

Appendix H: Transport Modelling Plan



Traffic Modelling Plan

ML1-JAI-TRA-ROUT_XX-PL-Y-00001 | P05.2

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MetroLink

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1. Introduction

1.1 Background

On 22 March 2018, the National Transport Authority (NTA) and Transport Infrastructure Ireland (TII) launched the Dublin MetroLink Project. The launch included the release of an Emerging Preferred Route (EPR) and the start of a public consultation period on the EPR.

TII are managing MetroLink on behalf of the NTA. In January 2018 a Jacobs Idom Consortium (J/I) was appointed by TII to develop a preliminary design for MetroLink, to undertake an Environmental Impact Assessment, Appropriate Assessment and prepare all required materials for the submission of a Railway Order Application under Section 37 of the Transport (Railway Order) Act 2001 amended.

The overall MetroLink objective, as established by the NTA and TII, and as informed by planning policy context is:

“to provide a safe, high frequency, high capacity, fast, efficient and sustainable public transport service connecting Swords, Dublin Airport, Irish Rail, DART, Luas, Dublin Bus and the city centre”.

In delivering this overall objective MetroLink will:

- Cater for existing and future public transport travel demand along the defined corridor;
- Be modern, attractive and accessible to all users;
- Be designed to integrate appropriately into the existing public realm;
- Be segregated from other transport modes to facilitate future trends in mobility;
- Contribute to a reduction in urban congestion and the enhancement of the environmental sustainability of the region;
- Support the continued economic development of the Dublin area and wider area;
- Be planned, constructed and operated in an environmentally sustainable manner;
- Support public transport network integration by providing high quality passenger interchange points, which facilitate convenient transfer between public transport modes at key locations in the study area;
- Facilitate connection to key trip attractors; and
- Facilitate the provision of a ‘strategic Park and Ride’ for the M1 Motorway corridor.

The preferred route will be approximately 19km in length, running from Estuary, north of Swords, southwards towards Dublin City via Dublin Airport. The route starts above ground from Estuary through Swords, going underground through Dublin Airport, before emerging again to cross over the M50. From

Northwood, through the city to its terminus at Charlemont in the south of the city, the route will run through a single bore tunnel. The route will include 16 new stations, a Park and Ride facility at Estuary Station, a depot (not operating as a station) at Dardistown, and ancillary infrastructure.



Figure 1-1: Preferred MetroLink Route

1.2 Purpose of Traffic Modelling Plan

As part of MetroLink, Jacobs/Idom (JI) is required to undertake the Transport Assessment, Scheme Appraisal, and Preliminary and Detailed Business Cases. The Transport Assessment is required to assess the potential benefits and/or impacts of the scheme during the operational phase and also during the construction phase, as well as providing technical input to the design, EIAR and Business Cases. The transport assessment requires strategic modelling of operations, strategic modelling of construction impacts, local/micro modelling of operations and local/micro modelling of construction impacts.

This Traffic Modelling Plan outlines the JI proposal in terms of inputs, modelling approach, outputs and deliverables. It is envisaged that this is a “live” document that will evolve over time in collaboration with TII to respond to the requirements of different stages of the assessment and appraisal phases of MetroLink.

2. Proposed Methodology

2.1 Overarching Approach

The following chart outlines the proposed assessment methodology outlining the high-level inputs, the strategic multi-modal modelling assessment, the interaction with local / micro modelling, and the outputs and deliverables. The strategic multi-modal modelling will underpin the assessment and comprise the main assessment of benefits and impacts, feeding into local / micro models where potentially significant impacts are identified. The local / micro modelling will be used to assess in greater detail the potential site-specific impacts and to develop appropriate mitigation for same. The local /micro modelling will also feedback detailed operational outputs to the strategic model to further improve the strategic assessment of the scheme.

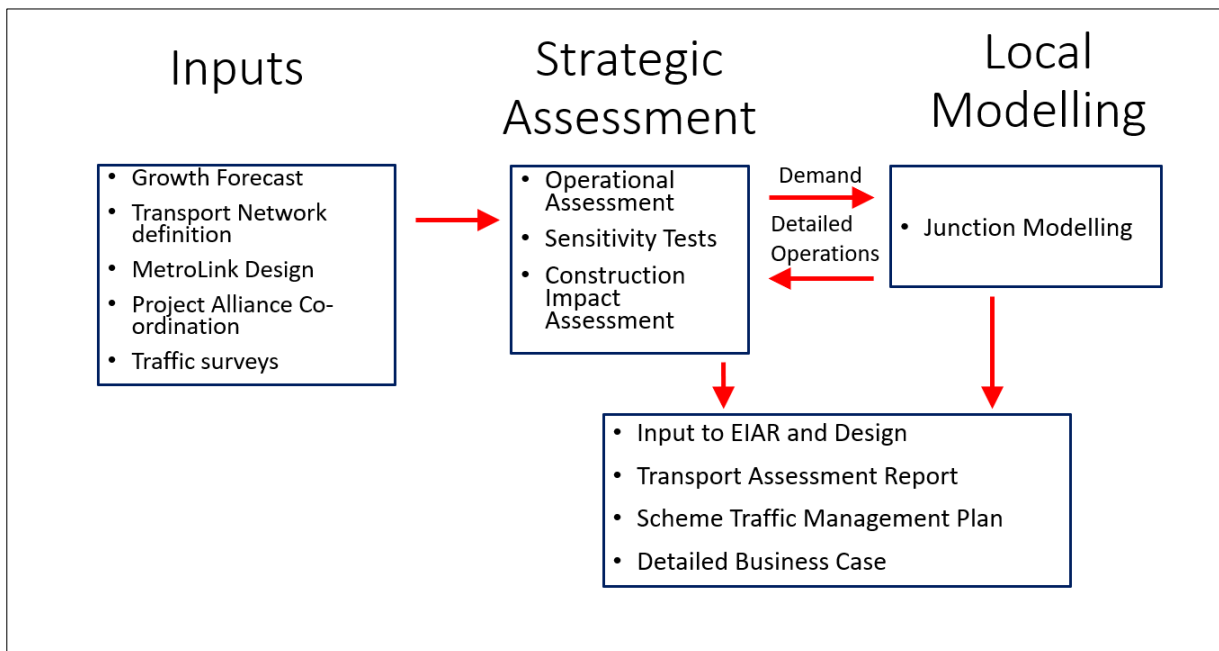


Figure 2.1: Transport Assessment Approach

3. Proposed Strategic Modelling Approach

As outlined in the overarching approach the strategic multi-modal modelling comprises the main element of the transport assessment. The following outlines our proposal in relation to the strategic transport modelling to be undertaken to carry out the scheme assessment and business case for MetroLink.

3.1 NTA Eastern Regional Model

3.1.1 Use of Eastern Regional Model

The strategic model to be used for the MetroLink Scheme Appraisal is the Eastern Regional Model (ERM) developed by the NTA. The ERM is a multi-modal, network based transport model that includes all main surface modes of travel, including: full geographic coverage of the Eastern Region, a detailed representation of the road network, a detailed representation of the public transport network & services, a detailed representation of all major transport modes including active modes, accurate mode choice modelling of residents, a detailed representation of travel demand of four time periods (AM, LT, SR and PM) and a prediction of changes in trip destination in response to changing traffic conditions, transport provision and/or policy.

The ERM captures all day travel demand, thus enabling more accurate modelling of mode choice behaviour and increasingly complex travel patterns, especially in urban areas where traditional nine-to-five working is decreasing. Best practice, innovative approaches were applied to the ERM demand modelling modules including car ownership; parking constraint; demand pricing; and mode and destination choice. The ERM is therefore significantly more responsive to future changes in demographics, economic activity and planning interventions than traditional models. This ERM has a base year of 2016 and is calibrated to 2016 Census, 2017 National Household Travel Survey and localised multi-modal surveys.

The TII Project Appraisal Guidelines (PAG), while not specifically developed for the assessment of public transport schemes, outline the following in support of the use of the ERM as the Variable Demand Model for the assessment of the MetroLink scheme:

- **Nature of Scheme:** Major scheme, traffic management in urban areas, public transport schemes, intermodal impacts;
- **Likely Impacts of Scheme:** Major urban areas where congestion will exist, schemes which lead to large reductions in journey time, schemes which will increase competition with public transport, mode choice is likely to be a significant issue.

3.1.2 Model Extents and Detail

Figure 3.1 outlines the extent of the ERM, covering most of Leinster, excluding Kilkenny. The ERM is centered on Dublin City, within increased network and zonal detail in the metropolitan area surrounding Dublin City. The ERM has 1,953 zones, including 1,907 geographic zones, 39 road route zones, 7 rail route zones and 3 special zones (including Dublin Airport, Dublin Port and Dun Laoghaire Port special zones).

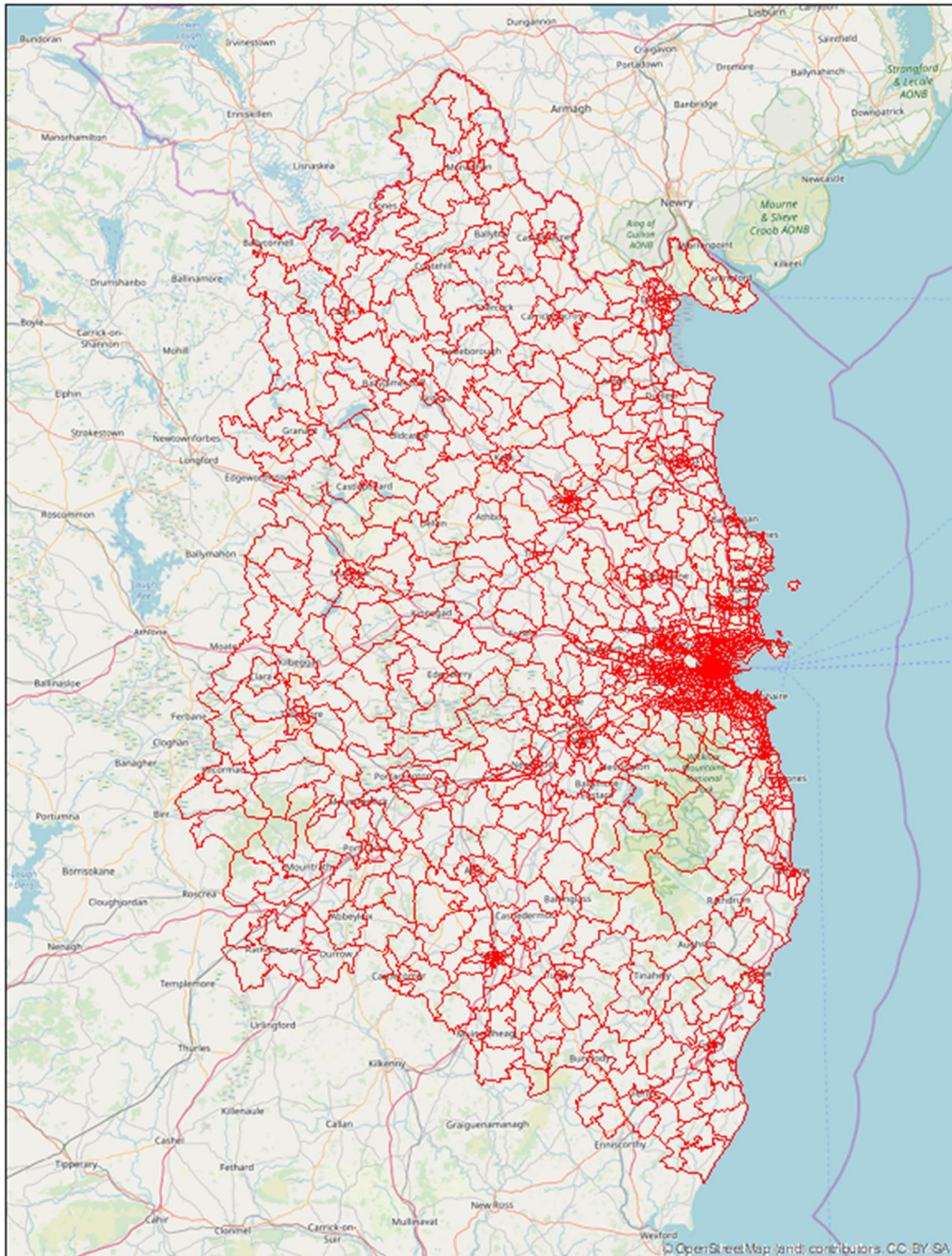


Figure 3.1: Extent of Eastern Regional Model

3.1.3 Area of Influence

To identify the area of influence, a 2018 Baseline Model was compared against a 2018 Do Scheme Model and the public transport outputs, and highway outputs from the model were reviewed to determine an area of influence for MetroLink.

The area of influence for the MetroLink scheme can be seen in Figure 3.2. As expected, the main area of influence is to the North of Dublin directly adjacent to the MetroLink scheme. The area of influence also extends to the West and South of Dublin along major radial corridors, and the M50 due to opportunities to combine Luas Green Line trips with MetroLink, and to access the Park and Ride Station.

The impacts of the MetroLink scheme can and do extend beyond this area of influence, however this area of influence has been used to identify an area where any future network schemes would be included within the future forecast models.

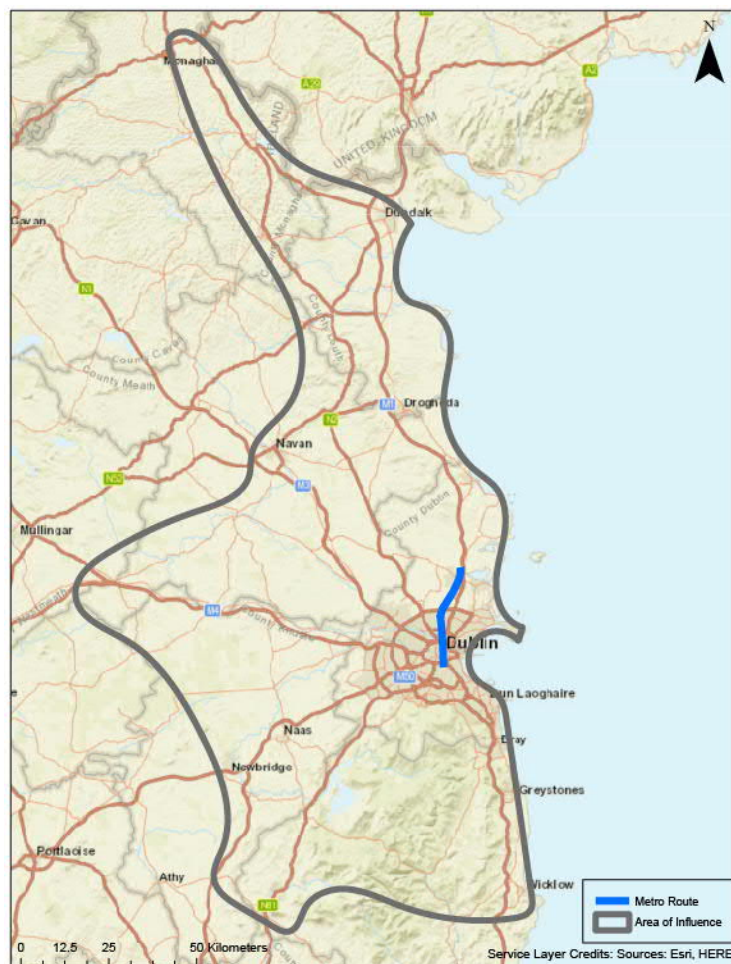


Figure 3.2: Area of Influence

3.2 Scenario Years

The following outlines the proposed scenario years to be considered for the MetroLink scheme modelling runs:

- Opening Year: 2030 (to be used as the construction impact year also);
- Design Year: 2045;
- Forecast Year: 2060; and
- The Business Case runs will utilise a Do Committed Schemes base, while the EIAR will utilise different Do Minimum networks for the 2030, 2045 and 2060 years.

3.3 Forecast Growth Scenarios

To ensure that MetroLink can operate efficiently and deliver benefits into the future, forecasts are required to determine the likely future levels of demand on Dublin's transport system. The TII PAG states that *"Unbiased future demand projections are a critical input in ensuring that capacity for transport infrastructure is neither too large nor too small to meet the future demand. Furthermore, travel demand projections inform the economic and environmental appraisal of transport schemes and therefore play a fundamental role in deciding whether a scheme is to progress"*.

The NTA have developed a planning datasheet forecast that aligns with the National Planning Framework (NPF) growth levels for the year 2040, and for the latest CSO forecast year of 2051.

The NTA will provide the project team with planning datasheets for the years of 2030, 2045 and 2060 and will provide information on how these years have been forecast including growth trajectories.

In addition to the forecast growth associated with the typical land use patterns, Dublin Airport is a key growth driver in the corridor and has a different growth associated with flight travel demand. Within the ERM, growth in landside demand is determined for passengers, staff and freight, applied to the Dublin Airport Special Zone. Freight and staff numbers are forecasted on a scaling factor, which will be aligned with passenger growth forecasts. DTTAS report "Review of Capacity Needs at Ireland's State Airports - August 2018" outlines forecast passenger growth to 2050 for Low, Central and High growth scenarios. There is a working group with NTA, TII, FCC and DAA where use of this aspect of the model is to be discussed to ensure consistent application of this tool.

The NTA have provided trip end forecasts for Dublin Airport and all other special zones. These are being used within the model.

3.4 Scheme Scenarios

The following describes the scenarios to be considered in the assessment:

- Do Committed;
- Do Minimum;
- Do Scheme; and
- Sensitivity Tests.

3.4.1 Do Nothing Network

Table 3-4 outlines the transport infrastructure and schemes that have been introduced in the intervening years between 2016 and 2019. The schemes listed in Table 3-4 will be added to the baseline 2016 ERM to create a present year ERM model.

3.4.2 Do Committed Scenario

The PAG also makes a clear distinction between Committed and Planned Schemes:

“(a) “Planned” improvements that are included in the fiscally constrained long-range plan for which the need, commitment, financing, and public and political support are identified and may be reasonably expected to be implemented; and

(b) “Committed” improvements that have been progressed through planning and are either under construction or are programmed into the capital expenditure budget.

The Do Minimum option should consider “committed” schemes alone as the inclusion of “planned” improvements may lead to a set of scheme options that incorporate projects that may not happen.”

The PAG also outlines that *“the inclusion of planned projects will suggest the reliance of the subject scheme on those projects”*.

As outlined above, ensuring an appropriate Do Minimum scenario is essential to the robust appraisal of the MetroLink Scheme. Schemes such as the DART Expansion, the DART Underground and BusConnects, etc. were they to be included as part of the Do Minimum scenario, could suggest a reliance of the MetroLink scheme, in particular where the proposed alignment and station locations would likely benefit from increased interchange between these schemes. However, there are improvements in DART services above current levels which will be delivered before 2030 and so would be included in the committed train service patterns.

In the case of the Do Committed scenario for the MetroLink Scheme the transport schemes/initiatives outlined in Table 3-4 are included.

3.4.3 Do Minimum Scenario

TII have instructed J/I to utilise the same Do Minimum scenario as BusConnects EIAR. Within the BusConnects EIAR, MetroLink is included within Do Minimum scheme, but within MetroLink, BusConnects is included as a Do Minimum scheme.

The details of the reasoning of case definition are contained within the report “BusConnects TIA - Definition of Do Minimum Schemes Scoping Note”.

3.4.3.1 Do Minimum Scheme Definition

Table 3-4 outlines the schemes to be included as part of the Do Minimum scenario for the opening year (2030) and the Design Year (2045). The Design Year (2045) is based on the implementation of the Transport Strategy for the Greater Dublin Area (GDA) measures.

The scheme opening year (2030) is based on the investment priorities contained within the National Development Plan (NDP).

3.4.3.2 Interchange and Boarding Penalties

It is proposed to maintain the calibrated boarding and interchange penalties within the model for both the Do Minimum and Do Scheme models. The default transfer penalties are presented in Table 3-1.

Table 3-1 ERM V3 Model Default Transfer Penalties between PT Sub-Modes (minutes)

	DART	Irish Rail	Luas	Urban Bus	Other Bus	BRT	Metro
DART	15	15	15	15	15	15	15
Irish Rail	15	15	15	15	15	15	15
Luas	15	15	5	5	5	5	5
Urban Bus	15	15	5	15	5	5	5
Other Bus	15	15	5	5	5	5	5
BRT	15	15	5	5	5	5	5
Metro	15	15	5	5	5	5	5

3.4.4 Do Scheme Scenarios

To appraise the MetroLink scheme, Scenario based analysis will be utilised. The main scenario will be called the Central Case, and in addition Scenario Sensitivity testing will be undertaken as per the Project Appraisal Plan.

Each Scenario will test a Do Minimum (without MetroLink) and Do Scheme (with MetroLink) to understand the impact of the MetroLink scheme under each scenario.

For each model run the following parameters, for example, will be included: MetroLink service pattern, journey time (speed profiles), vehicle capacities, station wait times, interchange penalties and associated local connections providing access to the stations from the street network and interchanging services.

The Scenario Sensitivity testing will include an agreed number of sensitivity tests utilising combinations of parameters that may impact on the passenger demand on the MetroLink scheme, in comparison to the Central Case.

3.4.5 Scenario Analysis / Sensitivity Test 1: Growth Projections

The slower growth scenario assumes that growth in population and jobs follows the same pattern as the core runs but happens at a slow pace, such that the difference increases as the forecast years get closer to 2060. The forecasts have been developed by utilising a planning datasheet from an earlier year, to represent a potential slow growth in the relevant forecast year, as summarized within Table 3-2.

Table 3-2: Slow Growth Forecast

Forecast Year	Planning Datasheet Year used for Slow Growth
2030	2028
2045	2040
2060	2053

3.4.6 Scenario Analysis / Sensitivity Test 2: Service Patterns

In this sensitivity test the core population and job forecasts and travel patterns have been assumed to remain in place, but the frequency of trains on the MetroLink have been reduced. This sensitivity test has been undertaken to understand how the MetroLink may perform if it operated with a lower frequency, i.e. with less trains.

The following table details the lower frequencies assessed in comparison with the core runs.

Table 3-3: Comparison of frequencies included in Core Runs and Sensitivity Test

Forecast Year	Core Run Frequencies	Low Frequency
2030	All Periods: 2mins	All Periods: 5mins
2045	All Periods: 2mins	All Periods: 3.5mins
2060	All Periods: 1.5mins	All Periods: 3mins

3.4.7 Scenario Analysis / Sensitivity Test 3: Complementary Measures

Complementary measures are outlined as a sensitivity test for the MetroLink scheme. Over the lifetime of the MetroLink scheme, additional transport infrastructure and measures are proposed that would likely supplement the operation of the MetroLink scheme. The National Development Plan (NDP), which includes MetroLink, sets out the transport proposals to be delivered in the State by 2027. The Transport Strategy for the Greater Dublin Area (GDA) sets out the transport proposals to be delivered in the GDA by 2035. It is proposed that both the NDP and GDA Transport Strategy are considered as sensitivities to the Do Scheme scenario. It is proposed that for these sensitivities, the NDP is included in the 2030 Opening Year

scenario, and that the GDA Transport Strategy is included in the 2045 Design Year and 2060 Forecast Year.

3.4.8 Scenario Analysis / Sensitivity Test 4: Alternative Demand

An alternative demand scenario has been developed by the NTA to represent travel in the post COVID world, this includes increases in working from home, increases in home-based shopping and reductions in business related travel from Dublin Airport.

3.4.9 Scenario Analysis/Sensitivity Test 5: Complementary Measures: National Development Plan + Alternative Demand

An alternative demand scenario has been developed to represent the build out of infrastructure projects included in the National Development Plan, in conjunction with the alternative demand scenario, detailed in section 3.4.8, to represent travel in the post COVID world. This was developed by the NTA, https://www.nationaltransport.ie/wp-content/uploads/2021/03/Alternative-Scenario-Development-Note-v-6.1_Final.pdf.

3.4.10 Construction Scenario

It is proposed to utilise a 2024 Do Minimum scenario as the basis for the construction impact assessment, as this will represent a worst-case scenario for travel demand levels during the construction period.

In this phase the impact of the different traffic management stages on the local transport network will be outlined. The road and street impacts will be coded into the 2024 Do Minimum scenario along with any identified mitigation to determine the potential local impacts, and any wider strategic impacts and diversions. This will provide input to the local junction modelling.

Further details of the traffic management will be contained within the Scheme Traffic Management Plan.

3.5 MetroLink Proposed Scheme List

The following table outlines the schemes to be included as part of the Do Minimum scenario for the opening year (2030) and the Design Year (2045). The Design Year (2045) is based on the implementation of the GDA Strategy measures.

The scheme opening year (2030) is based on the investment priorities contained within the National Development Plan (NDP).

Table 3-4: Proposed Scheme List

Proposed Scheme List		2019/ 2020	2030			2045 & 2060		
Scheme ID	Description	Do Nothing	Do Committed	Do Minimum	Do Scheme	Do Committed	Do Minimum	Do Scheme
<i>Rail Timetabling</i>								
TT1	Revised Irish Rail timetable	✗	✓	✓	✓	✓	✓	✓
<i>Heavy Rail Infrastructure</i>								
HR1	Interim DART Expansion Programme (non-tunnel elements) including additional stations at Kishogue, Cabra, Pelletstown, Woodbrook, Kilemore and Glasnevin	✗	Pelletstown & Kishogue only	✓	✓	Pelletstown & Kishogue only	✓	✓
HR2	DART Tunnel Element (Kildare Line to Northern Line)	✗	✗	✗	✗	✗	✓	✓
<i>Light Rail Infrastructure</i>								
	LUAS Cross City	✓	✓	✓	✓	✓	✓	✓
LR1	MetroLink (to Charlemont)	✗	✗	✗	✓	✗	✗	✓
LR2a	LUAS Cross City incorporating LUAS Green Line Capacity Enhancement - Phase 1	✗	✓	✓	✓	✓	✗	✗
LR3	LUAS Green Line Capacity Enhancement - Phase 2	✗	✗	✗	✗	✗	✓	✓
LR4	Finglas LUAS (Green Line extension Broombridge to Finglas)	✗	✗	✗	✗	✗	✓	✓
LR5	Extension of LUAS Green Line to Bray	✗	✗	✗	✗	✗	✓	✓
LR6	Lucan LUAS	✗	✗	✗	✗	✗	✓	✓

LR7	Poolbeg LUAS	x	x	x	x	x	x	x
LR8	Metro South (MetroLink extension Charlemont to Sandymount on LUAS Green Line alignment)	x	x	x	x	x	x	x
<i>BusConnects</i>								
BC1	Radial Core Bus Corridors	x	x	✓	✓	x	✓	✓
BC2	BusConnects Fares / Ticketing	x	✓	✓	✓	✓	✓	✓
BC3	BusConnects Routes and Services	x	x	✓	✓	x	✓	✓
BC4	Orbital Bus Corridors	x	x	x	x	x	x	x
<i>Park and Ride</i>								
PR1	Rail and Bus based P&R provision (partial implementation by 2028)	x	x	✓	✓	x	✓	✓
<i>Cycling</i>								
CY1	Greater Dublin Area Cycle Network Plan (excluding Radial Core Bus Corridor elements)	x	x	✓	✓	x	✓	✓
CY2	Greater Dublin Area Cycle Network Plan (including Radial Core Bus Corridor elements)	x	x	x	✓	x	x	✓
<i>National Roads</i>								
NR1	Reconfiguration of the N7 from its junction with the M50 to Naas, to rationalise junctions and accesses to provide a higher level of service for strategic traffic travelling on the mainline	x	x	x	x	x	✓	✓

NR2	Junction upgrades and other capacity improvements on the M1 motorway, including additional lanes south of Drogheda, where required	x	x	x	x	x	✓	✓
NR3	Widening of the M7 between Junction 9 (Naas North) and Junction 11 (M7/M9) to provide an additional lane in each direction	x	✓	✓	✓	✓	✓	✓
NR4	Widening of the M50 to three lanes in each direction between Junction 14 (Sandyford) and Junction 17 (M11) plus related junction and other changes	x	x	x	x	x	✓	✓
NR5	Reconfiguration of the N4 from its junction with the M50 to Leixlip to rationalise accesses and to provide additional capacity at the Quarryvale junction	x	x	x	x	x	✓	✓
NR6	Capacity enhancement and reconfiguration of the M11/N11 from Junction 4 (M50) to Junction 14 (Ashford) inclusive of ancillary and associated road schemes, to provide additional lanes and upgraded junctions, plus service roads and linkages to cater for local traffic movements	x	x	✓	✓	x	✓	✓
NR7	Enhancements of the N2/M2 national route inclusive of a bypass of Slane, to provide for additional capacity on the non-motorway sections of this route, and to address safety issues in Slane village associated with, in particular, heavy goods vehicles	x	x	x	x	x	✓	✓

NR8	Widening of the N3 between Junction 1 (M50) and Junction 4 (Clonee), plus related junction and necessary changes to the existing national road network	x	x	x	x	x	✓	✓
NR9	Development of a road link connecting from the southern end of the Dublin Port Tunnel to the South Port area, which will serve the South Port and adjoining development areas	x	x	x	x	x	✓	✓
<i>Regional and Local Roads</i>								
RR1	N3 Castaheany Interchange Upgrade	x	x	✓	✓	x	✓	✓
RR2	N3–N4: Barnhill to Leixlip Interchange	x	x	✓	✓	x	✓	✓
RR3	North-South Road – west of Adamstown SDZ linking N7 to N4 and on to Fingal	x	✓	✓	✓	✓	✓	✓
RR4	Glenamuck District Distributor Road	x	✓	✓	✓	✓	✓	✓
RR5	Leopardstown Link Road Phase 2	✓	✓	✓	✓	✓	✓	✓
RR6	Porterstown Distributor Link Road	x	✓	✓	✓	✓	✓	✓
RR7	R126 Donabate Relief Road: R132 to Portrane Demesne	x	✓	✓	✓	✓	✓	✓
RR8	Oldtown-Mooretown Western Distributor Link Road	x	x	✓	✓	x	✓	✓
RR9	Swords Relief Road at Lord Mayors	x	x	✓	✓	x	✓	✓
RR10	Poolbeg development roads	x	✓	✓	✓	✓	✓	✓
RR11	Cherrywood development roads	x	✓	✓	✓	✓	✓	✓

RR12	Clonburris development roads	x	✓	✓	✓	✓	✓	✓
RR13	R132 Reconfiguration in Swords	x	✓	✓	✓	✓	✓	✓
<i>Demand Management</i>								
DM1	Dublin City Centre Parking Constraint	x	x	✓	✓	x	✓	✓
DM2a	M50 Demand Management Measures - Variable Speed Limits	x	x	x	x	x	x	x
DM2b	M50 Demand Management Measures - Multi-point tolling	x	x	x	x	x	✓	✓
DM3	Implement demand management measures to address congestion issues on the radial national routes approaching the M50 motorway	x	x	x	x	x	✓	✓
DM4	Further demand management measures that ensure that all future growth in travel demand is facilitated by sustainable modes / max. 45% car commuter mode share.	x	x	x	x	x	✓	✓

3.5.1.1 Do Minimum Network Scheme Assumptions

The following section outlines the assumption on service patterns, capacities and frequencies that will be modelled for each of the schemes outlined in Table 3-4.

3.5.1.1.1 Heavy Rail Schemes

HR1: DART Expansion programme

The DART Expansion programme is a comprehensive scheme for the upgrade of all heavy rail commuter lines in the Greater Dublin Area, including electrifications to Drogheda, Maynooth and Hazelhatch. The DART Expansion Programme will not be fully delivered in 2030 with the programme focussed on the exiting network upgrade up to that point i.e. No DART Underground tunnel up to 2030.

For the purpose of modelling, the assumptions for the Heavy Rail network up to 2030 will be based on the NTA's **DART Expansion Programme Options Assessment – Addendum Report** with the network and service plans coded shown in Figure 3-4 below. A map of the proposed measures is shown in Figure 3-3 below.

Additional Stations by 2030

As part of the DART Expansion programme and based on further studies undertaken by the NTA since the publication of the GDA Strategy, several rail stations have been proposed at the following locations:

- **Kishogue**
 - An additional rail station has already been built between Clondalkin / Fonthill and Adamstown on the Dublin-Cork line. This will become a stopping station as part of the Do Committed scenario.
- **Pelletstown**
 - An additional rail station will be introduced between Ashtown and Broomsbridge on the Dublin-Sligo line. A footbridge will be provided to access from the North side of the canal. Walk links added for access to the station from both sides of the canal. All services Maynooth-Dublin and M3 Parkway - Dublin to stop at Pelletstown. Journey times increased by 1min to reflect dwell time. This station is included in the Do Committed scenario.
- **Woodbrook**
 - Introduction of a new rail station between Bray and Shankill on the Dublin-Rosslare line. All DART services to/from Bray/Greystones to stop at Woodbrook. Access to the station through the Woodbrook Golf course road. Journey times increased by 1min to reflect dwell time.
- **Kylemore**
 - Introduction of a new rail station between Park West and Heuston on the Kildare line. All DART services on the DART line to stop at Kylemore. Access to the station through from Kylemore road. Journey times increased by 1min to reflect dwell time.
- **Cabra**
 - Introduction of a new rail station on the Phoenix Park tunnel link on the Kildare line between Heuston and Drumcondra. All DART services on the line to stop at the station. Access to the station provided from Cabra Road and Old Cabra Road. Journey times increased by 1min to reflect dwell time.
- **Glasnevin**
 - Introduction of a new rail station at the junction between the Maynooth line and Phoenix Park tunnel line. All DART services on both the Maynooth line and Phoenix Park tunnel line to stop at the station. Transfer link provided to the Glasnevin MetroLink station. Access to the station provided from Phibsborough Road. Journey times increased by 1min to reflect dwell time.

The DART Expansion Programme also includes for the closure of level crossings on the Maynooth line. Location of road links that will be closed is to be clarified by the NTA.

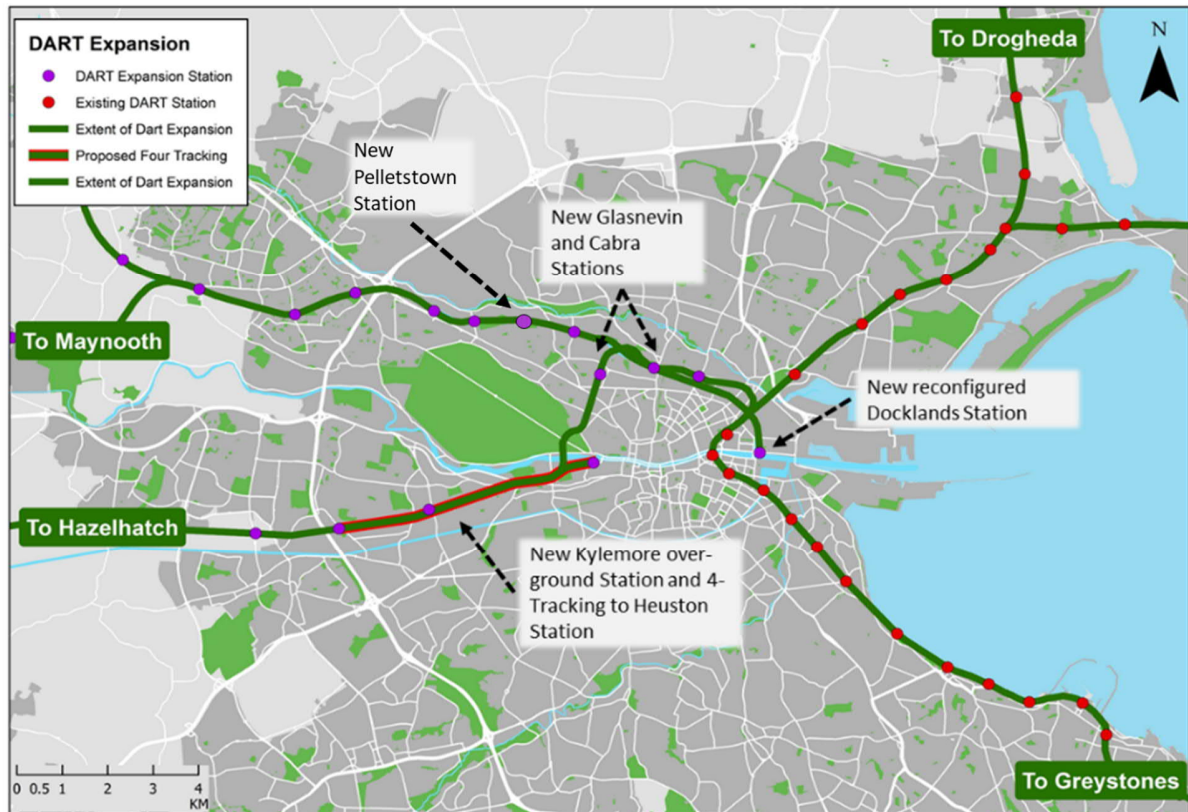


Figure 3-3: Interim DART Expansion Network

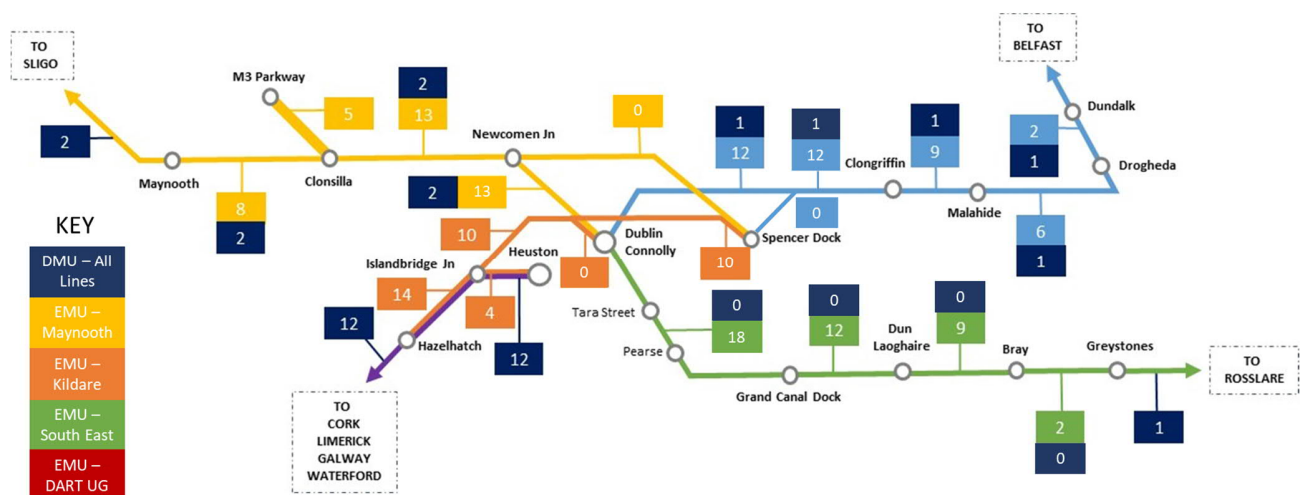


Figure 3-4: Interim DART Expansion - Service Provision

HR2: DART Expansion Programme including DART Tunnel Element

HR2 includes for the full implementation of the DART Underground tunnel component between Kylemore and Docklands stations connecting the Kildare Line with the Northern Line. It is proposed to reallocate the two 'Hazelhatch to Heuston' services via the Phoenix Park tunnel to maintain access to Cabra Station as this scenario assumes that HR2 follows the full implementation of HR1.

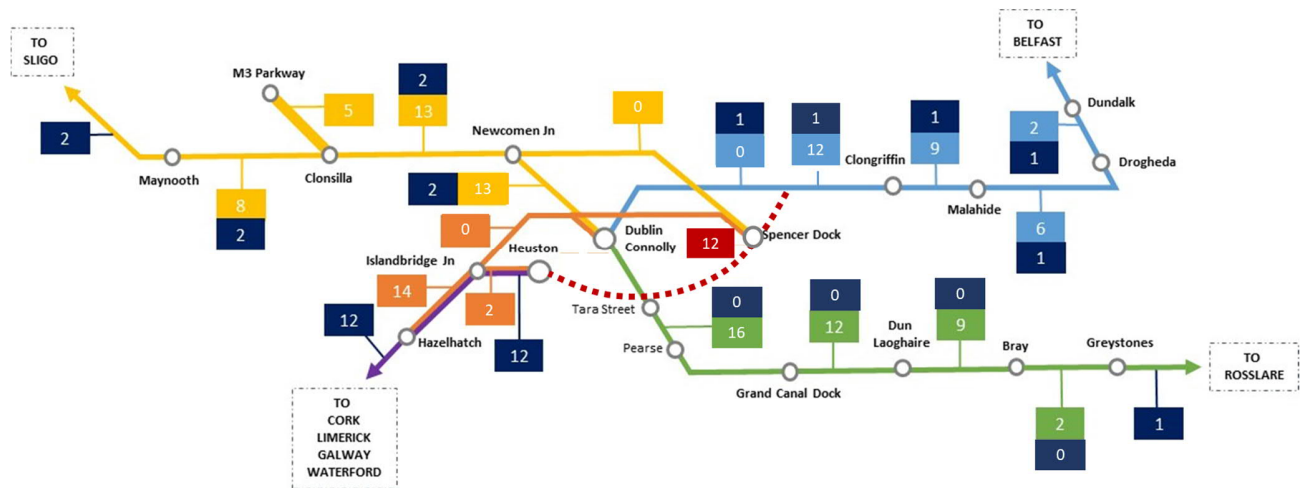


Figure 3-5: DART Expansion including DART Underground – Service Provision

Table 3-5 below outlines the service provision for both HR1 and HR2.

Table 3-5 Heavy Rail Peak Hour Service Provision

Route	HR1 DART Expansion (non-tunnel elements)	HR2 DART Expansion Including DART Underground
Northern Line		
Belfast to Connolly (Enterprise)	1	1
Connolly to Rosslare Europort (Diesel)		1
Greystones to Rosslare Europort (Diesel)	1	
Dundalk to Bray	2	
Drogheda to Docklands	2	
Drogheda to GCD	2	
Malahide to Bray	3	
Clongriffin to Dún Laoghaire	3	
Howth to Howth Jn [Shuttle]	6	6
Connolly to Bray		
Clongriffin to Bray	0	
Kildare / Northern Lines		

Route	HR1 DART Expansion (non-tunnel elements)	HR2 DART Expansion Including DART Underground
Drogheda to Hazelhatch		4
Dundalk to Hazelhatch		2
Clongriffin to Hazelhatch		3
Malahide to Hazelhatch		3
Maynooth & M3 Parkway		
Sligo to Connolly (Diesel)	2	2
Maynooth to GCD	4	
Maynooth to Dún Laoghaire		3
Maynooth to Bray	2	3
Maynooth to Greystones	2	2
M3 Parkway to Clonsilla [Shuttle]		4
M3 Parkway to Docklands	5	
M3 Parkway to GCD		2
M3 Parkway to Bray		3
Kildare Line		
Mainline to Heuston (DMU)	12	12
Hazelhatch to Heuston	4	
Hazelhatch to Docklands	5	2
Hazelhatch to Connolly	5	

Capacities on the routes will be as follows, interpeak frequencies will be assumed as half the peak frequencies:

- DART Services
 - Capacities: 512 seating / 1,382 crush
- Shuttle service Howth – Howth Junction
 - Capacities: 256 seating / 691 crush
- Shuttle service M3 Parkway – Clonsilla
 - Capacities: 185 seating / 660 crush

3.5.1.1.2 Light Rail Schemes

LR3: LUAS Cross City incorporating LUAS Green Line Capacity Enhancement – Phase 1

LUAS capacity increased on the Green Line from the current 43.6m trams (68 seating / 312 crush capacity) to 55m tram sets (96 seating / 408 crush).

- 2 trams per hour (tph) Brides Glen to Parnell;

- 10 tph Brides Glen to Broombridge;
- 8 tph Sandyford to Parnell; and
- 4tph Sandyford to Stephen's Green.

LR3: LUAS Green Line Capacity Enhancement - Phase 2

Phase 2 of the LUAS Green Line Capacity Enhancement with 55m tram sets (96 seating / 408 crush) and increased frequency levels

- 10 trams per hour (tph) Bray to Finglas;
- 10 tph Brides Glen to Broombridge;
- 6 tph Sandyford to Charlemont; and
- 4tph Sandyford to Stephen's Green.

LR4: LUAS Extension to Finglas

Extension of the existing LUAS Green line north to Charlestown. Service pattern affected by LR3 (Metro South) as Charlemont-Sandyford section used for Metro services Swords-Sandyford.

- Charlemont – Charlestown services
- 38min end-to-end journey times
- 3min (AM & PM) / 6min (LT & SR)
- Capacity (per LUAS): 96 seating / 408 crush

LR6: Lucan LUAS

Newly constructed LUAS line between Lucan and College Green. The main characteristics are:

- Journey times to reflect similar per km LUAS Red line times;
- Line to join with LUAS Red line services at Blackhorse;
- Limit of 4min frequency for all time periods for the combined routes from Blackhorse to city centre.
- Capacity (as per LUAS Red Line): 72 seating / 308 crush

3.5.1.1.3 BusConnects

BC1: Radial Core Bus Corridors (CBCs)

Each of the BusConnects schemes (based on the available ED schemes) will be coded into the Do Minimum network. The designs will be based on the scheme layouts that were recently issued for public consultation, circa April 2020.

BC2: BusConnects Fares / Ticketing

Integrated ticketing has been included within the Do Minimum and Do Scheme runs for all scenarios. Details on the Integrated ticketing has been provided by the NTA.

BC3: BusConnects Routes and Services

The latest available BusConnects services will be coded into the ERM. The routes will be provided to the project team in GTFS format and converted into model files using a bespoke process.

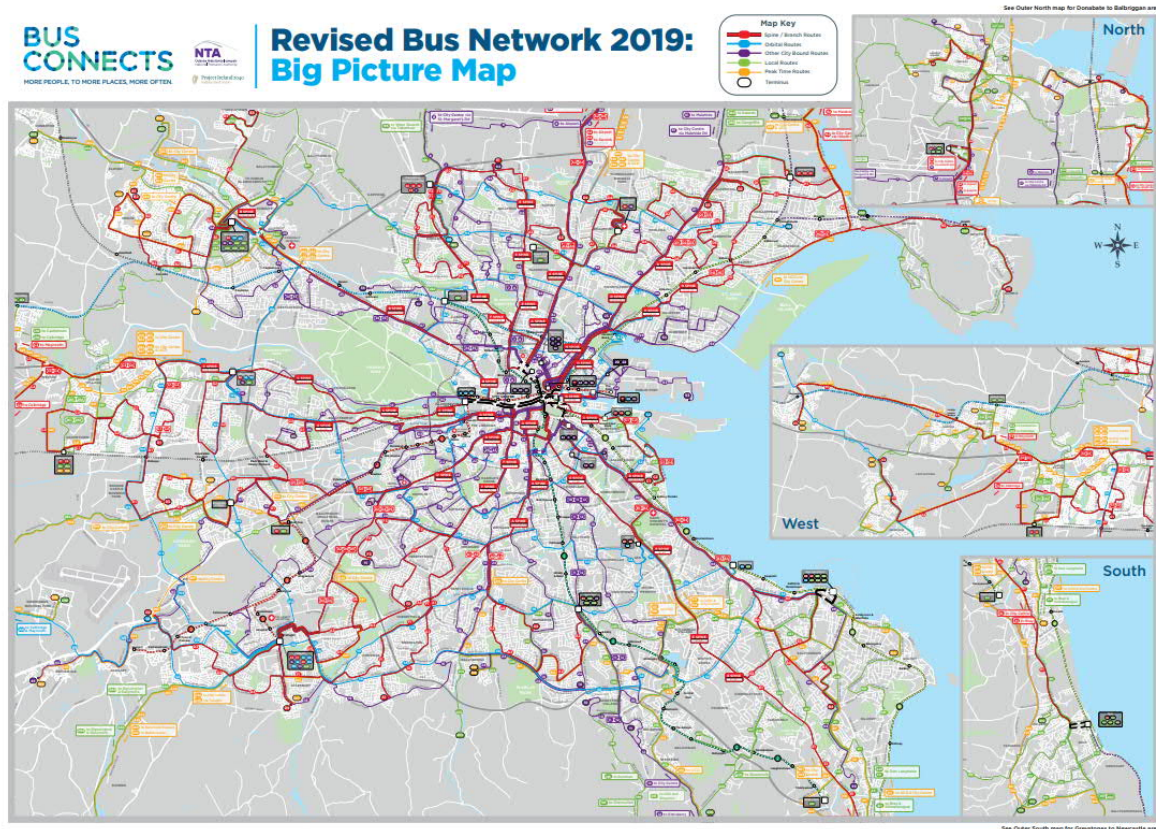


Figure 3-6: Bus Connects Network

Service frequencies will be initially coded based on the frequencies published as part of the 2019 consultation.

BC4: BusConnects Orbital Bus Corridors

These have not been included within the modelling runs to ensure consistency with BusConnects project.

3.5.1.1.4 Park and Ride

As proposed in the GDA Strategy a number of potential Rail based park and ride sites are envisaged. These facilities are, or would be, located at Swords, Finglas, Dunboyne, Liffey Valley, Naas Road, Carrickmines, Woodbrook and Greystones.

3.5.1.1.5 Cycling

The Greater Dublin Area Cycle Network plan will form the basis of the cycling network as part of the Do Minimum scenario (excluding the Radial Core Bus Corridor elements) (CY1).

The Do Scheme scenarios (CY2) will additionally include the cycling improvement proposals that form part of the Radial Core Bus Corridors. The network will be coded into the ERM with improved travel speeds to reflect the upgrade to the routes.

3.5.1.1.6 National Road Schemes

The following National Road improvement schemes will be coded within the Do Minimum scenarios.

- NR1: Widening of the N7 to 3 lanes between junction with the M50 and the M7. (Completed).
- NR 2: Widening of the 2-lane section of the M1 to 3 lanes between Drogheda and Junction 4 with the M50, in both directions.
- NR 3: Widening of the M7 between Junction 9 (Naas North) and Junction 11 (M7/M9) (Recently completed)
- NR 4: Widening of the M50 to three lanes in each direction between Junction 14 (Sandyford) and Junction 17 (M11).
- NR 5: Reconfiguration of the N4 from its junction with the M50 to Leixlip to rationalise accesses and to provide additional capacity at the Quarryvale junction
- NR 6: Capacity enhancement and reconfiguration of the M11/N11 from M50 junction to Junction 14 (Ashford) inclusive of ancillary and associated road schemes, to provide additional lanes and upgraded junctions, plus service roads and linkages to cater for local vehicular traffic movements.
- NR 7: Enhancements of the N2/M2 national route inclusive of a bypass of Slane, to provide for additional capacity on the non-motorway sections of this route, and to address safety issues in Slane village associated with heavy goods vehicles
- NR 8: Widening of the N3 between Junction1 (M50) and Junction 4 (Clonee), plus related junction and necessary changes to the existing national road network
- NR 9: Development of a road link connecting from the southern end of the Dublin Port Tunnel to the South Port area, which will serve the South Port and adjoining development areas, intended primarily for goods access and remove goods vehicle from East-Link (Thomas Clarke) bridge.

3.5.1.1.7 Regional Road Schemes

The following Regional Road improvement schemes will be coded within the Do Minimum scenarios. All of these schemes will be included in both the 2030 and 2045 models.

- RR 1: N3 Castaheany Interchange
- RR 2: N3-N4: Barnhill to Leixlip Interchange
- RR 3: North-South Road – west of Adamstown SDZ linking N7 to N4 and on to Fingal
- RR 4: Glenamuck Distributor Road
- RR 5: Leopardstown Link Road Phase 2
- RR 6: Porterstown Distributor Link Road
- RR 7: R126 Donabate Relief Road: R132 to Portrane Demesne

- RR 8: Oldtown – Mooretown Western Distributor Link Road
- RR 9: Swords Relief Road at Lord Mayors
- RR10: Poolbeg development network modifications
- RR11: Cherrywood development network modifications
- RR12: Clonburris development network modifications

3.5.1.1.8 Demand Management

The following assumptions on demand management proposals will be applied:

- DM1: Dublin City Centre Parking Constraint.
 - No increase in the quantum of Dublin city centre (inside canal boundaries) parking spaces in future years
- DM 1a: M50 Demand Management Measures - Variable Speed Limits
 - Implemented as an adjustment to Speed Flow Curves on M50 links within the model. Methodology to be agreed with the NTA
- DM 1b: Multi point tolling on the M50. Same values to be coded as in previous 2035 Strategy coding as outlined in Figure 3-7 below (in cents).
- DM 2: Implement demand management measures to address congestion issues on the radial national routes approaching the M50 motorway. Same values coded as in previous 2035 Strategy coding as outlined in Figure 3-7 below (in cents).
- DM3: Implement demand management measures to address congestion issues on the radial national routes approaching the M50 motorway.
- DM4: Further demand management measures that ensure that all future growth in travel demand is facilitated by sustainable modes / maximum 45% car commuter mode share.

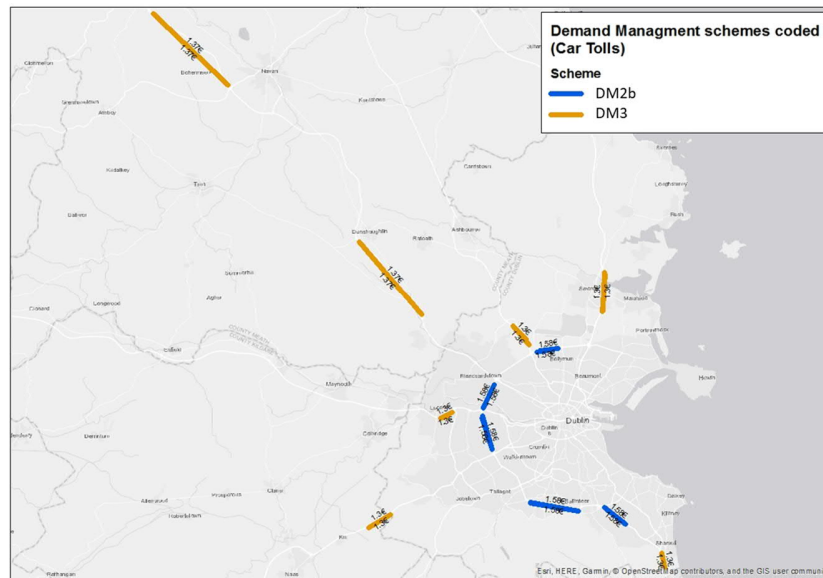


Figure 3-7: Potential Do Minimum Demand Management Schemes

3.6 Modelling Parameters for MetroLink

Assumptions for the strategic modelling are detailed in Table 3-6. It is assumed that the same rolling stock will be used for each model run and the level of service will also be kept the same, to ensure a fair comparison between model runs.

Table 3-6: Modelling Assumptions Table

Assumptions	2028	2045	2060
Service Pattern	Estuary-Charlemont	Estuary-Charlemont	Estuary-Charlemont
Headways	2min	2min	90sec (could reduce to 2 mins if 90 sec appropriate for a high frequency test)
Fares	Integrated ticketing (as used for BusConnects).	Same	same
Capacity (/Vehicle)	125seat/500 crush	Same	Same
Crowding Curve	As ERM standard crowding curve for Luas	Same	Same
Waiting Curve / Boarding Penalties / Transfer Penalties	As standard RMS/ERM curve & penalties	same	same

	<p>These are:</p> <ul style="list-style-type: none"> • 10min board penalty all modes • 15min transfer penalty to/from rail • 15min transfer penalty Dublin Bus to Dublin Bus • Otherwise, 5min transfer penalty. 		
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4. Junction and Microsimulation Modelling

If significant local impacts are identified at operational stage of MetroLink by the strategic ERM analysis, additional local modelling will be undertaken to further assess the impacts. The local modelling will likely incorporate LinSig modelling of signalised junctions, PICADY modelling of priority junctions and ARCADY modelling of roundabouts.

Typically, the following modelling packages are anticipated to be used:

- ARCADY – Roundabouts;
- PICADY – Priority Junctions;
- LinSig – Signalised Junctions;
- Vissim / Paramics – Vehicular microsimulation; and
- VisWalk – Pedestrian microsimulation.

5. Deliverables

5.1 Proposed Deliverables

The proposed deliverables are listed below:

- Transport Modelling Plan (this document);
- Traffic and Transport Assessment Report(s) – Operational Phase;
- Scheme Traffic Management Plan
- Transport Modelling Report.