preferable would be an additional 300m approximately in length but at slower speeds, resulting in a potential journey time delay of 5-7min subject to congestion and signal timing. For those on foot intending going to locations south of the railway will results in a reduced pedestrian journey time. .

6.5.5.4 Categorisation of Impact and Significance of Bridge Closure on Bus Services

Below summary of the impact and significance of the bridge closures on bus routes is below in Table 6.39.

Table 6.39: Categorisation of Impact and Significance of Bridge Closures on Bus Routes

Bridge Closure/Diversion	Impact	Significance	Clarification
Le Fanu Road	Negative	Moderate	No diversion of buses. The bus 860 does not cross the bridge but does use the planned diversion route; which will be congested and will delay this service.
Kylemore Road	Negative	Significant	Longer journey lengths for bus and some users to get to a bus; and Congestion Delays
Khyber Pass Bridge	None	None	No Bus Routes affected
Sarsfield Road Under-Bridge	Negative	Moderate	Longer journey lengths for bus and some users to get to a bus; but for maximum of 5-7days
Memorial Road Bridge	Negative	Significant	Longer journey lengths for bus and some users to get to a bus; and Congestion Delays
South Circular Road Interchange	Negative	Significant	Longer journey lengths for bus and some users to get to a bus; and Congestion Delays
Glasnevin Cemetery Road Bridge	None	None	No Bus Routes affected

6.5.6. Construction Impact on Rail Services

The existing railway lines between Hazelhatch and Celbridge Station and Heuston Station are to remain operational in the peak commuter hours throughout the construction period. However, the Phoenix Park Tunnel Branch Line is proposed to be closed for a period of approximately 6 months. In some areas the services may be operated at slower line speed, but this will predominantly be outside of the commuter AM and PM Peak periods (but occasionally also in the peak periods in consideration of the safety to construction personnel and commuters alike).

6.5.6.1 Construction Impact on Passenger Rail Services

There will be occasions where temporary track possessions will be required to allow for temporary track changes to facilitate an operational stage. (The stages have been identified in Chapter 5 Construction Strategy).

The impact on passenger rail transport is considered to be short term, negative and moderate. Where possible these will be kept to Normal Possessions (at night) with no impact on passenger services however occasionally the works will require a Disruptive Possession.

6.5.6.2 Construction Impact on Freight Rail Services

During the temporary long duration closure of the Phoenix Park Tunnel Branch Line, the limited volume of freight rail currently routed via the Phoenix Park Tunnel will need to be diverted on to road or sea haulage routes during the anticipated 6-month closure of the Phoenix Park Tunnel.

The impact on freight rail transport is considered to be short term, negative and significant.

6.5.6.3 Temporary Rail Closures - Short Duration (Less Than or Equal to a Week)

The majority of the temporary track possessions (line closures) along the Cork Mainline will be planned for off peak operational times (night and weekend) and where feasible during seasonal off peak. Where such possessions occur during the day and for more than a day, one of 2 no. operational changes will be employed:

- It will not result in full service closure across the entire Project line and will be isolated between existing stations. Additional buses will be facilitated to get passengers from one station to the next or those thereafter.
- Where possible the possession will be limited to a partial closure and potentially include speed restrictions through the works area concerned.

6.5.6.4 Temporary Rail Closures - Long Duration (Greater Than a Week)

The main long duration closure impacts to passenger and freight rail services expected are outlined in Table 6.40. This includes the full closure of the Phoenix Park Tunnel and Phoenix Park Tunnel Branch Line which is anticipated to be 6 months. The resultant effect is that passengers currently using the service will have to make alternative arrangements. There are a number of public transport options, including bus and Luas services connecting Heuston Station with the city centre. The choice of an alternative mode will be subject to user preference and practical considerations. Passengers may temporarily shift to vehicular transport, bus, Luas and/or other modes from point source.

Table 6.40: Categorisation of Impact and Significance of Temporary Rail Closures

Temporary Track Possessions	Impact	Significance	Clarification
Phoenix Park Tunnel (long duration)	Negative	Significant	Journey time increase and additional modal change points for many passengers. Freight may shift modes entirely.
Track Possessions or speed restrictions (Short duration)	Negative	Moderate	Journey time increase and additional modal change points for many passengers. Freight may shift modes entirely.

6.5.7. Operational Impact Assessment

The proposed Project will increase rail capacity, provide a new Heuston West Station, facilitate increased frequency of rail services and enhanced public transport interconnectivity. The impact of this is projected to be positive resulting in the railway line being able to accommodate a greater number of services and consequently a greater number of passengers with the potential to reduce the volume of vehicles on the local road networks.

All existing bridges / underpasses shall be retained or replaced in the construction phase by bridges / underpasses at the existing locations. In most cases the reconstructed (replacement) bridges shall re-instate existing kerb line layouts. However, at Le Fanu Road and Kylemore Road, additional dedicated pedestrian / cyclist facilities are being provided across the reconstructed (replacement) bridges and the short sections of associated road reconstruction, thereby enhancing connectivity as compared to the baseline.

6.5.8. Potential Wider Operational Impacts

The NTA's ERM has been used to carry out the demand modelling associated with the DART+ Programme. Operation of the proposed Project in 2028 was assessed as the opening year with a future year of 2043 also being considered as well in terms of determining impacts.

Some of the key summary findings from the strategic modelling are presented below in Figure 6-19, which presents the forecast change in modal shares as a result of the DART+ South West Project in both opening and design years.

The mode shares have been assessed within a 5km buffer along the DART+ South West Project corridor, as shown in Figure 6-20. The modelling forecasts a shift towards public transport usage along the rail line east and west of the M50 by 2028, this shift is more pronounced in 2043.

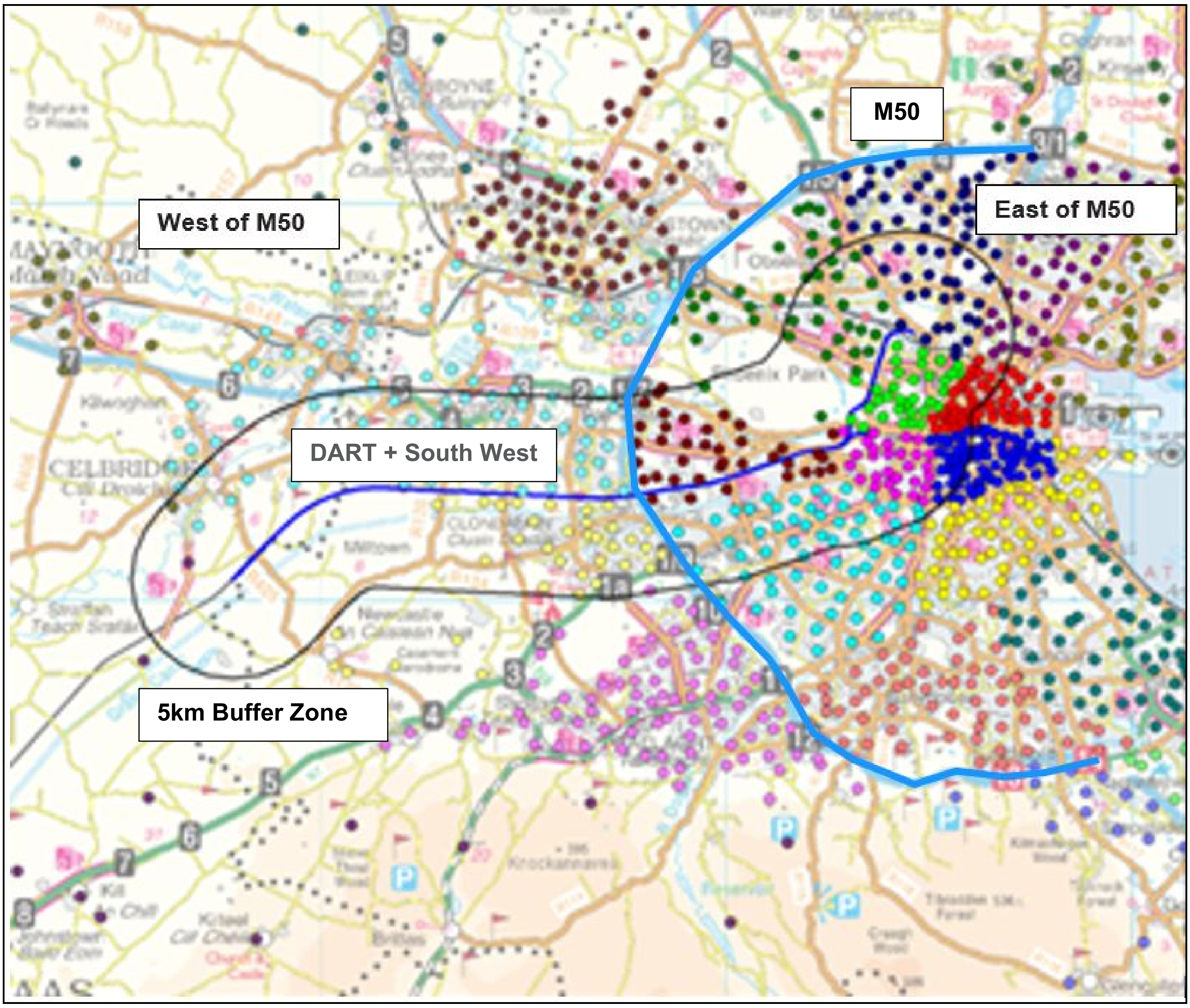


Figure 6-19 5 km Buffer Zone along the DART + South West Project Route East and West of the M50 on ERM Sector System

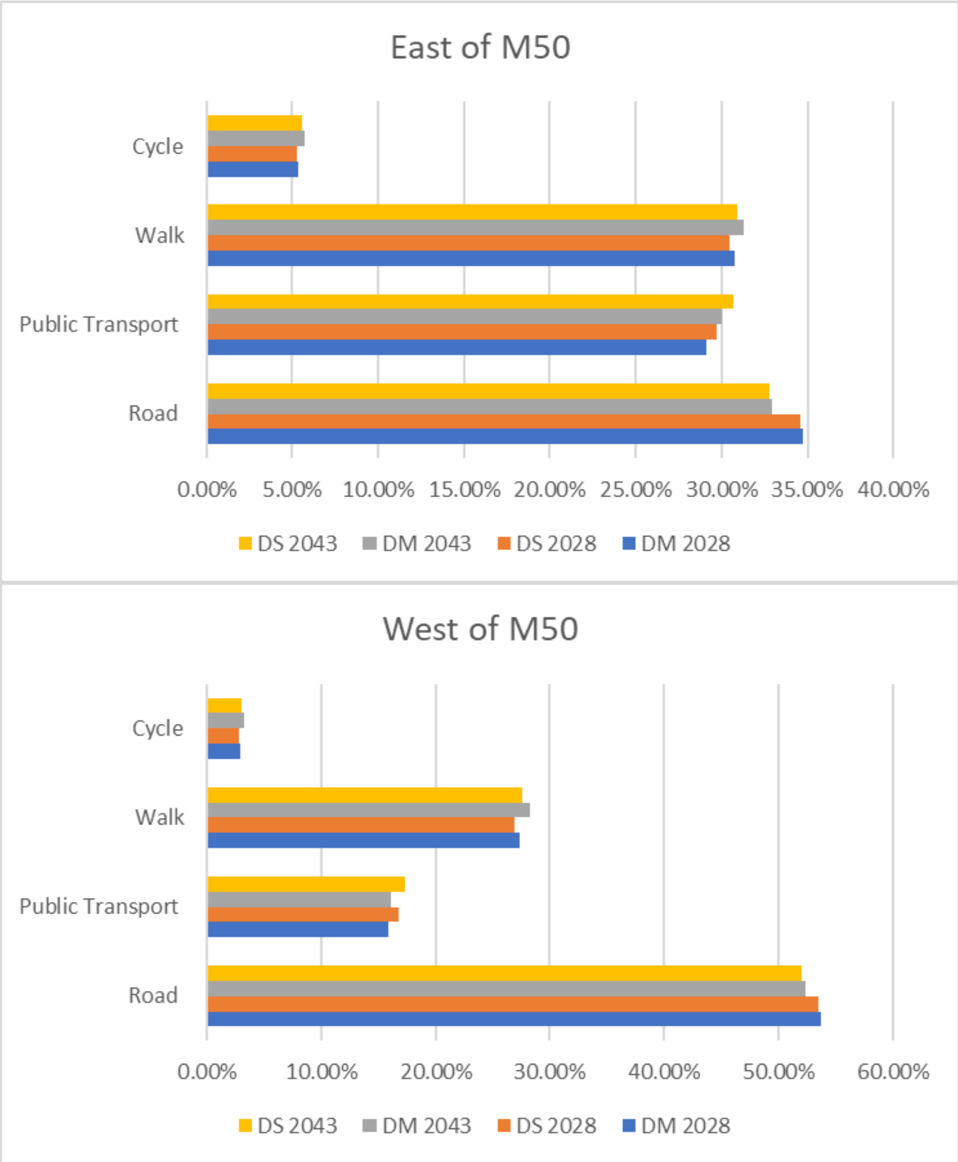


Figure 6-20 Projected Mode Shares within 5km Buffer of DART + 2028 & 2043

Overall mode shares impact across the entire ERM model area in the standard scenario are presented in Figure 6-21.

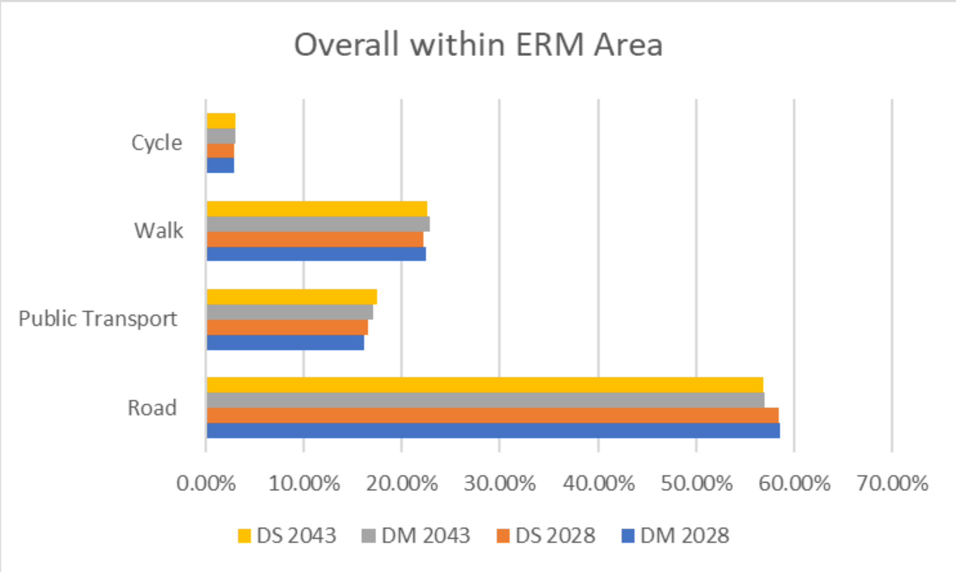


Figure 6-21 Projected Mode Shares With & Without DART + Proposals in 2028 & 2043 ERM

It can be seen that there is an increase in public transport rising to 17.5% and a decrease in road usage arising from the proposed Project.

Overall mode shares impact across the entire ERM model area in the Dynamic Scenario in which all projects contained in the *Transport Strategy for the Greater Dublin Area 2016 - 2036* are assumed to be in place are presented in Figure 6-22 below.

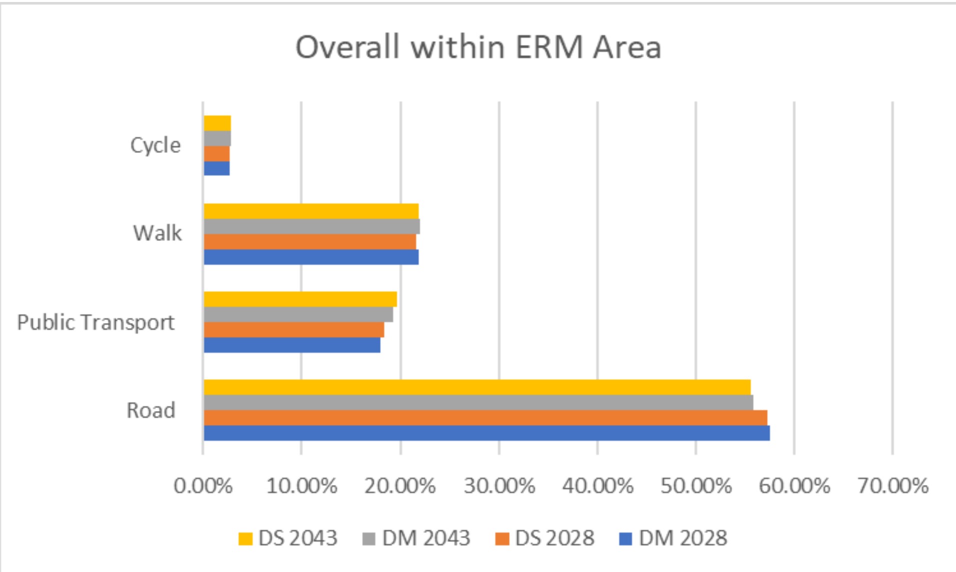


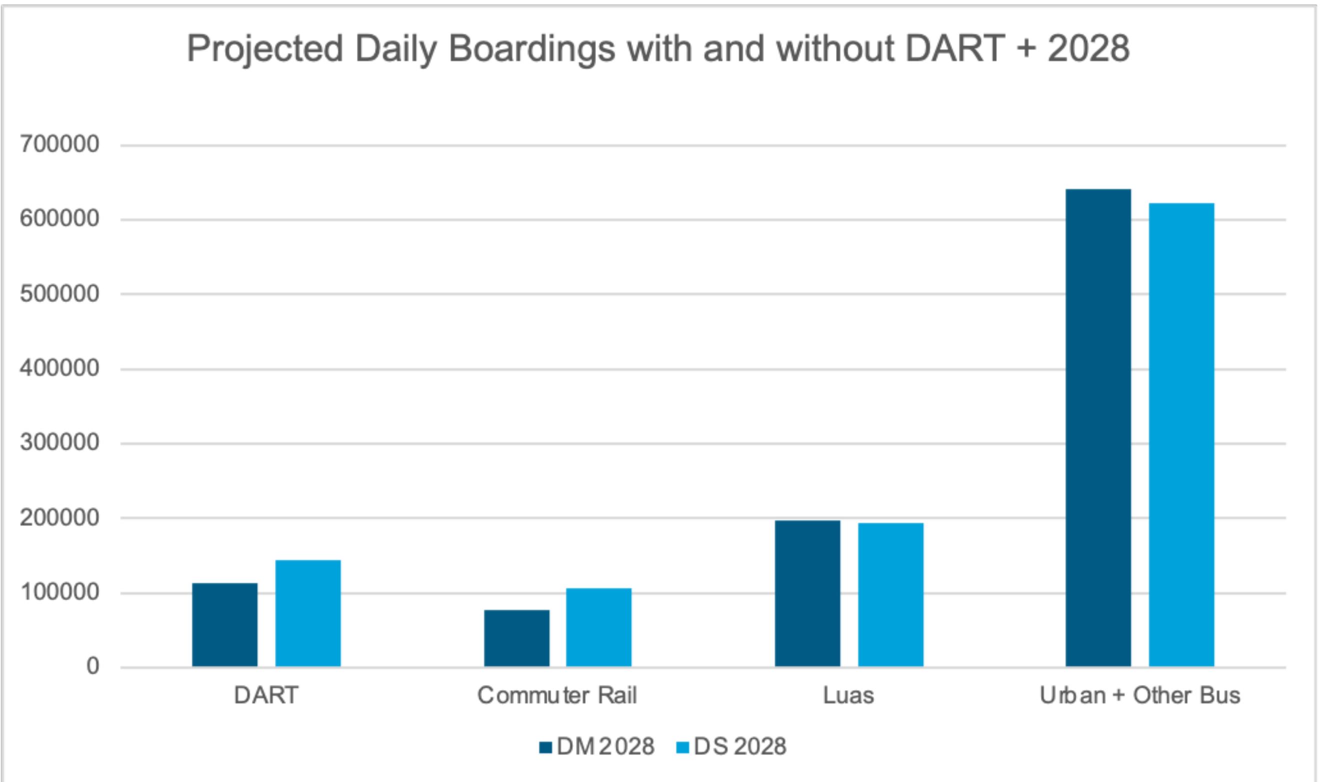
Figure 6-22 Projected Mode Shares With & Without DART+ Programme*

* Including all projects contained in the *Transport Strategy for the Greater Dublin Area 2016 - 2035* in 2028 & 2043 ERM

It can be seen that in the dynamic scenario there is a more pronounced shift to public transport which has a higher mode share (19.7%). The mode share enjoyed by road is lower and reduces more significantly.

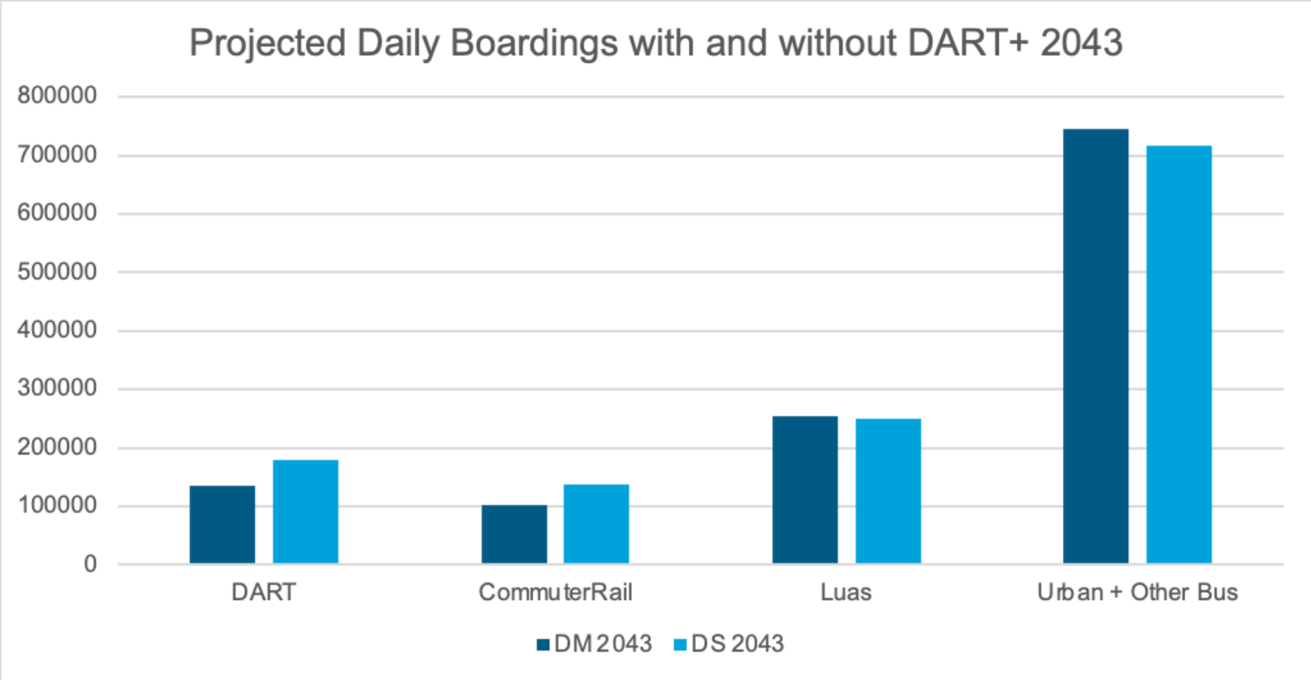
Introduction of DART+ Programme will result in an increase in public transport patronage of around 45,000 daily passengers per annum by 2043 with a slight reduction in road (private vehicle) demand.

The shares for each public transport mode are presented in Figure 6-23 and Figure 6-24 for years 2028 and 2043 respectively.



	DART	Commuter Rail	Luas	Urban & Other Bus
DM 2028	113,476	77,074	197,407	641,655
DS 2028	144,533	106,790	193,570	622,564

Figure 6-23 Projected Daily Boarding's with and Without DART+ Programme in 2028



	DART	Commuter Rail	Luas	Urban & Other Bus
DM 2043	136,279	101,564	254,542	745,035
DS 2043	178,347	137,119	249,797	717,573

Figure 6-24 Projected Mode Shares With and Without DART + Programme in 2043

The total boardings show a significant shift towards DART rail services with an increase in the region of 31,000 -42,000 passenger boarding's per day or between 11 - 15 million per annum for both years 2028 and 2043 respectively.

6.5.9. Operational Impact Passenger Rail

DART+ South West will significantly increase train capacity from the current 12 trains per hour per direction to 23 trains per hour per direction (i.e., maintain the existing 12 services, with an additional 11 train services). This will increase passenger capacity from the current peak capacity of approximately 5,000 passengers per hour per direction to approximately 20,000 passengers per hour per direction.

The proposed Project will result in the railway line accommodating a greater number of services and therefore a greater number of potential passengers. The increase in passenger numbers at each station along the length of the line has been identified and is presented in this section.

The ERM model for DART+ South West area provided by Iarnród Éireann in May 2021, developed by AECOM was used to establish passengers' demand forecast. The model provides information for the existing stations and additionally the potential future stations at Kylemore and Cabra. The information states boarding and alighting data for each direction, East and West Bound, and for AM and PM peaks.

The peak hours of 07:45 - 08:45 and 17:15 - 18:15 are assumed for the AM peak and PM peak respectively for the base year Census 2019.

A growth factor of 2% is assumed for the years 2019 to 2028. For the growth between 2028-2029 all stations, except Connolly and Docklands, assume a growth factor associated with the growth between the 2028 Do Minimum (DM) ERM to the 2028 Do Something (DS) ERM scenarios, where DS includes DART+ Programme, as well as an annual background growth factor of 2%.

For all stations, growth between 2028 – 2043 is based on the growth factor associated with the difference between the 2028 DS ERM to the 2043 DS ERM scenarios.

Kishoge, Kylemore, Heuston West, Cabra Road and Glasnevin are assumed to be built in 2027 and are included into the data analysis in the same year. Its initial station demand in 2027 is based on outputs from the ERM but adjusted based on the average difference between Rail Census and ERM found at the other stations on the line.

The change in passenger numbers as a result of the proposed Project at each of the stations is set out in Table 6.41 for 2028 and Table 6.42 for 2043.

Table 6.41: Projected Growth in Passengers at Each Station in AM Peak Periods

Station	2019		2028		2043	
	AM		AM		AM	
	Board	Alight	Board	Alight	Board	Alight
Hazelhatch & Celbridge	248	6	877	11	1649	14
Adamstown	46	4	151	13	268	16
Kishoge	0	0	1162	589	1473	801
Clondalkin Fonthill	66	8	275	22	470	29
Park West & Cherry Orchard	15	160	42	376	66	485
Kylemore	0	0	806	1054	912	1447
Heuston Rail	0	0	229	3158	294	4208
Cabra Road	0	0	173	220	199	330
Glasnevin	0	0	1079	2195	1277	3009
Docklands	8	678	11	1056	14	1397
Total	**383**	**856**	**4,805**	**8,694**	**6,622**	**11,736**

Table 6.42: Projected Growth in Passengers at each Station in PM Peak Periods

Station	2019		2028		2043	
	PM		PM		PM	
	Board	Alight	Board	Alight	Board	Alight
Hazelhatch and Celbridge	20	253	86	380	112	731
Adamstown	3	121	11	851	15	1530
Kishoge	0	0	342	1158	470	1489
Clondalkin Fonthill	4	76	10	553	14	1005
Park West and Cherry Orchard	110	46	223	286	296	439
Kylemore	0	0	706	749	951	860
Heuston Rail	0	0	2029	591	2691	873
Cabra Road	0	0	154	204	219	241
Glasnevin	0	0	1333	1201	1748	1459
Docklands	383	0	554	0	709	0
Total	**520**	**496**	**5,448**	**5,973**	**7,225**	**8,627**

There is a large increase in train and passenger capacity and ridership arising from the proposed Project. Table 6.43 shows the changes in total rail capacity in a single peak hour.

Table 6.43: Changes in Train Capacity

Commuter route	Existing Number of services	Existing Capacity	Future Number of services	Future Capacity
PPT / DART PPT (Hazelhatch - Connolly)	2	800	7	8400
DART Hazelhatch / Heuston	0	0	4	4800
Heuston Commuter	4	1600	4	2400
Heuston Intercity Including services calling at Kildare, Newbridge & Sallins.	6	2700	8	4560
Total	**12**	**5,100**	**23**	**20,160**

The impact on passenger rail transport is considered to be long term, positive and significant. Further detail is provided in Table 6.44.

Table 6.44: Categorisation of Impact and Significance Rail Passenger Transport

Criteria	Impact	Significance	Clarification
Journey Time	Positive	Slight	Increased service frequency will reduce wait time and thereby journey time.
Journey Length	Positive	Slight	The provision of a new train station at Heuston West will reduce journey length for a relatively small no. of passengers.
No. of Passengers	Positive	Significant	Projected large increase in passenger numbers

6.5.10. Operational Impact on Freight Rail

The upgrade of the railway network, specifically the proposed four-tracking will increase freight rail capacity within the study area. No changes to journey time are projected.

The impact on freight rail transport is considered to be long term, positive and moderate.

6.5.11. Operational Impact on Vehicular Traffic

As set out in Chapter 4 Project Description, the proposed Project in the operational phase has very limited impact on the road network. There are no new roads proposed and no severance / access / diversion impacts arising from the operation of the proposed Project. A number of existing bridges are to be upgraded. In all such cases the vehicular capacity of the network will be maintained / increased.

The modelling statistics presented, which report on the average conditions across the entire modelled area was extracted from the ERM to assess the proportional change in each model. Model statistics are presented below.

Table 6.45 and Table 6.46 set out the impact of the proposed Project on the whole network in the Do Minimum and Do Something standard scenarios on queuing, travel time, travel distance and average speed in the ERM Model for the years 2028 and 2043 respectively.

Table 6.45: Operational Impact 2028 – AM and PM Peak Hour

Indicator	AM Peak			PM Peak		
	Do Minimum	Do Something	% Change	Do Minimum	Do Something	% Change
Queuing (pcu hour)	42600	42121	-1.1%	40124	39446	-1.7%
Travel Time (pcu hour)	157026	155969	-0.7%	148307	147229	-0.7%
Travel Distance (pcu kilometre)	7168784	7131931	-0.5%	6920540	6896293	-0.4%
Average Speed (kph)	45.7	45.7	0.2%	46.7	46.8	0.4%

Table 6.46: Operational Impact 2043 – AM and PM Peak Hour

Indicator	AM Peak			PM Peak		
	Do Minimum	Do Something	% Change	Do Minimum	Do Something	% Change
Queuing (pcu hour)	60326	59488	-1.4%	55263	55306	0.1%
Travel Time (pcu hour)	190590	189251	-0.7%	175859	175463	-0.2%
Travel Distance (pcu kilometre)	8136017	8107605	-0.3%	7713625	7687187	-0.3%
Average Speed (kph)	42.7	42.8	0.4%	43.9	43.8	-0.1%

The network wide statistics from ERM indicate that the impact of the Project in terms of queuing, travel time, travel distance and average speed across the entire model area would be minimal, less than 2% in all instances, which given the extent of the model is to be expected.

The impact on vehicular traffic is considered to be long term, positive and slight, further detail is provided in Table 6.47.

Table 6.47: Categorisation of Impact and Significance Vehicular Transport

Criteria	Impact	Significance	Clarification
Travel Time	Positive	None	Travel time reduced moderately
Average Speed	None	None	No discernible impact on average speed on the road network.
Travel Distance	Positive	Slight	Travel distance reduced moderately
Car Mode Share	Positive	Slight	Reduction in Road mode share of c.1%.

6.5.12. Operational Impact on Public Transport – Bus

The proposed Project in the operational phase has a negligible impact on the road network. Existing bus routes will not be impacted by the proposed Project in the post project operational stage. All routes and bus lanes will be maintained and there will be no requirement to re-locate bus stops. It is not projected that journey time will be impacted.

It is envisaged that bus services providing connectivity with existing and planned future train stations along the DART+ South West Project extent may experience increased demand arising from the enhanced rail services.

It is expected that there will be passenger demand for Bus Route 145, currently serving Heuston Station to service the proposed new Heuston West Station. As Heuston Station is a principla stop, the journey time for bus passenger would not be affected but accommodating the same may affect schedule. The incorporation of Heuston West into the Airport Bus 728 route would increase journey time by 4-7mins. The provision of additional DART services may lead to a shift from bus to rail transport. Mode share projections as reported in Figure 6-24 indicate a drop in bus mode share of c. 3% – 4%. The ERM modelling indicates a slight increase in average vehicle speed, which may impact on public transport journey times.

The impact on bus public transport is considered to be long term and neutral. Further detail is provided in Table 6.48.

Table 6.48: Categorisation of Impact and Significance Bus Transport

Criteria	Impact	Significance	Clarification
Bus Route Journey Time	None	None	Avg speed on road network to increase and queuing to reduce moderately
Bus Route Journey Length	None	None	No impact on Bus Route Journey Length. Road network materially unchanged.
No. Passengers	Negative	Slight	Projected slight reduction in passenger no's

6.5.13. Operational Impact on Public Transport – Luas

The proposed Project in the operational phase has no impact on the Luas network. The increased usage of DART services arising from the proposed Project and increased passenger numbers at Heuston and Connolly Stations, both of which are served by Luas, can be expected to promote increased Luas ridership.

The provision of additional DART services may lead to a shift from bus to rail transport. Mode share projections as reported in Figure 6-24 indicate a drop in Luas mode share of c. 2%.

The impact on Luas public transport is considered to be long term and negative, but so marginal as to be negligible. Further detail is provided in Table 6.49.

Table 6.49: Categorisation of Impact and Significance Luas

Criteria	Impact	Significance	Clarification
Luas Route Journey Time	None	None	No discernible impact on Luas journey time
Bus Route Journey Length	None	None	No discernible impact on Luas journey length
No. Passengers	None	None	No discernible impact on overall Luas passenger no.s

6.5.14. Operational Impact on Pedestrians and Cyclists

The proposed Project provides additional dedicated pedestrian / cycling facilities at 2 no. bridge crossings, Le Fanu Road Bridge (OBC7) and Kylemore Road Bridge (OBC5A). A pedestrian / cycle route is to be provided to Heuston West Station. No additional works to the pedestrian / cycle network is proposed.

The proposed Project, including the provision / upgrade of these routes will therefore reduce pedestrian / cycle severance. As detailed in Section 6.5.8, there will be a small increase in pedestrian and cycling mode share within 5km of the proposed Project and in the ERM area overall.

The change in rail passenger numbers as a result of the proposed Project was derived from the ERM Modelling, as detailed previously in Section 6.5.9. To obtain the growth in the number of cyclists, an assumption that 4% of passengers using train services along the line are currently cycling to and from train stations. Due to the development of the GDA cycle strategy cycle and the enhanced rail services to be delivered as part of the proposed Project the cycle mode share in 2028 and 2043 was increased to 6% and 8% respect.

The growth in cyclist numbers as a result of the proposed Project at each of the stations is set out in Table 6.50 and Table 6.51 for both years 2028 and 2043.

Table 6.50: Projected Growth in Cyclists in the AM at Each Station in 2028 and 2043

Station	2019		2028			2043		
	AM		AM			AM		
	Board	Alight	Board	Alight	% Change AM	Board	Alight	% Change PM
Hazelhatch & Celbridge	10	0	53	1	227%	132	1	68%
Adamstown	2	0	9	1	250%	21	1	83%
Kishoge	0	0	70	35	-	118	64	73%
Clondalkin Fonthill	3	0	17	1	500%	38	2	82%
Park West & Cherry Orchard	1	6	3	23	368%	5	39	65%
Kylemore	0	0	48	63	-	73	116	70%
Heuston Rail	0	0	14	189	-	24	337	78%
Cabra Road	0	0	10	13	-	16	26	83%
Glasnevin	0	0	65	132	-	102	241	74%
Docklands	0	27	1	63	137%	1	112	77%

Table 6.51: Projected Growth in Cyclists in the PM at Each Station in 2028 and 2043

Station	2019		2028			2043		
	PM		PM			PM		
	Board	Alight	Board	Alight	% Change PM	Board	Alight	% Change PM
Hazelhatch and Celbridge	1	10	5	23	156%	9	58	141%
Adamstown	0	5	1	51	943%	1	122	139%
Kishoge	0	0	21	69	-	38	119	74%
Clondalkin Fonthill	0	3	1	33	956%	1	80	141%

Station	2019		2028			2043		
	PM		PM			PM		
	Board	Alight	Board	Alight	% Change PM	Board	Alight	% Change PM
Park West and Cherry Orchard	4	2	13	17	389%	24	35	92%
Kylemore	0	0	42	45	-	76	69	66%
Heuston Rail	0	0	122	35	-	215	70	81%
Cabra Road	0	0	9	12	-	18	19	71%
Glasnevin	0	0	80	72	-	140	117	69%
Docklands	15	0	33	0	117%	57	0	71%

The increase in patronage at stations due to the proposed Project will increase the pedestrian and cyclist movement around the stations.

The impact on bicycle transport is considered to be long term, positive and slight in the wider study area. In the immediate vicinity of the train stations the impact will be long term, positive and significant. Further detail is provided in Table 6.52.

Table 6.52: Categorisation of Impact and Significance of Temporary Diversions on Pedestrians and Cyclist

Category Assessed	Impact	Significance	Clarification
Pedestrians & Cyclists - Volumes	Negative	Slight	Increase in bicycle and pedestrian movement, particularly in the vicinity of the train stations.
Pedestrians & Cyclists – Journey Length	None	None	Minimal changes in cycle / pedestrian network resulting in no discernible change to journey length.
Pedestrians and Cyclist (Safety)	Positive	Slight	The enhanced cycle and pedestrian facilities proposed at Le Fanu Road and Kylemore Road impact positively.

6.6. Mitigation Measures

This section describes the mitigation measures which are proposed to ameliorate, remediate or reduce traffic and transport impacts from the Construction and Operational phases of the Project.

The provision of temporary vulnerable user bridges has been proposed at all bridge reconstruction locations in order to mitigate the impact of bridge closures on vulnerable road users. In the case of the Kylemore Road Bridge (OBC5A) closure, a temporary northbound vehicular bridge is also to be provided in addition to the vulnerable user bridge to the east.

A Construction & Environmental Management Plan (CEMP) as outlined in Volume 4, Appendix 5.1 will be updated by the successful Main Contractor. The CEMP will set out the Contractor’s overall management and administration of the construction project. A Mobility Management Plan which will also include a Construction Traffic and Construction Worker Travel Plan will be provided by the Main

Contractor outlining mitigation measures after having considered any potential cumulative impacts of works staging and other projects in the public space.

6.6.1. Construction Phase

6.6.1.1 General Mitigation

The following mitigation measures are proposed during the construction phase of the proposed Project in order to mitigate any significant traffic and transport effects from the proposed Project:

- Use of sufficient clear signage to ensure that construction vehicles use only designated routes and that the contracted hauliers are well briefed of the routes and restrictions;
- Routing of HGVs on main roads away from sensitive areas such as schools, residential areas, and areas sensitive in terms of air quality;
- Time slots for bulk deliveries to ensure that convoys of vehicles do not arrive simultaneously;
- Provision of holding spaces to avoid congestion on the local road network by waiting vehicles;
- Coordination of abnormal large loads;
- Scheduling of deliveries / collections away from peak hours, either before the AM peak or during the inter-peak daytime period;
- Encouraging construction hours to avoid the AM and PM peak traffic period for construction workers;
- On-site recycling of materials to reduce export and import vehicle movements, including stockpiling topsoil for landscape works, or crushing existing hard standing material for engineering fill;
- Keeping the access routes clear of debris associated with the construction;
- Implementation of wheel washing facilities to prevent debris being deposited on the highway network;
- Implementation of appropriate traffic management (given the already constrained environment) to ensure that construction of the site access junctions does not give rise to undue disruption.

6.6.1.2 Embedded Mitigation within the Construction Programme

The construction programme for the proposed Project has been developed considering how efficiently the works may be undertaken and to reduce the potential for environmental impacts. The following mitigation measures have been incorporated into the construction programme for the proposed Project as outlined below.

6.6.1.2.1. Defined Maximum Possession Periods

Impacts to passenger rail services will be mitigated through reducing track possession time to outside of the peak travel, this will include temporary closures implemented at required locations overnight or over the weekends. Track possessions area a part of normal operating procedures on the railway line.

In the case of the Phoenix Park Tunnel work impact; the proposed mitigation is to programme the implementation of as many of the other works required between the between Heuston Station Yard and the Glasnevin connection (that would typically require peak period possessions) during the 6month full track closure of the Phoenix Park Tunnel. This would include the construction of the proposed Heuston West Station.

6.6.1.2.2. Construction Staging to Limit Impact on Train Operations

The construction staging has considered the principle of keeping 2 no. tracks to be kept in operation for the majority of the construction period where feasible. While this does prolong the construction contract, it also serves to limit the impact on passenger rail services.

6.6.1.2.3. Construction Works Sequencing Dependencies

Limiting concurrent bridge closures, serves to reduce compounding the congestion already experienced on these limited crossing points over the railway corridor cutting.

6.6.2. Operational Phase

The mitigation proposed for the operational phase of the Project is embedded into the operational assessment. The overall impact is considered to be positive and therefore no specific additional operational mitigation measures are required.

6.7. Monitoring

Traffic counts in advance of the works and periodically during the work period are recommended to validate the assessment in the future. This monitoring, as well as community engagement (meetings, surveys and correspondence) proposed throughout the bridge closures periods, will serve to alleviate concerns from local residents. The formalised audit processes for temporary traffic management schemes within DCC and TII will provide an additional tier to monitor the safety and efficacy of the temporary traffic management proposals during implementation.

In addition, regular transport stakeholders' project co-ordination meetings are proposed. This will provide adequate multiparty input to aid any necessary adjustments in order to improve diversions in response to the actual impacts observed during the construction stage.

An annual National Census of Rail patronage is carried out each year by Iarnród Éireann on behalf of the National Transport Authority. Boardings and alightings of passengers at every train station in the country are recorded on one day of the year. In the event that this annual census ceases to be undertaken, such data should continue to be gathered annually by Iarnród Éireann for the train stations within the study area.

Ongoing monitoring of the car parking provided at the stations should be undertaken to ensure that demand does not exceed capacity. This will be done in consultation with the NTA to inform any strategic proposals around development of Park & Ride. Proposals to develop Park and Ride will be brought forward independently of the DART+ Programme.

Ongoing monitoring of cycle parking will be undertaken by Iarnród Éireann to inform their existing Station Enhancement Programme to ensure adequate cycling facilities in terms of meeting existing demand and encouraging travel by alternative modes.

6.8. Residual Effects

6.8.1. Construction Phase

The construction phase of the proposed Project has been developed to minimise the impact on all highway reassignments issues in its vicinity. The roads required to be temporarily closed and their alternative diversion routes are already considered congested during the AM and PM peaks. The overall impact for each of the diversions is considered to be temporary but significant.

6.8.2. Operation Phase

The overall impact is considered to be positive. Rail capacity and frequency of service will be enhanced. The impact on passenger rail transport is considered to be long term, positive and significant. The impact on vehicular traffic is considered to be long term, positive and slight. The impact on bus public transport is considered to be long term and neutral. The impact on Luas public transport is considered to be long term and negative, but so marginal as to be negligible.

6.9. Cumulative Effects

The cumulative assessment of relevant plans and projects is undertaken separately in Chapter 26 of this EIAR.

6.10. References

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