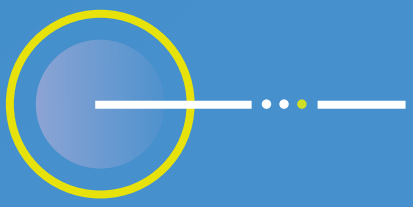
NTA
Údarás Náisiúnta Iompair
National Transport Authority

Jacobs SYSTRA

Greater Dublin Area Transport Strategy 2022 2042



Greater Dublin Area Transport Studies

Bray and Environs

November 2021

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Executive Summary

Introduction

The National Transport Authority (NTA) commissioned Jacobs Engineering Ireland Limited (Jacobs), in collaboration with Systra, to complete a series of Area Based Studies for the Greater Dublin Area (GDA). This study will inform the NTA's review of the Transport Strategy for the Greater Dublin Area (2016-2035) which will consider the future development of the transport network in the GDA for the period up to 2042.

This report details the findings for the Bray and Environs area, which is located approximately 19km to the south of Dublin City Centre. The study area includes the entire electoral divisions of Bray No. 1, Bray No. 2, Bray No. 3 and Rathmichael (Bray), it also includes the north-eastern section of Kilmacanogue, the south-eastern section of Shankill-Rathmichael and the south section of Shankill Shanganagh.

The methodology for this study is based on the Area Based Transport Assessment (ABTA) process which has been adapted and comprises the following key steps:

- Policy Context – understand the planning and transport policy context within which this study sits;
- Baseline Assessment – provide a clear understanding of the existing spatial characteristics, land uses, transport conditions and constraints in the study area;
- Establish Context – understand the future growth proposals for the study area as well as future travel patterns which proposed transport options need to serve;
- Options Development and Assessment – identify high-level transport options to serve demand in the study area and assess them via a multi-criteria analysis against the objectives of the study; and
- Final Summary – present the options to be taken forward and investigated further as part of the detailed preparation of the Draft Transport Strategy.

Policy Context

A comprehensive review of existing national, regional and local level legislation, policy and guidance relevant to this study has been undertaken in order to provide context for the identification of interventions which align with wider policy goals. Key documents include:

- Project Ireland 2040 – National Planning Framework;
- Project Ireland 2040 – National Development Plan;.
- Draft National Investment Framework for Transport in Ireland (2018);
- Strategic Investment Framework for Land Transport (2014);
- National Cycle Policy Framework (2009 to 2020)
- Building on Recovery: Infrastructure and Capital Investment (2016 to 2021)
- Smarter Travel: A Sustainable Transport Future (2009 to 2020);
- The Climate Action Plan (2019);
- Road Safety Strategy (2013 to 2020)
- UN Convention for the Rights of People with Disabilities
- The Regional Spatial and Economic Strategy for the Eastern and Midland Region (2019 to 2031);
- Dublin Metropolitan Area Strategic Plan (2019);
- Transport Strategy for the Greater Dublin Area (2016 to 2035);
- Transport Strategy for the Greater Dublin Area Review;

- Greater Dublin Area Cycle Network Plan (2013);
- Dún Laoghaire-Rathdown County Council Development Plan (2016 – 2022);
- Draft Dún Laoghaire-Rathdown County Council Development Plan (2022 – 2028);
- Woodbrook-Shanganagh Local Area Plan 2017-2023;
- Cherrywood Strategic Development Zone Planning Scheme;
- Wicklow County Council Development Plan (2016 – 2022);
- Draft Wicklow County Council Development Plan (2021 – 2027);
- Bray Municipal District Local Area Plan (2018 – 2024); and
- Bray and Environs Transport Study 2019.

Baseline Assessment

The main settlements within the study area include Bray itself as well as sections of Shankill to the north. These are predominantly residential, with some areas of commercial and industrial land use. Areas to the west and south of the Study Area are rural, with agriculture being one of the key land uses within these areas. Key trip attractors within the study area include Bray Seafront and Bray Head, Bray town centre, Bray Business Park, and Southern Cross Retail and Business Parks. Outside of the study area, key trip attractors include Dublin City Centre, Cherrywood Business Park, and the Sugar Loaf Mountain.

The M11/N11 route runs north-south through the study area, linking with the M50 to the north of the Bray and Environs Study area.

The South-Eastern rail line runs north to south through the study area, passing through Bray and continuing along the coast. This line is used by the DART, InterCity and Commuter train services. There is also the Luas Green Line, which currently provides services between Dublin City Centre and Brides Glen (less than 500m north of the study area boundary). There are a number of bus services which serve the study area. However, there are some gaps in network coverage; for example, few services travel within the west of the study area. These services are operated predominantly by Bus Éireann, Dublin Bus or Go-Ahead. The study area does have cycle infrastructure in place; however, there are limited connections between Bray and the surrounding environs.

The proportion of houses with at least one car within the study area (82%) is higher than across the GDA (79%). The proportion of people who travel to work by active modes within the study area (11%) is lower than the GDA (15%). However, the proportion of people who travel to work by public transport is slightly higher; bus, minibus or coach within the study area (9%) is in line with the GDA (10%), whilst train use in the study area (11%) is high compared to the GDA (7%).

There are two Special Areas of Conservation (SAC) within the study area: Bray Head SAC (000714) located south of Bray on the coast of the Irish Sea and Ballyman Glen SAC (000713) to the west of the area. The study area borders the Irish Sea along its eastern side and is home to a number of key watercourses including the Dargle River, Rathmichael River and Shanganagh River.

Context

Chapter 4 provides the context of the transport demand and supply in the forecast year, 2042. It considers the proposed growth in the area, transport proposals, travel patterns and forecast demand if modal shift was to occur. Population, education and employment levels are all expected to increase significantly within this time period (an increase of 68%, 53% and 47% respectively). A large proportion of this increase in population, education and employment growth is located within the new developments to the west of the study area, as well as the Woodbrook-Shanganagh area.

The chapter provides an overview of a number of proposed transport interventions within the study area. This includes heavy and light rail improvements such as an extension of the Luas Green line to Bray town centre and a

new Metro South link involving the upgrade of the existing Luas Green line to either Sandyford or Cherrywood. The bus network is expected to see comprehensive improvements through the BusConnects programme. Park and Ride facilities are proposed in combination with a new DART station at Woodbrook, to serve the new developments there. In addition, the GDA Cycle Network Plan proposals are expected to create a comprehensive cycle network in the study area with varying qualities of service. A number of highway improvements are also proposed within the study area.

The 2040 demand suggests that there was a high demand from the study area going to Dún Laoghaire-Rathdown and the south east of Dublin City Centre. Key trip origins from within the study area to external locations include Fassaroe, the north side of Shankill-Rathmichael and Bray Town Centre. Additionally, the main movements into and within the study area are from the areas of Dún Laoghaire-Rathdown and Fassaroe (Wicklow).

Car is the dominant mode across the study area, where car trips make up approximately 60% of the mode share. Across the entire study area public transport makes up approximately 22% of mode share, with public transport trips highest to the north of the study area and central Bray.

From the Eastern Regional Model (ERM) AM peak, several junctions along the N11 including Junction 8, N11/R117 (Kilcroney Cross) and N11/R118 (Cherrywood) were identified as having severe congestion during the morning peak. On the rail lines, DART train line services data (2042) shows a volume over crush capacity (V/CC) up to 70% on both directions within the Bray and Environs area. The service reaches higher V/CC as approaching Dun Laoghaire above 71% and then, even higher V/CC above 85% towards the Dublin city (NB). In addition, modelling suggests that there are capacity issues on bus routes travelling along the N11/M11 route as well as the R119 to the north of Bray.

Public transport trips experience significantly higher journey times compared to car within the Bray and Environs study area due to the existing level of public transport services. Car is the preferred mode of transport for travelling in the Bray and Environs area, but this potentially generates an opportunity to improve public transport provision across the study area by introducing new services or improving the frequency of existing ones.

Analysis has also been undertaken to estimate the level of public transport demand along key movement corridors if certain levels of mode shift away from car were to occur. This analysis is intended to provide an indicative level of demand to help inform the options development process, in terms of level of provision required. Analysis was undertaken on six screenlines throughout the study area:

- S1: Bray town centre
- S2: Middle of the study area
- S3: M/N11
- S4: Wicklow to Dun Laoghaire-Rathdown
- S5: Dun Laoghaire-Rathdown to Dublin City Centre
- S6: North West District (West of M/N11)

To achieve a car mode share in the region of 45%, provision for approximately 7,700 public transport trips would need to be made in northbound demand from Bray and Environs to north of the study area (screenline 4). Screenlines 3 and 6 suggest that around 6,500 public transport trips would need to be catered for from the east of the study area, and 1,700 from the west.

Options Development

To identify options to serve demand in the study area in 2042, the following steps were completed:

- A review of relevant planning and transport policies and strategies has provided the overall context for options, and identified current thinking in relation to the future transport network;

- A baseline analysis of the existing transport network identified existing network issues and opportunities;
- An analysis of planning and travel data from the 2042 Planning Sheet and a DM run of the ERM for 2042 provided insights into future travel demand and network capacity constraints; and
- A review of the GDA strategy objectives against which all options should be aligned.

The above steps resulted in the preparation of an options long list to serve demand in the study area:

Reference	Type of option	Location / description
Based on existing Strategy of Proposal		
1	Light Rail	Metro South to Sandyford
2	Light Rail	Metro South to Cherrywood
3	Light Rail	Luas Green Line extension to Bray town centre
4	P&R	Park & Ride facilities and associated DART station at Woodbrook
5	Bus	Bray Core Bus Corridor Dublin Rd/M11-N11
6	Bus	Busway from Fassaroe to Old Connaught over the County Brook at Ballyman Glen (which also facilitates walking and cycling)
7	Bus	Support the delivery of a bus service from Sandyford via Rathmichael and Old Connaught to Bray DART Station until the Luas Green Line extension to Bray is suitably advanced.
8	Road	N11/M11 Junction 4 to 14 improvement scheme
9	Cycle	Improvements listed within Greater Dublin Area Cycle Network Plan
New proposals		
10	Light Rail	Luas Green Line extension to west of N11
11	Bus	Increase bus service capacity along R119 through Shankill and north of Bray
12	Bus	Bus service to developments west of N11

Options Assessment

A demand assessment was completed for each of the public transport options within the long list. At this stage the Luas extension to west of N11 option was discounted due to insufficient demand.

The remaining options identified within the long list were taken forward into Chapter 6 for a qualitative Multi-Criteria Analysis (MCA), providing a high-level assessment based on professional judgement. Building on the key themes of the Common Appraisal Framework (CAF), a set of criteria which sit within these overarching themes were developed to enable a more detailed assessment of options to be undertaken. The criteria were based on the objectives for Transport Strategy for the Greater Dublin Area (2016 to 2035), as provided by the NTA. The exception was the P&R at Woodbrook option and the Greater Dublin Area Cycle option, as these provide an alternative mode option for consideration and were therefore progressed past the MCA stage.

Based on the MCA assessment, the Metro South to Sandyford option has been removed from further analysis, due predominantly to its distance from the study area. However, the Metro South option to Cherrywood is recommended to be progressed and this option would encompass a Metro option through Sandyford.

All of the remaining options proposed within the MCA are recommended to be brought forward to the next stage of analysis. These options provide different functions; however, many of them have complementary purposes, for example the busway from Fassaroe could work to improve the bus services to the west of N11 option.

Summary

This study provides a comprehensive review of the Bray and Environs study area in relation to proposals for future land use and transport networks and identifies a series of transport options to serve future travel demand. Twelve long list options including bus, Luas, Metro South, P&R, cycle and highway junction improvements were identified based on policy and demand analysis. These options were analysed using an MCA assessment, with the exception of the cycle and P&R options which were progressed beyond the MCA.

All the long-listed options, with the exception of the Metro South to Sandyford option and Luas extension to west of N11 option, have been recommended as being progressed for further analysis, as each of the proposed options serves a distinct function within the study area.

1. Introduction

1.1 Background to the study

The National Transport Authority (NTA) commissioned Jacobs Engineering Ireland Limited (Jacobs) in collaboration with Systra to complete an Area Based Study for the Bray and Environs area.

This study was commissioned in order to inform the NTA's review of the Transport Strategy for the Greater Dublin Area (2016 – 2035), which will consider the future development of the transport system in the Greater Dublin Area (GDA) for the period up to 2042. In this context, the purpose of this study is to:

- Provide a comprehensive assessment of future travel demand in the Bray and Environs area;
- Identify realistic potential options to meet future travel demand to and from this area, and in particular to cater for demand into Dublin City Centre and other key destinations;
- Focus in particular on options for public transport and active modes provision, taking account of emerging proposals;
- Assess potential options using a multi-criteria assessment framework; and
- Recommend options which can be taken forward for further assessment as part of the development of the revised Transport Strategy.

1.2 Overview of the study area

Bray and Environs study area is located within the GDA, approximately 19km to the south of Dublin City Centre, as shown in Figure 1-1.

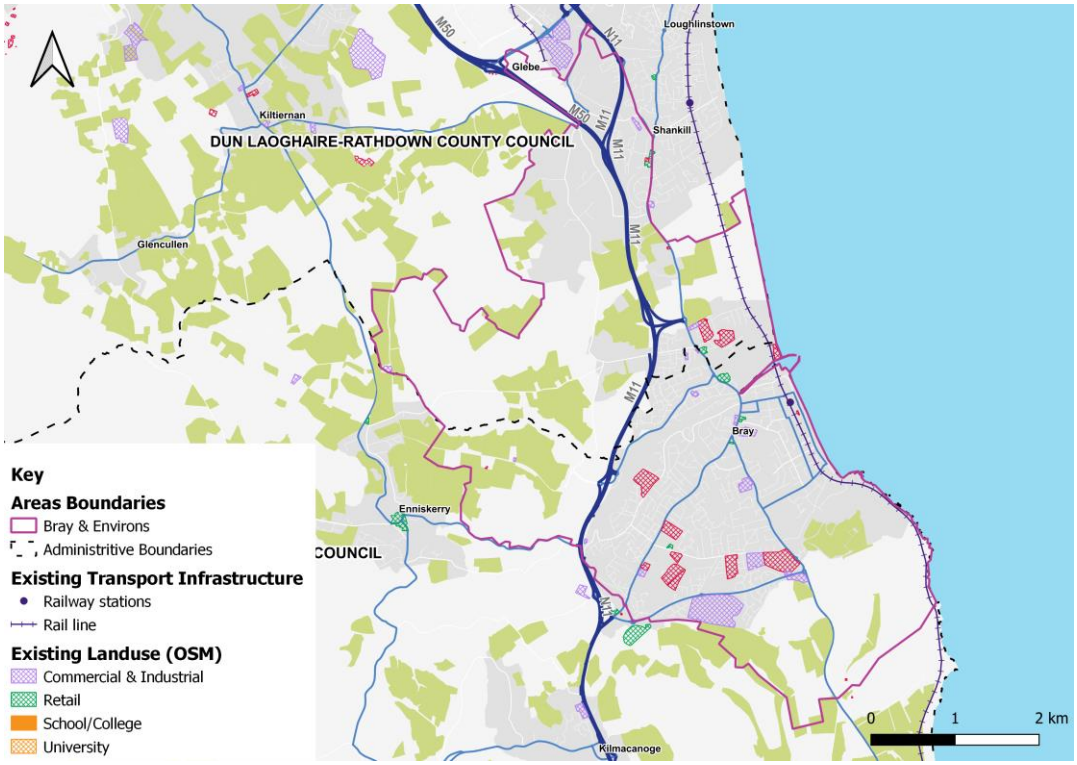


Figure 1-1: Bray and Environs study area *(© OpenStreetMap contributors)*

The study area sits across two county council areas - Dún Laoghaire-Rathdown County Council and Wicklow County Council. The main settlements within the Study Area include Bray as well as sections of Shankill to the

north, with areas to the west and south of the study area being predominantly rural. The M/N11 runs north to south through the study area, joining with the M50 to the north.

1.3 Study methodology

The methodology for this study is based on the Area Based Transport Assessment (ABTA) process, which has been developed by both the NTA and Transport Infrastructure Ireland (TII). This approach ensures that movement and accessibility of all forms, across all modes of travel, is considered in the development of areas at a local level. The ABTA approach has been adapted for the purposes of this study comprises the following key steps:

- Policy Context – understand the planning and transport policy context within which this study sits;
- Baseline Assessment – provide a clear understanding of the existing spatial characteristics, land uses, transport conditions and constraints in the study area;
- Establish Context – understand the future growth proposals for the study area as well as future travel patterns which proposed transport options need to serve;
- Options Development and Assessment – identify high-level transport options to serve demand in the study area and assess them via a multi-criteria analysis against the objectives of the study; and
- Final Summary – present the options to be taken forward and investigated further.

1.4 Report structure

This report is comprised of the following chapters:

- Chapter 2 – Policy context;
- Chapter 3 – Baseline assessment;
- Chapter 4 – Future context;
- Chapter 5 – Options development;
- Chapter 6 – Options assessment; and
- Chapter 7 – Summary.

2. Policy context

This section provides a comprehensive review of existing national, regional and local level legislation, policy, and guidance relevant to this study. It examines plans, policies and objectives at all levels in order to provide the broad context for this area study. It therefore frames the development of the study and provides a context for the identification of interventions which align with wider policy goals.

2.1 National policy

2.1.1 Project Ireland 2040 - National Planning Framework

Project Ireland 2040 was adopted by the Government in February 2018 and includes two elements:

- National Planning Framework (NPF) - shaping development in economic, environmental and social terms to 2040; and
- National Development Plan (NDP) - setting out the investment priorities that will underpin the NPF from 2018 to 2027.

Project Ireland 2040 provides the framework for future development and investment in Ireland and is the overall Plan from which other, more detailed plans will take their lead, including city and county development plans and regional strategies. The NPF is a tool to assist the achievement of more effective regional development.

The objectives of the NPF, in brief, are to:

- Guide the future development of Ireland, taking into account a projected 1 million increase in population, and create 660,000 additional jobs and 550,000 more homes by 2040;
- Direct 25% of this growth to Dublin, 25% across Cork, Limerick, Galway and Waterford and the remaining 50% across key regional centres, towns and villages (as set out in the RSES); and
- Co-ordinate delivery of infrastructure and services in tandem with growth, helping to tackle congestion and quality of life issues.

The NPF represents the overarching national planning policy document and is underpinned by a series of core principles named National Strategic Outcomes (NSOs) which include:

- NSO 1 Compact Growth;
- NSO 2 Enhanced Regional Accessibility;
- NSO 4 Sustainable Mobility;
- NSO 7 Enhanced Amenity and Heritage; and
- NSO 8 Transition to a Low Carbon and Climate Resilient Society.

These principles are translated by supporting policies and actions at sectoral, regional and local levels.

In relation to Dublin, the NPF requires the preparation of the Dublin Metropolitan Area Strategic Plan (part of the RSES), and notes that the identification of infrastructure required to sustain growth is a key priority of this Plan. In relation to Dublin, the NPF itself sets a clear focus on:

- Supporting future growth by better managing growth and ensuring it can be accommodated within and close to the city. This includes a focus on underutilised land within the canals and M50 ring, and a more compact urban form.
- Enabling significant population and jobs growth in the Dublin metropolitan area, together with better management of the trend towards overspill into surrounding counties.

- There will be a requirement for significant greenfield development on sites which have good integration with the city and can be served by high capacity public transport. Some existing sites have already been designated as Strategic Development Zones (SDZs).

- Addressing infrastructural bottlenecks, improving quality of life and increasing housing supply in the right locations.

Key transport-related growth enablers for Dublin include:

- Delivering key rail projects set out in the Transport Strategy for the GDA including Metro Link, DART expansion and the Luas green line link to MetroLink;
- The development of an improved bus-based system, with better orbital connectivity and integration with other transport networks;
- Delivering the metropolitan cycle network set out in the GDA Cycle Network Plan, including key commuter routes and urban greenways; and
- Improving access to Dublin Airport, including public transport.

This policy sets the context for the development of transport interventions, including those considered through this study. It highlights that there will be significant growth to 2040 and that improvements to public transport and active mode provision are key to supporting the levels of planned development.

2.1.2 Project Ireland 2040 - National Development Plan

The NDP sets out the enabling investment to implement the strategy set out in the NPF, for the period 2018 to 2027. Under the NDP, investment in public transport infrastructure will be accelerated to support the development of an integrated and sustainable national public transport system consistent with the NPF's NSOs of Sustainable Mobility and Company Growth. Projects with allocated funding within the NDP include:

- Continued investment in bus and train fleets and infrastructure;
- The delivery of the Dublin BusConnects programme;
- The complete construction of Metro Link;
- Delivery of the priority elements of the DART Expansion Programme;
- A Park & Ride programme; and
- Cycling and walking networks in key urban areas.

These projects will deliver significant improvements. This study, and other work the NTA is doing to review the Transport Strategy for the Greater Dublin Area, will consider other longer-term interventions required to support the NPF to 2040 and beyond.

2.1.3 Project Ireland 2040 – Draft National Investment Framework for Transport in Ireland (NIFTI) (2021)

NIFTI is the Department of Transport's new high-level strategic framework for prioritising future investment in the land transport network. At the time of writing, the public consultation for NIFTI is currently underway and expected to conclude in May 2021. Once published, NIFTI will replace SIFLT as the framework for future land transport investment. NIFTI is intended to ensure that transport investment is aligned with and supports the NPF and its NSOs. NIFTI outlines key investment priorities that future transport projects must align with to be considered for funding.

Priorities include:

- Decarbonisation – Recognises the fact transport accounts for approximately one-fifth of Irish greenhouse gas emissions, therefore decarbonisation is an urgent priority in the context of climate change targets;

- Protection and renewal – many of the challenges faced by the network can be addressed, at least partially, through protection and renewal. Adequate maintenance is necessary to ensure safety, make sustainable modes an attractive option, deliver connectivity and accessibility and ensure the resilience of key pieces of infrastructure;
- Mobility of people and goods in urban areas – requires prioritisation in order to facilitate compact and sustainable growth in towns and cities. Support will be given to projects that reduce urban congestion, especially through the use of sustainable mobility measures; and
- Enhanced regional and rural connectivity – through addressing priority bottleneck and network constraints as well as ensuring all parts of the country are well served with access to major ports and airports.

This framework highlights the need for this study to identify measures to address issues such as climate change and urban congestion through modal shift and improved provision for sustainable modes.

2.1.4 Investing in Our Transport Future: Strategic Investment Framework for Land Transport (2014)

The Strategic Investment Framework for Land Transport (SIFLT) sets out the strategic framework to consider the role of transport in the future development of the Irish economy and estimates the appropriate level of investment required in the land transport system. The framework establishes:

- High-level priorities for future investment in land transport; and
- Key principals, reflective of those priorities, to which transport investment proposals will be required to adhere.

Priorities include:

- Achieve steady state maintenance – emphasising the importance of efficient maintenance and management;
- Addressing urban congestion – recognising that improvements to the efficiency and sustainability of urban transport systems are a key priority. The document specifically notes that this "must be guided by demand/capacity assessments and recognise the role of urban centres as key drivers of economic activity, nationally and regionally." It goes on to say that measures should include improved and expanded public transport capacity, walking and cycling infrastructure as well as Intelligent Transport Systems to improve efficiency and capacity; and
- Maximising the contribution of land transport networks to national development.

This framework highlights the need for this study to identify measures that address urban congestion and improve the provision of sustainable transport modes.

2.1.5 Smarter Travel: A Sustainable Transport Future (2009 to 2020)

Smarter Travel: A Sustainable Transport Future presents an overall policy framework for sustainable transport in Ireland. The policy sets out a vision, goals and targets to be achieved, and outlines 49 actions that form the basis of achieving a more sustainable transport future.

Smarter Travel acknowledges that continued growth and dependency on the private car is not sustainable and therefore sets an objective to promote a significant mode shift in favour of public transport, walking and cycling. A key target in this regard was to reduce the proportion of travel to work trips by car from 65% to 45%.

Key goals of Smarter Travel include:

- Improving quality of life and accessibility to transport for all;
- Improving economic competitiveness through maximising the efficiency of the transport system and alleviating congestion and infrastructural bottlenecks;
- Minimising the negative impacts of transport on the environment through reducing air pollution;

- Reducing overall travel demand and commuting distances in the private car; and
- Reducing reliance on fossil-fuel-based transport modes.

This policy is currently under review as part of the Sustainability Mobility Policy Review. Consultation on the review closed in early 2020. The consultation documents emphasised that the purpose of the review was to put in place a new policy which supports:

- A shift away from the private car to greater use of active travel and public transport;
- Travel by cleaner and greener transport; and
- Comfortable and affordable journeys to and from work, home, school, college, shops and leisure.

The new policy will align with the NPF and will replace the Smarter Travel policy, plus the National Cycle Network Policy Framework.

This policy highlights the need for this study to place key emphasis on identifying the interventions required to support mode shift.

2.1.6 National Cycle Policy Framework (2009 to 2020)

Ireland's first *National Cycle Policy Framework 2009-2020's* vision is that all cities, towns, villages and rural areas will be bicycle friendly. The overarching mission of the Framework is to create a strong national cycling culture to align with *Smarter Travel's* objective that 10% of all trips will be by bike by 2020.

The Framework sets out a comprehensive package of interventions – both 'hard' (planning and infrastructure) and 'soft' (communication and education) – to make cycling a convenient and safe option for everyone. The approach recommended is a hierarchy of measures, including:

- Reducing volumes of through-traffic, especially HGVs, in urban centres and in the vicinity of schools and colleges;
- Calming traffic/ enforcing low traffic speeds in urban areas; and
- Making junctions safe for cyclists and removing multi-lane one-way street systems.

A number of objectives relevant to this study include:

- Support the planning and design of urban centres to support cyclists and pedestrians;
- Improve integration between cycling and public transport to enable multi-modal travel;
- Provide secure parking for bikes; and
- Evaluate and monitor the implementation of measures.

This policy is currently under review as part of the Sustainability Mobility Policy Review (as detailed above). This policy highlights the need for this study to identify the cycle infrastructure required to support future growth.

2.1.7 Building on Recovery: Infrastructure and Capital Investment (2016 to 2021)

Building on Recovery: Infrastructure and Capital Investment 2016-2021, published by the Department of Public Expenditure and Reform in 2016, presents the Government's new €42 billion framework for infrastructure investment in Ireland over the period 2016 to 2021.

The Exchequer transport capital allocation is largely framed by the recommendations and priorities set out in the *Strategic Investment Framework for Land Transport* (superseded by the *Planning Land Use and Transport Outlook 2040* in 2018). These priorities are threefold:

- Maintain and renew the strategically important elements of existing land transport system;
- Address urban congestion; and

- Improve the efficiency and safety of existing transport networks.

Under the Plan, €100 million is being committed to smarter travel and carbon reduction measures, including Greenways, to ensure that the transport sector makes a major contribution to climate change mitigation targets.

This policy highlights the need for this study to identify measures that contribute to climate change mitigation targets, whilst addressing the priorities outlined above.

2.1.8 Climate Action Plan (2019)

The *Climate Action Plan: To Tackle Climate Breakdown* was published by the Government in June 2019. The Plan identifies how Ireland will achieve its 2030 targets for reduction in carbon emissions and a pathway towards achieving a net zero emissions by 2050.

A central pillar of this plan is the role that transport can play in reducing our carbon footprint and improving air quality in our towns and cities. The plan acknowledges that the delivery of improved public transport will lead to a modal shift away from unsustainable transport choices and go a large way to the decarbonisation challenge that lies ahead.

The *Climate Action Plan* sets a target reduction of 45-50% in Ireland's transport emissions by 2030. The projected increase in population and economic activity and the resulting increased travel demand from the movement of people and goods will further intensify Dublin's current decarbonisation challenge. In 2017, transport accounted for a significant proportion of Ireland's greenhouse gas emissions – approximately 20%.

Other targets in relation to transport include:

- Increasing the number of electric vehicles;
- Building the electric vehicle charging network at the rate required to meet demand;
- Require at least one recharging point in new non-residential buildings with more than 10 parking spaces; and
- Raise the blend proportion of biofuels in road transport.

This plan highlights the need for this study to identify measures that contribute to reductions in transport related carbon emissions.

2.1.9 Road Safety Strategy (2013 to 2020)

The Road Safety Strategy sets out targets to be achieved in terms of road safety in Ireland, with the primary target defined as follows:

'A reduction of road collision fatalities on Irish roads to 25 per million population or less by 2020 is required to close the gap between Ireland and the safest countries. This means reducing deaths from 162 in 2012 to 124 or fewer by 2020. A provisional target for the reduction of serious injuries by 30% from 472 (2011) to 330 or fewer by 2020 or 61 per million population has also been set.'

The Strategy goes on to state that 'the attractiveness of walking depends strongly on the safety of the infrastructure provided. Collisions involving pedestrians account for 1 in 5 fatalities annually.' It also notes that 'collisions involving cyclists account for 1 in 25 road deaths annually, and many collisions involving cyclists lead to serious head injuries.'

The Road Safety Authority (RSA) undertook a consultation on their new strategy 2021-2030, which closed in November 2020. The new strategy is proposed to have an end date of 2030 to align with the EU Road Safety Policy. The review document notes that while the long-term trend shows that roads in Ireland have become safer for road users overall, this has not been the case for all road user groups. It notes that the biggest decrease in fatalities was among pedestrians and that there were 68% fewer pedestrian causalities in 2019 compared to

2000, but that pedestrians are still the second largest fatality group, behind car occupants. The new strategy will look at how to further reduce fatalities and serious injuries and how to deal with new issues in road safety.

2.1.10 UN Convention on the Rights of People with Disabilities

In March 2019, Ireland ratified the *UN Convention on the Rights of People with Disabilities*. Article 9 of the 'UNCRPD' includes the right to transport and creating an accessible end to end journey, with the user focus central to this approach. Its focus is:

"To enable persons with disabilities to live independently and participate fully in all aspects of life, States Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas. These measures, which shall include the identification and elimination of obstacles and barriers to accessibility, shall apply to, inter alia:

"Buildings, roads, transportation and other indoor and outdoor facilities, including schools, housing, medical facilities and workplaces.

"Information, communications and other services, including electronic services and emergency services."

Article 9 for the first time enshrines the right to transport within Irish legislation. The focus on Usability and Accessibility has implications and opportunities across transport planning and provision, including the National Planning Framework and the way that schemes are appraised to capture wider benefits associated with ensuring this Right.

2.1.11 Other national guidance

The following national guidance has also been considered:

- Area Based Transport Assessment Guidance (ABTA), National Transport Authority and Transport Infrastructure Ireland, 2018;
- Design Manual for Urban Roads and Streets (DMURS), Department of Transport, Tourism and Sport, 2013 (updated 2019);
- National Physical Activity Plan, Healthy Ireland, 2019 (updated 2021);
- National Cycle Manual, National Transport Authority, 2011;
- Permeability: A Best Practice Guide, National Transport Authority, 2015; and
- Achieving Effective Workplace Travel Plans; Guidance for Local Authorities, National Transport Authority[1].

2.2 Regional policy

2.2.1 Regional Spatial and Economic Strategy for the Eastern and Midland Region (2019 to 2031)

The *Regional Spatial and Economic Strategy for the Eastern and Midland Region* (RSES) translates the objectives of the NPF at a regional level and provides a link between the NPF and local plans. Overall, it provides a framework for investment to better manage spatial planning and economic development throughout the Region to 2031, and beyond to 2040.

[1] https://www.nationaltransport.ie/wp-content/uploads/2012/03/Achieving-Effective-Workplace-Travel-Plans-Guidance-for-Local-Authorities11.pdf

The RSES identifies 16 regional strategic outcomes (RSOs). Integrated transport and land use is one of these, aiming to promote best use of transport infrastructure and promote sustainable and active modes of travel. The key challenge facing the region is identified as the transition to a low carbon society. The RSES therefore identified a number of primary areas of transition, with sustainable transport systems being one of these.

Dublin Metropolitan Area Strategic Plan

The Metropolitan Area Strategic Plan (MASP) for Dublin sets out a strategic planning and investment framework for the Dublin metropolitan area covering the short term (to 2026), medium term (to 2031) and longer term (to 2040). It includes a vision for future growth to 2031 including large scale development opportunities and a sequence of infrastructure priorities. It envisages a 250,000 increase in population of the metropolitan area between 2016 and 2031.

The vision is underpinned by a spatial framework in line with the overall settlement strategy focused on:

- Consolidation of Dublin City and suburbs;
- Key towns of Swords, Maynooth and Bray; and
- Planned development in strategic development areas in Donabate, Dunboyne, Leixlip and Greystones.

The MASP includes a number of guiding principles for development, with a key focus on integrated transport and land use, focusing growth on public transport corridors and nodes. It aims to see 50% of all new homes within or adjoining the existing built-up area in Dublin and 50% in other settlements. To unlock development capacity in strategic development areas, the MASP identifies sequencing of enabling infrastructure and directs the cross-sectoral investment required to deliver development.

The MASP identifies five strategic development corridors and areas and, for each, highlights the:

- Population capacity (as opposed to targets) in the short, medium, and longer term;
- Strategic residential development opportunities;
- Strategic employment opportunities; and
- Infrastructure required to enable this development in the short to medium and medium to longer term.

The MASP recognises that "Facilitating modal shift to more sustainable transport options, including walking and cycling, is a key element in promoting better traffic management and climate change strategies in the metropolitan area." It supports the NTA Greater Dublin Area Cycle Network Plan and recognises that Greenways are of strategic value as routes.

Table 2-1: Strategic Development Areas and corridors, capacity infrastructure and phasing

Corridor	Residential	Employment/Mixed-use	Phasing/enabling infrastructure
North-South corridor (DART) Population capacity Short 31,000 Medium 13,000 Long 7,000 Total 51,000	South County Dublin - North Wicklow – development of new residential communities at Woodbrook- Shanganagh and Bray Golf course and Harbour lands	Strengthening commercial town functions in Bray, developing IDA strategic site in Greystones to strengthen economic base in North Wicklow	**Short term** Access road, new station at Woodbrook - Shanganagh. Access to Bray station and PT bridge.
	Bray Fassaroe– westward extension of Bray at Old Connaught-Fassaroe (Dún Laoghaire) and Bray -Fassaroe (Wicklow) lands	New mixed use residential and employment district at Fassaroe, west of Bray Greystones Strategic site	**Short to Medium term** High capacity bus between Bray and Fassaroe, distributor road, N/M11 upgrades, new bridge to Old Conna. Waste water upgrades. Local and wider area water network and storage upgrades **Long term** Luas extension to Bray

2.2.2 Transport Strategy for the Greater Dublin Area (2016 to 2035)

The *Transport Strategy for the Greater Dublin Area 2016-2035* provides a framework for the planning and delivery of transport infrastructure and services in the GDA up to 2035. It provides a transport planning policy around which other agencies involved in land use planning, environmental protection, and delivery of other infrastructure such as housing, water and power, can align their investment priorities.

The GDA's transport infrastructure must be planned for and invested in on the basis of the following:

- Assumed sustained economic growth;
- Substantial population growth;
- Full employment;
- That no one is excluded from society, by virtue of the design and layout of transport infrastructure and services or by the cost of public transport use; and
- That the environment in the GDA is protected and enhanced.

The Strategy set out high-level proposals for the walking, cycling, public transport and road networks, as well as parking management measures and other supporting measures for the entire GDA. This study looks to update work done as part of this strategy with a new forecast year of 2042.

2.2.3 Transport Strategy for the Greater Dublin Area Review (2021)

The NTA is required by legislation to review the Transport Strategy for the Greater Dublin Area every six years. The ongoing review will assess the implementation of the current plan and look to produce an updated strategy which will set out the framework for investment in transport infrastructure and services, through to 2042. The NTA aims to complete the review by the end of 2021, so that the new strategy can be approved by the Minister for Transport in early 2022.

The review process recognises that the following are particular challenges and considerations for the new strategy:

- Climate change and the environment – recognising the need for transport to lead the way towards a net zero emissions future;

- Growth and change – ensuring the public transport investment aligns with changes in the location of population, jobs and schools;
- Health and quality – recognising that transport can open up opportunities and have a positive impact on health and wellbeing; and
- The economy – with effective public transport being a major driver of economic activity.

This transport study will feed into the review process currently being undertaken by the NTA.

2.2.4 Greater Dublin Area Cycle Network Plan (2014)

The Greater Dublin Area Cycle Network Plan was adopted by the NTA in early 2014 and is identified as a key future growth enabler for Dublin in the NPF.

The plan forms the strategy for the implementation of a high quality, integrated cycle network for the GDA. This involves the expansion of the urban cycle network from 500km to 2,480km, comprising a mix of cycle tracks and lanes, cycle ways and infrastructure-free cycle routes in low traffic environments. Within the urban network this will consist of a series of routes categorised as follows:

- **Primary** – main cycle arteries that cross the urban area and carry most cycle traffic – target quality of service (QoS) of two abreast plus overtaking width = 2.5m
- **Secondary** – link between principal cycle routes and local zones – target QoS of single file plus overtaking width = 1.75m
- **Feeder** – cycle routes within local zones and/or connection from zones to the network levels above.

Specific proposals relevant to the Bray and Environs study area are detailed in Section 4.2.6.

2.3 Local policy

A number of local policy documents are relevant to the Bray and Environs study area. Local policy documents have been reviewed to inform growth locations and future transport developments.

- Dún Laoghaire-Rathdown County Council Development Plan (2016 – 2022);
- Dún Laoghaire-Rathdown County Council Draft Development Plan (2022 – 2028);
- Woodbrook-Shanganagh Local Area Plan 2017-2023;
- Cherrywood Strategic Development Zone;
- Wicklow County Council Development Plan (2016 – 2022);
- Wicklow County Council Draft Development Plan (2021 – 2027);
- Bray Municipal District Local Area Plan (2018 – 2024); and
- Bray and Environs Transport Study 2019.

3. Baseline Assessment

3.1 Description of the study area

3.1.1 General

The Bray and Environs study area is located approximately 19km to the south of Dublin City Centre. The study area sits across two county council areas; the northern section of the study area falls within Dún Laoghaire-Rathdown County Council whilst the southern section falls within Wicklow County Council. The study area includes the entire electoral divisions of Bray No. 1, Bray No. 2, Bray No. 3 and Rathmichael (Bray), the north-eastern section of Kilmacanogue, the south-eastern section of Shankill-Rathmichael and the south section of Shankill Shanganagh.

The main settlements within the study area include Bray as well as sections of Shankill to the north. These are predominantly residential, with some areas of commercial and industrial land use. Areas to the west and south of the Study Area are predominantly rural, with agriculture being one of the key land uses within these areas.

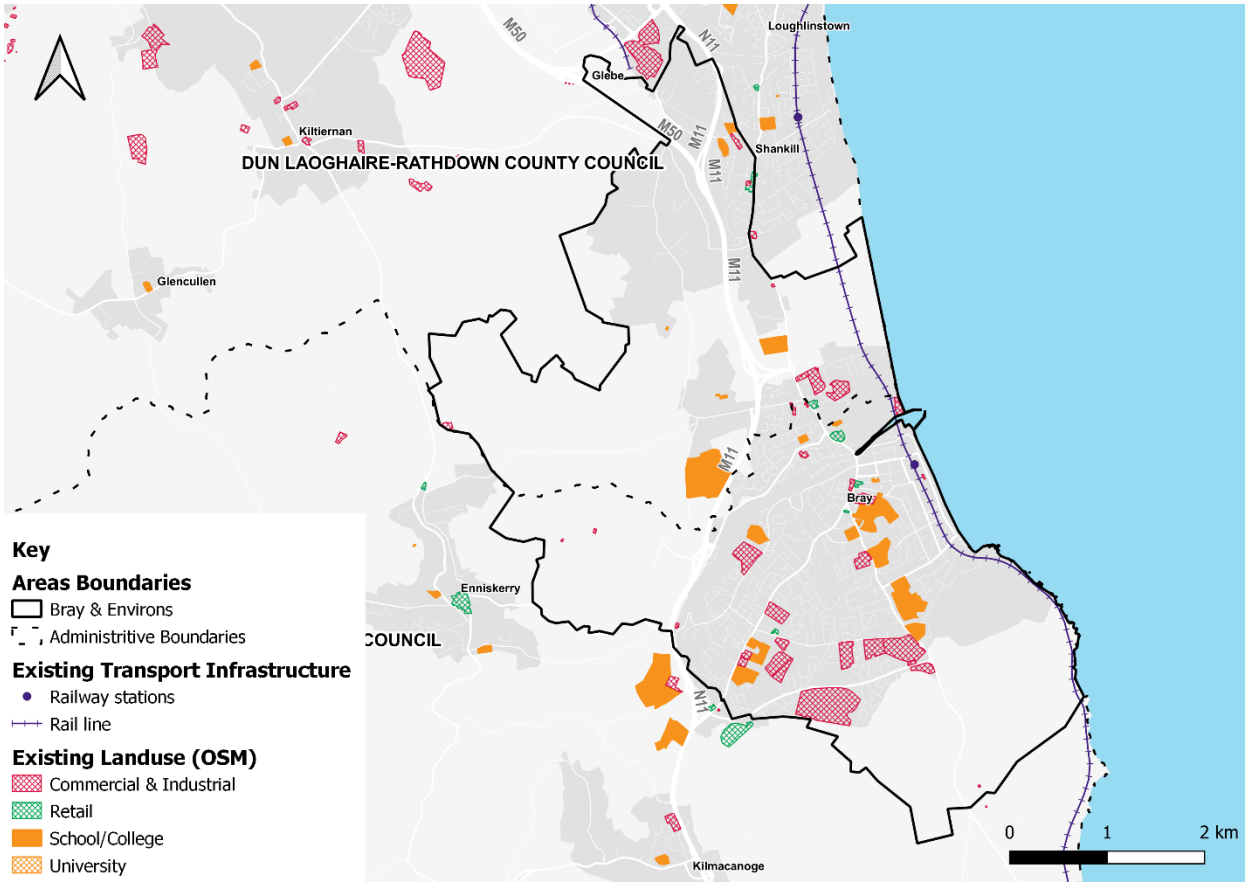


Figure 3-1: Bray and Environs existing land use *(© OpenStreetMap contributors)*

3.1.2 Transport network and services

Road network

The national road network provides the basis for Dublin's wider national-level and inter-regional connectivity. There is one National Primary Route through the study area, the M/N11, which runs south-to-north connecting Dublin City Centre and Wexford via Wicklow. Junctions 5, 6 and 7 are within the study area and provide access to

Bray North, Bray Central (and Enniskerry) and Bray South, respectively. The study area's regional road network comprises mainly radial routes connecting to the national road network and wider environs (Figure 3-2).

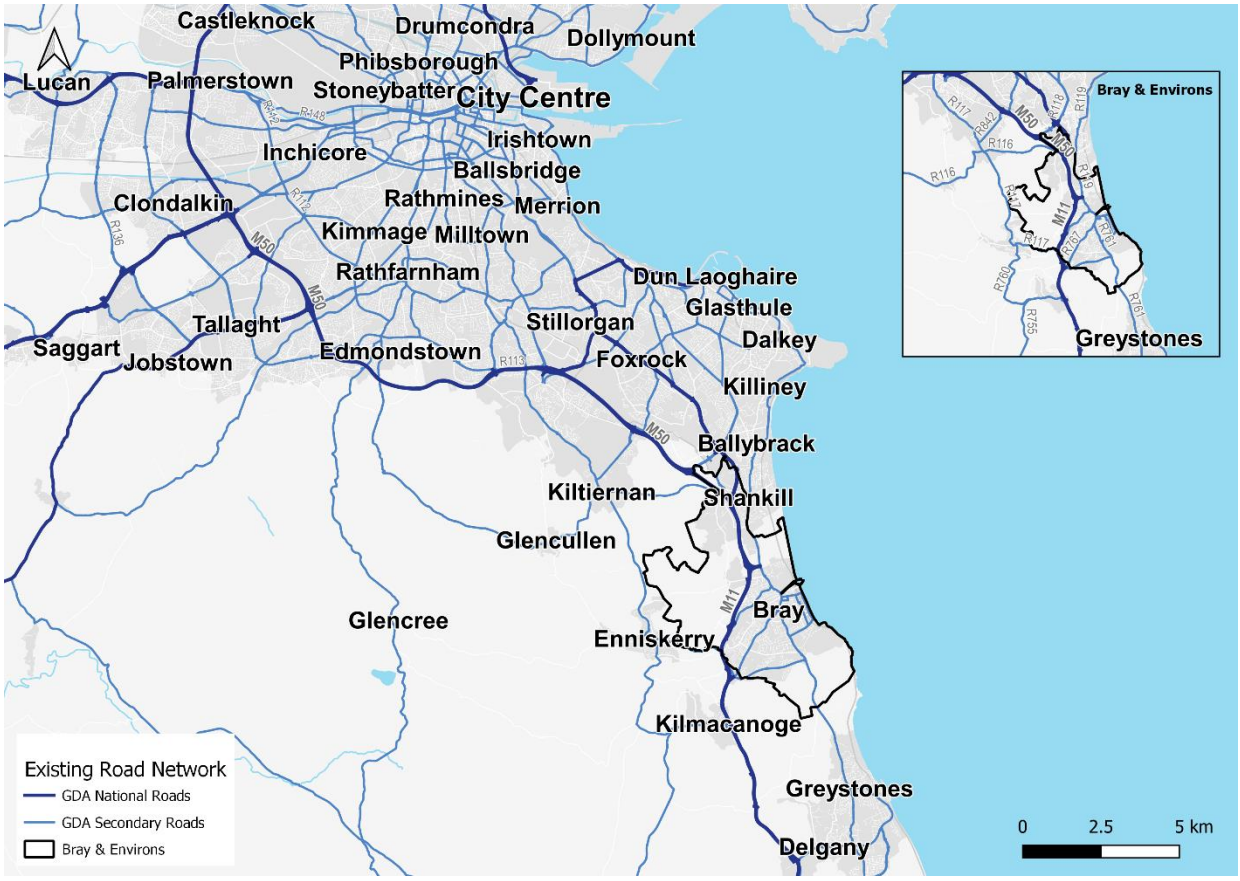


Figure 3-2: Road network in Bray and Environs *(© OpenStreetMap contributors)*

Transport Infrastructure Ireland (TII) produced a National Roads Network Indicators report in 2019 detailing the performance of the Primary Routes in Ireland, so only focuses on the M/N11 through the study area. Section C1 shows level of service of the roads during the AM Peak. This shows southbound through the study area there is 'free flow' traffic; however, northbound this flow is labelled as 'unstable flow' with a poor level of service.

This is corroborated in Section C2 which shows the capacity that roads are performing at. It shows that through the study area the M/N11 is performing above 120% capacity when comparing a ratio of its AADT volume to that of its daily operational capacity, the highest of the radial routes into Dublin.

Further evidence of this is presented in Section D6 which looks at hourly levels of service of Dublin's radial routes. On the M/N11 between Bray North and M50 northbound the road is approaching unstable flow in the AM Peak from 07:00-09:00. Southbound in the PM Peak traffic issues are much worse with forced or breakdown flow from 16:00-19:00.

Section D2 studies the performance of the M50, and focuses on performance of each junction northbound and southbound. Junction 17 of the M50, at one end of it, where it joins the M/N11: this junction performs well outside of the peak period and northbound during the AM peak the flow is stable. However, in the PM Peak in the southbound direction between 17:00-18:00 the flow is forced or breakdown flow, the worst performing category.

Rail network

Heavy rail

The South-Eastern rail line runs north to south through the study area, passing through Bray and continuing along the coast. The DART train service uses this route through the study area, travelling from Howth to Greystones and stopping at Bray. In addition, the Southeastern Commuter train runs services from central Dublin along this line.

There is only one railway station (Bray) in the study area which is served by three rail lines, though Shankill station is just outside the study area to the north. Bray station is served by:

- DART - a high frequency service (a train up to every 10 minutes during weekdays[2])
- Southeastern Commuter Train - a low frequency service (approximately every 20-30 minutes during the morning peak); and,
- Intercity Services (for each direction of travel there is approximately 5 services daily during weekdays, 3-4 services daily on weekends)[3].

Figure 3-3: Existing rail lines *(© OpenStreetMap contributors)*

Bray Station is located about 500m from Bray Town Centre, to the east of Bray near to the Seafront. The housing areas to the south and west of Bray are approximately 2.5 – 3km away with an average distance to the areas beyond the Town Centre being around 1.5km.

[2] https://www.dublinpublictransport.ie/dublin-trains
[3] https://www.irishrail.ie/IrishRail/media/Timetable-PDF-s/Connolly-DART-timetables/08_dublin-rosslare.pdf

Bray Rail Station has a small100 space car park, a 100 space bike park, and a taxi rank. Bray Station is served by several bus services listed below. The majority of these buses head either north or south from the station to towns outside of Bray along the R routes; therefore, there is limited provision into the housing areas in Bray:

- Service 45a/b: Kilmacanogue – Dún Laoghaire
- Service 84: Temple Road (Dublin) – Newcastle Road (Rockingham)
- Service 84a: Temple Road (Dublin) – Bray Station
- Service 143: Towards Sandyford Luas Station (Dublin) – Newtownmountkennedy
- Service 155: IKEA (Dublin) – Bray Station
- Service 184: Newtownmountkennedy – Bray Station
- Service 185: Bray Station – Enniskerry

Light Rail

The Dublin Light Rail system (Luas) consists of two lines. The Luas Green Line currently provides services between Dublin City Centre and Brides Glen (less than 500m north of the study area boundary). The Luas Stop at Brides Glen can be accessed from the study area via the M/N11 and M50. The Red Line provides services from Tallaght to the Point, with a spur from the north of Tallaght to City West at the western end, and from Busáras to Connolly in the city centre. These two lines provide high frequency, high-capacity services along these corridors.

The Luas Green Line operates seven days a week, from 05:30 – 00:30 Monday to Friday, 06:30 – 00:30 on a Saturday and 07:00 – 23:00 on a Sunday. The service runs regularly throughout the day, with trams operating at a 3-5 minute frequency during peak hours and a 12-15 minute frequency during off-peak hours.

Figure 3-4: Luas routes *(© OpenStreetMap contributors)*

Bus network

BusConnects is the NTA's programme to improve bus and sustainable transport services in Ireland. The programme has several key elements including:

- The Core Bus Corridors – 16 radial routes into the city centre;
- Dublin Area Bus Network redesign;
- Improvements to bus livery; and
- New bus stops and shelters and improved information.

As part of the BusConnects programme, a redesign of the bus network in the GDA is proposed to provide a more coherently planned network. The implementation of the New Dublin Area Bus Network will be completed in phases commencing in 2021; as such, the proposed network is set out here as part of the baseline. The new network features:

- **Spines** – frequent routes made up of bus services timetabled to work together along a radial corridor and branch off to serve different areas;
- **Orbitals** – providing connections between the suburbs, town centres and key transport interchanges without requiring travel into the city centre;
- **Other city-bound routes** – other routes which operate on their own timetables outside of spine routes;
- **Local routes** – routes providing connections within local areas;
- **Peak only** – services operating during peak periods to provide additional capacity on key corridors; and
- **Express** – direct services from outer suburbs to city centre at peak times.

The routes proposed to run through the Bray and Environs study area are detailed in Table 3-1.

Table 3-1: Dublin Area New Network routes in the study area

Route Type	Service	Route	Weekday Frequency
Spinal Routes	E1	Northwood - City Centre - Bray Main St. - Ballywaltrim	8-20 minutes
Local Routes	L1	Greystones - Newcastle Loop Clockwise - Bray	40-60 minutes
	L2	Greystones - Newcastle Loop Anticlockwise - Bray	40-60 minutes
	L11	Kilmacanogue - Bray - Dún Laoghaire	20-30 minutes
	L12	Ballywaltrim - Bray Station	20-30 minutes
	L14	Southern Cross Rd - Bray Station - Palermo	30-60 minutes
	L15	Shop River - Enniskerry - Bray	60 minutes
Peak-only/express route	X1	Kilcoole - Southern Cross - City Centre	6 services in AM peak, 6 service in PM peak
	X2	Newcastle - Kilcoole - Southern Cross - City Centre	3 services in AM peak, 3 service in PM peak

A map of these proposed routes and others in the vicinity of the study area can be seen in Figure 3-5. This bus network serves a number of key locations including Bray Town Centre and seafront, Bray railway station and Dublin City Centre. Whilst existing bus services provide connectivity with the north into Dublin City Centre and south to Greystones and Newtownmountkennedy through the local R-road, there are gaps in south east Bray, along the seafront.

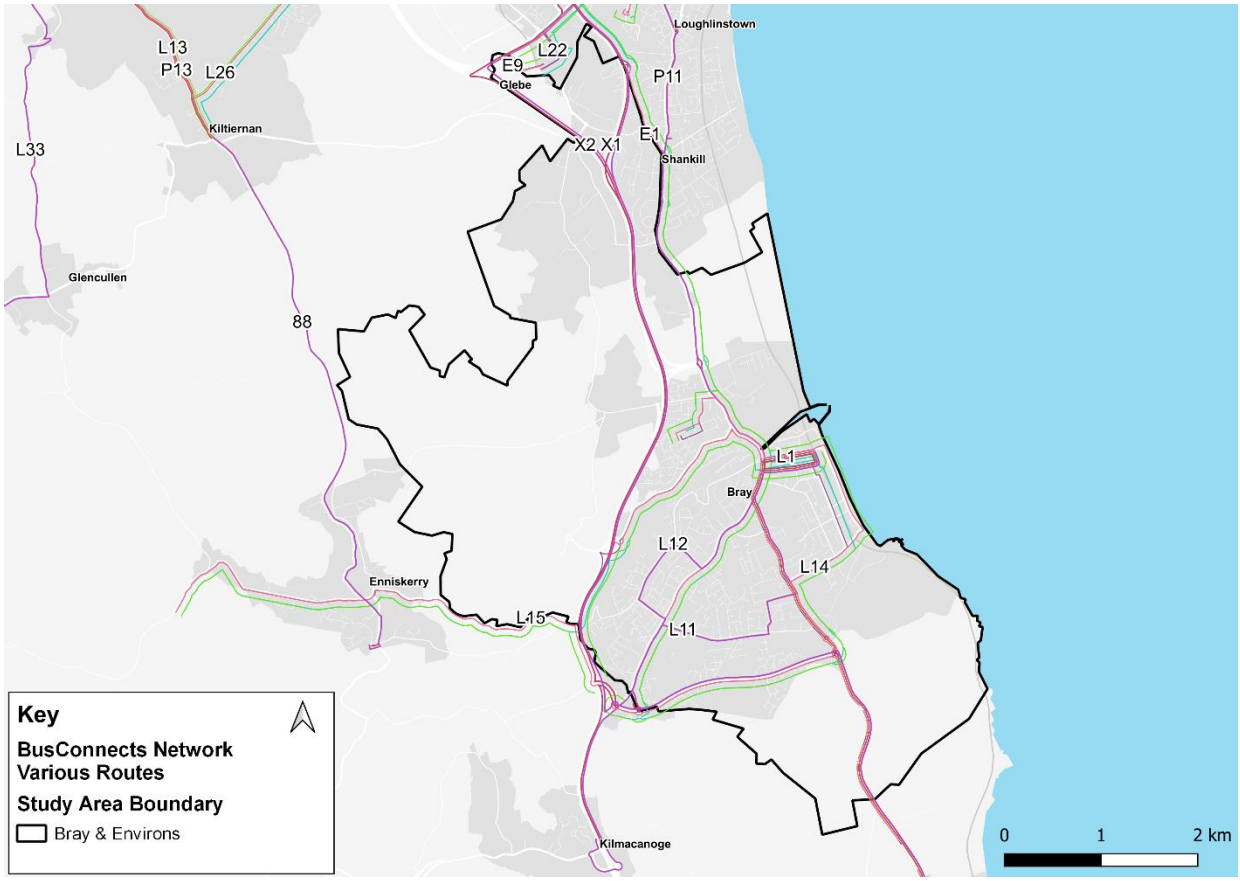


Figure 3-5: Bray and Environs BusConnects Route Map *(© OpenStreetMap contributors)*

Cycle network

The current cycling provisions within the study area are shown in Figure 3-6 below. Provisions within the area primarily consist of on-road cycle lanes, in some areas interspersed with bus lanes and bus stops. Most of this provision is located on the primary road network within Bray itself, though there is some on the R119 between Bray and Shankill. There are some off-road segregated cycle lanes within Bray and this is highlighted particularly along the Boghall Road in south Bray. However, on the whole there is limited cycling infrastructure between Bray and the wider environs.

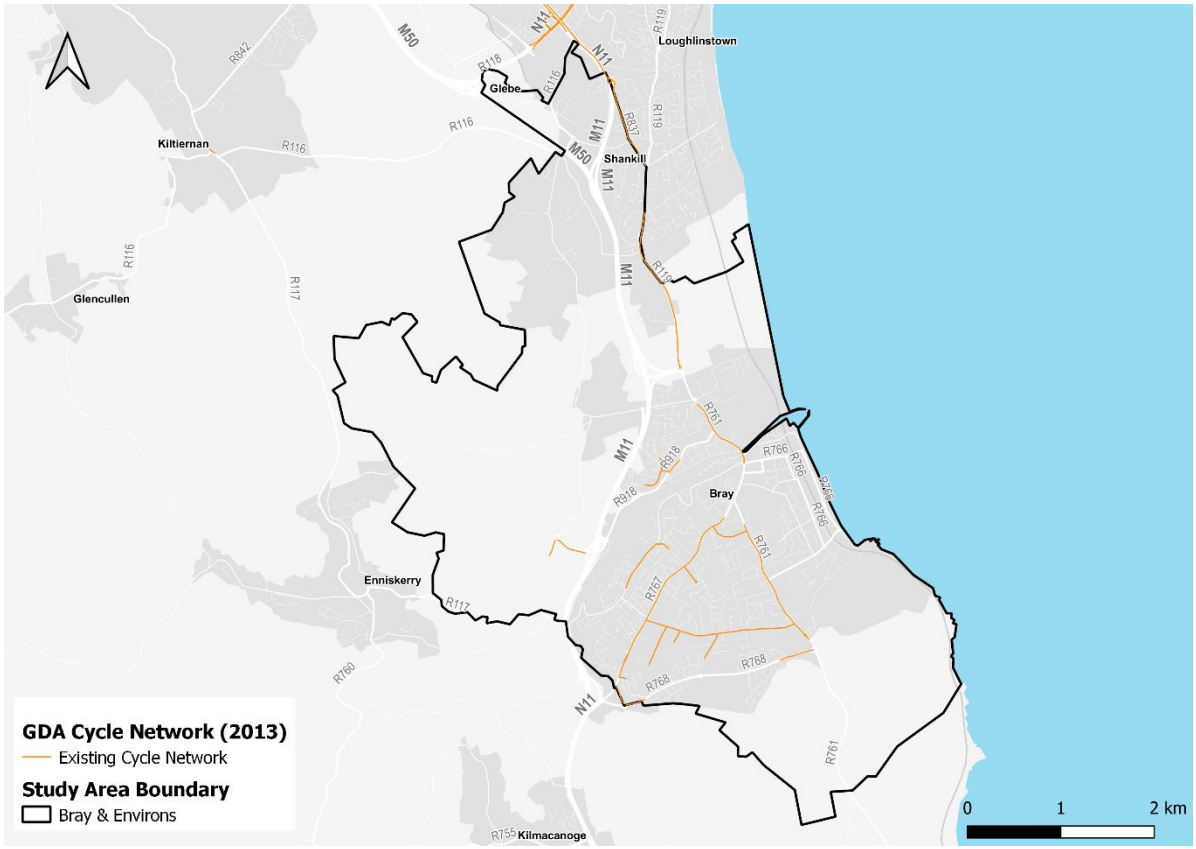


Figure 3-6: Existing cycle network *(© OpenStreetMap contributors)*

Walking Network

Throughout the study area, footpaths and street lighting are generally provided adjacent to all roads providing good connectivity within and between settlements and to key facilities such as schools, transport links and town centres.

There are also some alternative traffic free, unpaved and unlit leisure paths between some settlements: Bray to Enniskerry (5km), Bray to Delgany (8km), Bray to Greystones (coastal path) (6km) and Bray to Shankill (4km), though their nature may present barriers to some user groups.

Road safety

There were no fatal collisions within this area in 2016 and approximately 7 serious collisions. One of these serious collisions was located on the M11, involving a motorcycle. Of the remaining serious collisions, 2 involved pedestrians, 2 involved cyclists, 1 involved a motorbike and 1 involved cars.

There were no fatal collisions in 2015, however in 2014 there was 1 fatal collision within the study area, located near to the junction between the M50 and M11 and involved a single car.

Parking provision

Parking provision within the study area is predominantly focused around the key trip attractors within Bray: Bray Town Centre, Bray Harbour, Bray Promenade/Beach, National Sea Life Centre, Bray Train Station and other amenities such as retail parks, business parks, supermarkets, local shops, schools, doctors, places of employment and places of worship.

3.2 Existing travel patterns

3.2.1 Key trip attractors

The key trip attractors within the Bray and Environs study area include some of the following:

Tourism:

- Bray Seafront
- National Sea Life Centre
- Bray Head
- Kilruddery House & Gardens

Local Amenities/Services:

- Bray Town Centre
- Southern Cross Retail Park
- Southern Cross Business Park
- Bray Business Park
- Bray Wanderers FC

Outside of Study area:

- Dublin (City Centre located approximately 14km north west)
- Leopardstown Racecourse (4km north west)
- Cherrywood Business Park (200m north)
- Sugar Loaf Mountain (3km south west)
- Powerscourt House & Gardens (2km south west)

3.2.2 Car ownership

The proportion of houses with at least one car within the study area (82%) is higher than across the GDA (79%). Within the study area the proportion of houses with at least one car is highest in Shankill-Shanganagh (92%) and Shankill-Rathmichael (89%) to the north of the study area and the very south of the Dublin City and Suburbs area. These contrast with Bray No. 1 (62%) and Rathmichael (Bray) (67%) which have a much lower percentage of households with at least one car.

Table 3-2: Bray and Environs car ownership (2016 Census)

Area	Total Households	Cars per household					
		0	1	2	3	4+	Not stated
Greater Dublin Area	666,724	18%	41%	31%	5%	2%	4%
Bray and Environs	**12,769**	**15%**	**44%**	**31%**	**5%**	**2%**	**2%**

3.2.3 Travel data

Travel to work/school/college by mode

As shown in Table 3-3, the proportion of people who travel to work by active modes (on foot or by bicycle) within the study area (11%) is lower than for the GDA (15%). Overall, the proportion of people who travel to work by

public transport is slightly higher; bus, minibus or coach within the study area (9%) is in line with the GDA (10%), whilst train use in the study area (11%) is high compared to the GDA (7%).

The highest proportions of train users live predominately within Bray No. 2 (where the Daly Station Bray DART station is situated) (21%) and Bray No. 3 (12%) whilst the proportions from Rathmichael (Bray) (6%) and Shankill-Shanganagh (7%) are lower despite the relative vicinity of Shankill DART Station.

Car/van usage within the study area (58%) is slightly higher than the GDA (55%) and is particularly high in Kilmacanogue (63%) and Shankill-Shanganagh (62%).

Table 3-3: Travel to work data for the study area (2016 Census)

Area	Total work	On foot	Bicycle	Bus, minibus or coach	Train, DART or Luas	Motorcycle or scooter	Car / van driver	Car passenger	Other/Not Stated
Greater Dublin Area	835,694	10%	5%	10%	7%	1%	55%	3%	9%
Bray and Environs	**15,600**	**9%**	**2%**	**9%**	**11%**	**1%**	**58%**	**4%**	**7%**

As shown in Table 3-4 the proportion of people who travel to school/college by bicycle within the Study Area (2%) is much lower than the Greater Dublin Area (4%) with all areas lower. Car/van passenger usage within the Study Area (40%) is higher than the Greater Dublin Area (35%). However, there are large differences within the settlements. Lower proportions of car/van passenger trips take place from / within Bray No. 2 (28%) and Rathmichael (Bray) (30%), whilst the proportions from Shankill-Shanganagh (53%) are higher, which could be attributed to its more rural setting. There are high proportions of walking trips predominately taking place from / within Bray No. 2 (40%) and Bray No. 3 (39%). However, across the whole study area walking to school/college is 29%, slightly lower than the average across Greater Dublin (31%).

Table 3-4: Travel to school or college in the study area (2016 Census)

Area	Total School/ College	On foot	Bicycle	Bus, minibus or coach	Train, DART or Luas	Motorcycle or scooter	Car / van driver	Car passenger	Other/Not Stated
Greater Dublin Area	427,946	31%	4%	18%	4%	0%	4%	35%	5%
Bray and Environs	**8,181**	**29%**	**2%**	**16%**	**6%**	**0%**	**4%**	**40%**	**3%**

Journey time to work / school / college

In line with the average for the GDA (53%), the majority of trips to work / school / college in the study area have a journey time under 30 minutes (54%), though in Bray No. 2, 26% have a commute over 45 mins compared to 18% for the GDA.

Table 3-5: Journey time to work / school / college in the study area (2016 Census)

Area	Total	Under 15 mins	1/4 hour - under 1/2 hour	1/2 hour - under 3/4 hour	3/4 hour - under 1 hour	1 hour - under 1 1/2 hours	1 1/2 hours and over	Not stated
Greater Dublin Area	1,237,858	24%	29%	21%	8%	8%	2%	8%

Area	Total	Under 15 mins	1/4 hour - under 1/2 hour	1/2 hour - under 3/4 hour	3/4 hour - under 1 hour	1 hour - under 1 1/2 hours	1 1/2 hours and over	Not stated
Bray and Environs	**23,267**	**25%**	**29%**	**19%**	**8%**	**11%**	**2%**	**6%**

In line with the figure for the GDA, the majority of trips leaving home to travel to work / school / college in the study area take place between 7:30am and 9:00am. However, within the study area, the average time leaving home is weighted slightly towards 7:30-8:30am, whereas within the GDA a slightly higher proportion of the population leave home towards 8:00-9:00am. This pattern could suggest longer commutes for residents living within the study area when compared to the population of the greater Dublin Area as a whole.

Table 3-6: Time leaving home to travel to work, school or college (2016 Census)

Area	Total	Before 06:30	06:30 - 07:00	07:01 - 07:30	07:31 - 08:00	08:01 - 08:30	08:31 - 09:00	09:01 - 09:30	After 09:30	Not stated
Greater Dublin Area	1,237,858	6%	8%	11%	16%	22%	19%	5%	8%	6%
Bray and Environs	**23,267**	**5%**	**9%**	**11%**	**17%**	**25%**	**16%**	**4%**	**8%**	**4%**

3.3 Environmental conditions

The following environmental conditions are of note for the Bray and Environs study area:

- There is one air quality monitoring station within the study area, at Southern Cross Business Park in the Ballywaltrim area of Bray, which has been rated as 'Good Air Quality'[4].
- There are a large number of National Inventory of Architectural Heritage (NIAH) building footprints within Bray town centre and waterfront, in addition to National Monuments[5] and Protected Structures located throughout the study area.
- There are two Special Areas of Conservation (SAC) within the study area, including Bray Head SAC (000714) located south of Bray on the coast of the Irish Sea and Ballyman Glen SAC (000713) to the west of the area[6].
- Proposed National Heritage Areas (pNHAs) within the study area include Bray Head pNHA to the south east of the study area on the Irish Sea coast and Ballyman Glen pNHA to the west[7].
- The most dominant noise source on the sensitive receptors is assumed to be the traffic on the existing road network especially the M/N11 and R-road network. There will also be some additional noise from the railway line where it passes through the scheme from north to south.
- The study area borders the Irish Sea along its eastern side. In addition, the study area includes the following watercourses:
  - The Dargle River, which flows from the south west and through the centre of Bray to its estuary at Bray Harbour. The River is noted as supporting Salmonid fish and has several tributaries from the north and south through the study area.

[4] http://www.epa.ie/testaqblue/air%20quality%20map
[5] Sites recorded by the Archaeological Survey of Ireland
[6] https://gis.epa.ie/EPAMaps/
[7] https://gis.epa.ie/EPAMaps/

- To the north of Bray there is the short Rathmichael River which has its source within the study area under Carrickgollogan Hill.
- In the very north of the study area is the Shanganagh River, which flows through Shankill.

3.4 Summary of baseline assessment

The review of existing transport infrastructure and services, and travel demand in the Bray and Environs study area has identified several key conclusions:

- **Roads** – The study area is served by the N11/M11, running north to south through the study area and joining the M50 in Shankill. The M/N11 currently experiences significant over-capacity periods, which results in congestion and increased journey times. There is a high reliance on motor vehicles within the study area, with 58% of individuals within the study area commuting to work by car/van;
- **Rail** – Bray railway station is the only rail station within the study area. The station is located on the very eastern edge of the study area, reducing its accessibility and connectivity to residential areas. The rail station at Bray is served by the rail line running north to south in the east of the study area, used by the DART service, South eastern Commuter Train and Intercity services. Journeys to work by train from the Study Area (11%) is high compared to the Greater Dublin Area (7%);
- **Luas** - The Luas Green Line currently provides services between Dublin City Centre and Brides Glen (less than 500m north of the study area), with regular services 7-days a week. Brides Glen Luas stop can be accessed from the study area via the M50/M11;
- **Bus** – Several bus services will run regularly as part of the launch of the New Dublin Area Bus Network and will provide access to nearby towns and the city centre. 9% of residents commute to work by bus, minibus or coach within the study area; and
- **Active travel** - Provisions within the area for cyclists primarily consist of on-road cycle lanes, in some areas interspersed with bus lanes and bus stops. The proportion of people who travel to work by active modes (on foot or by bicycle) within the Study Area (11%) is lower than average for the Greater Dublin Area (15%). There is good connectivity within and between settlements for walking, with footpaths and street lighting generally provided adjacent to all roads. There are also a number of traffic free, unpaved and unlit leisure paths between some settlements. However, the level of car dependency remains fairly high.

4. Context

This section sets out the context of the transport demand and transport supply in the forecast year of 2040. It builds on the baseline (2016) assessment to consider proposed growth and predicted future travel patterns and anticipated travel demand across the study area. This data forms the basis of the assessment of the future year issues and opportunities, and the basis for identifying potential options for intervention.

4.1 Future land use

4.1.1 Overview

The future land use scenario presented here is based on a Planning Sheet for 2040 provided by the NTA in discussion with relevant local authorities. It reflects the 2016 and 2040 population, employment, and education places across the study area in line with regional and local planning aspirations. It is aligned with the overall objectives of the NPF and the RSES.

Table 4-1 presents the population, employment and education statistics for the Bray and Environs study area and the entire GDA.

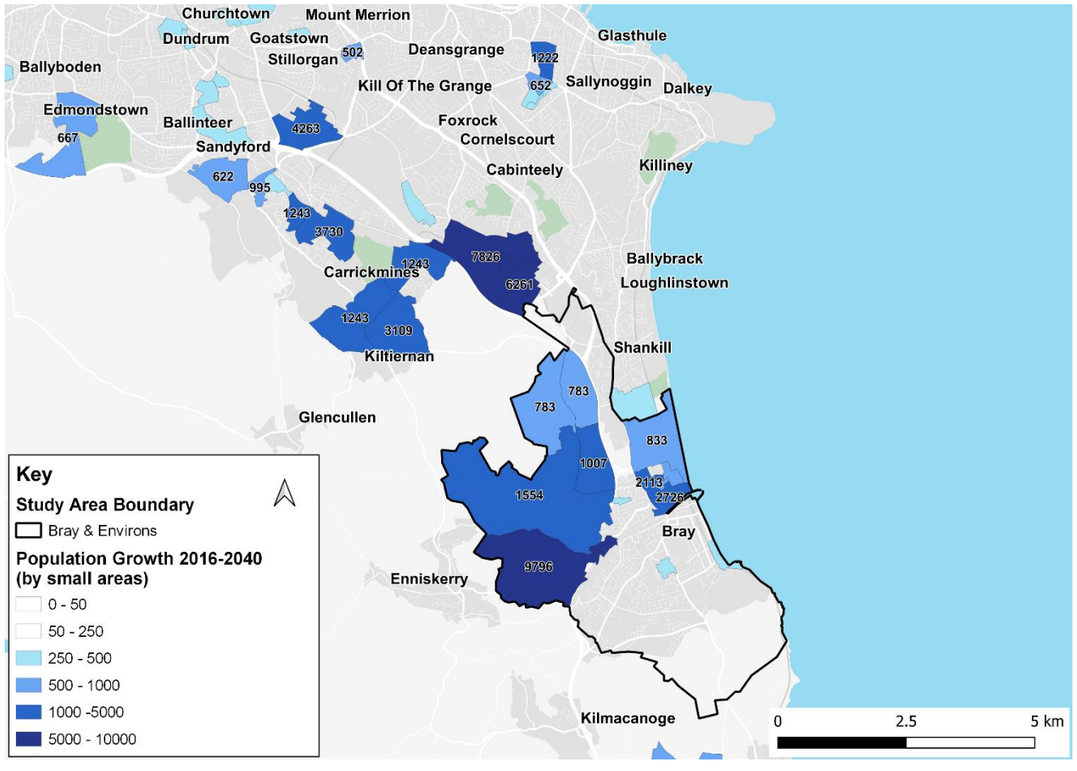
Table 4-1: Population, employment and education statistics

Area	2016	2040	Growth	
			Absolute	Percentage
Population				
Bray and Environs	36,779	61,948	25,169	68%
GDA	4,761,865	5,790,237	1,028,372	22%
Employment				
Bray and Environs	9,102	13,351	4,249	47%
GDA	1,468,093	1,996,002	527,909	36%
Education				
Bray and Environs	7,288	11,150	3,862	53%
GDA	982,185	1,186,472	204,287	21%

4.1.2 Population

The projected population growth between 2016 and 2040 within the Bray and Environs study area is shown in Figure 4-1. This illustrates the majority of population growth is expected within the northwest of the study area, where population is expected to increase by between 500-10,000 depending on the area. This section of the study area encompasses the development sites at Fassaroe and Old Connaught. Additionally, there is significant population growth to the north of Bray, an area which includes the Woodbrook-Shanganagh Local Area Plan development and the lands of Bray Golf Club.

Overall, the population in the Bray and Environs study area is expected to grow from 36,779 in 2016, to 61,948 in 2040, an increase of 25,169 (+68%).



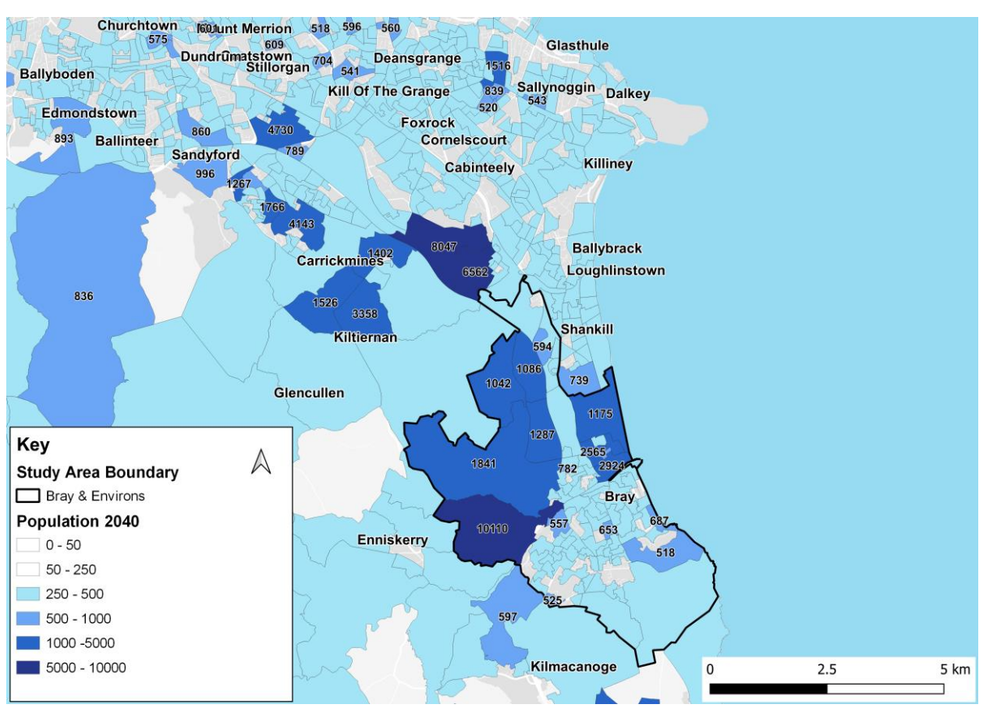


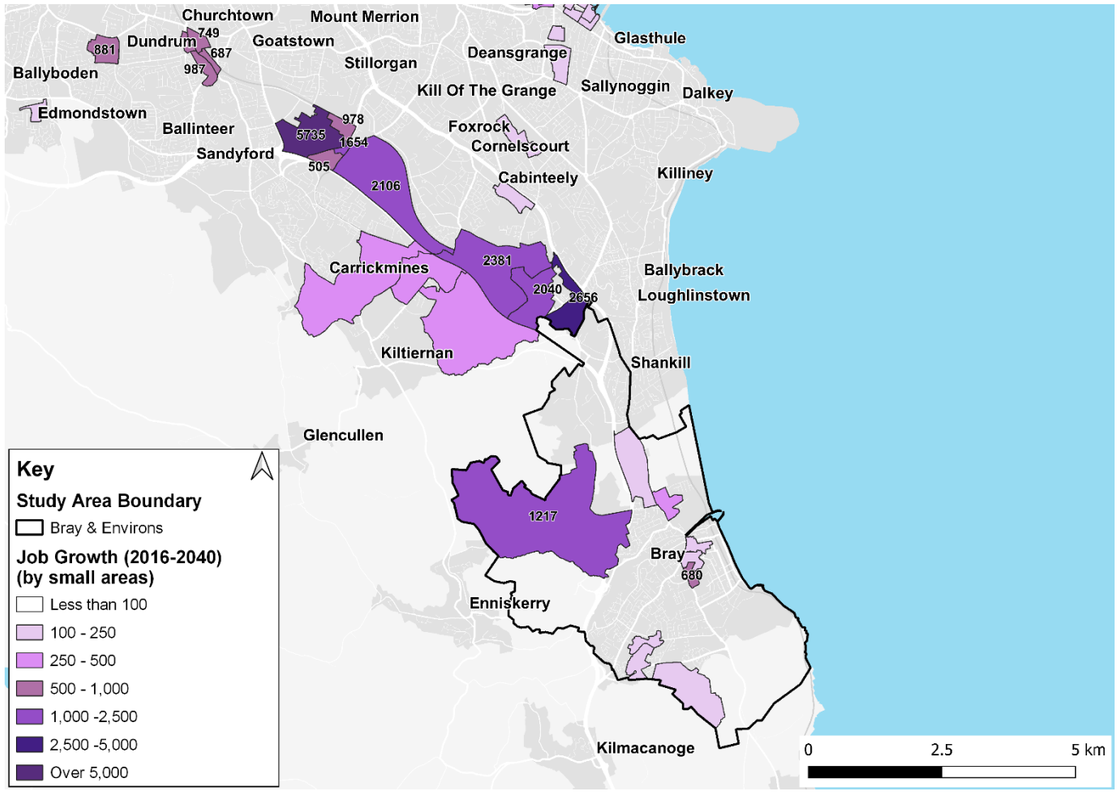
Figure 4-1: Population growth in the Bray and Environs study area (2016 to 2040) *(© OpenStreetMap contributors)*

4.1.3 Employment

Figure 4-2 shows the projected employment growth within the study area between 2016 and 2040. The highest increases in employment growth within Bray and Environs includes the area to the west, where it is expected that employment will increase by between 1,000 to 2,500 jobs.

Overall, the employment in the Bray and Environs study area is expected to grow from 9,102 jobs in 2016 to 13,351 jobs in 2040, an increase of 4,249 (+47%).

The Bray Municipal District Local Area Plan (2018-2024) highlights proposed areas of E1 employment land at the junction between the N11 and R918 near Fassaroe in addition to an area south of the R768. This is reflected within the employment growth highlighted within Figure 4-2.



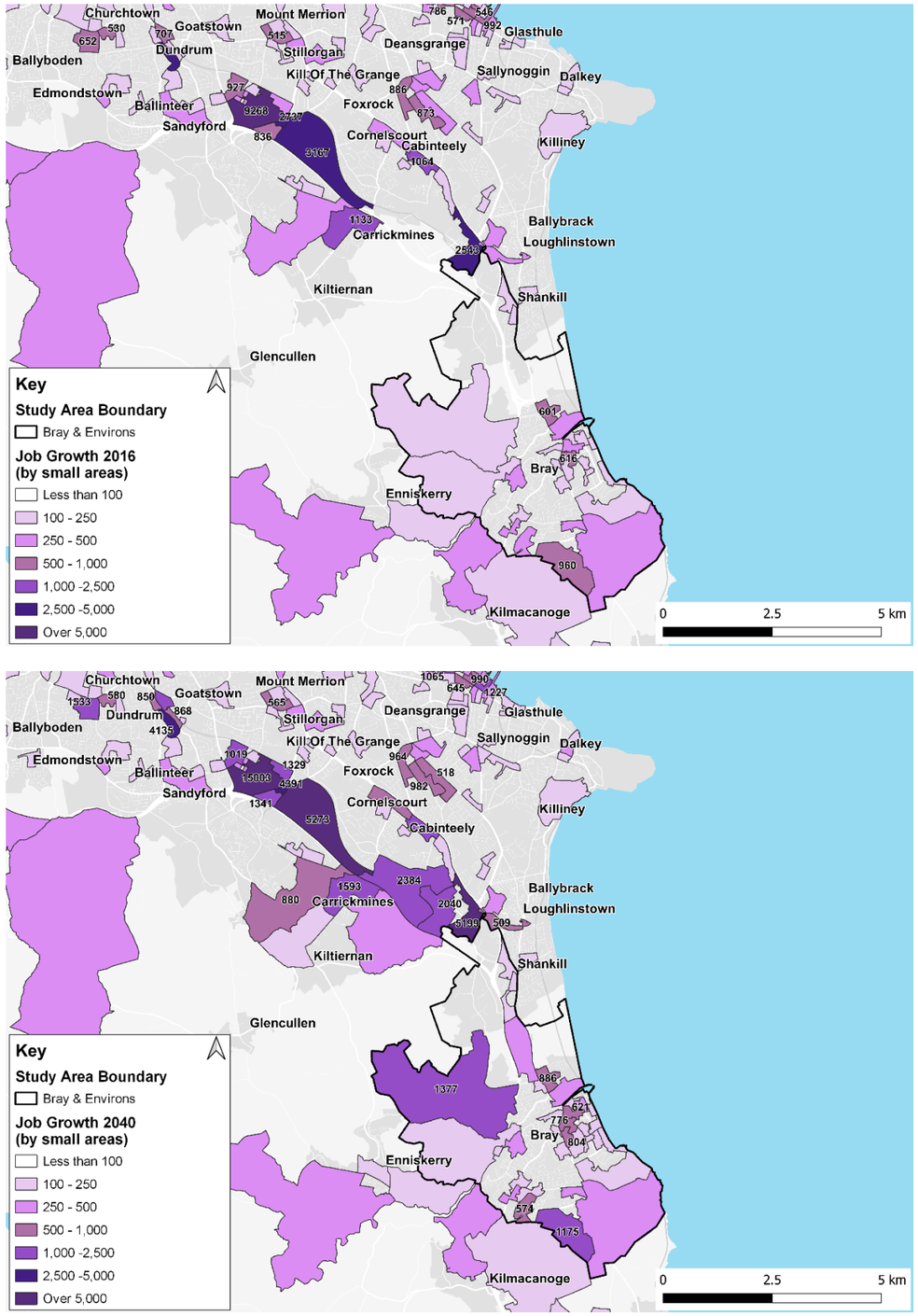
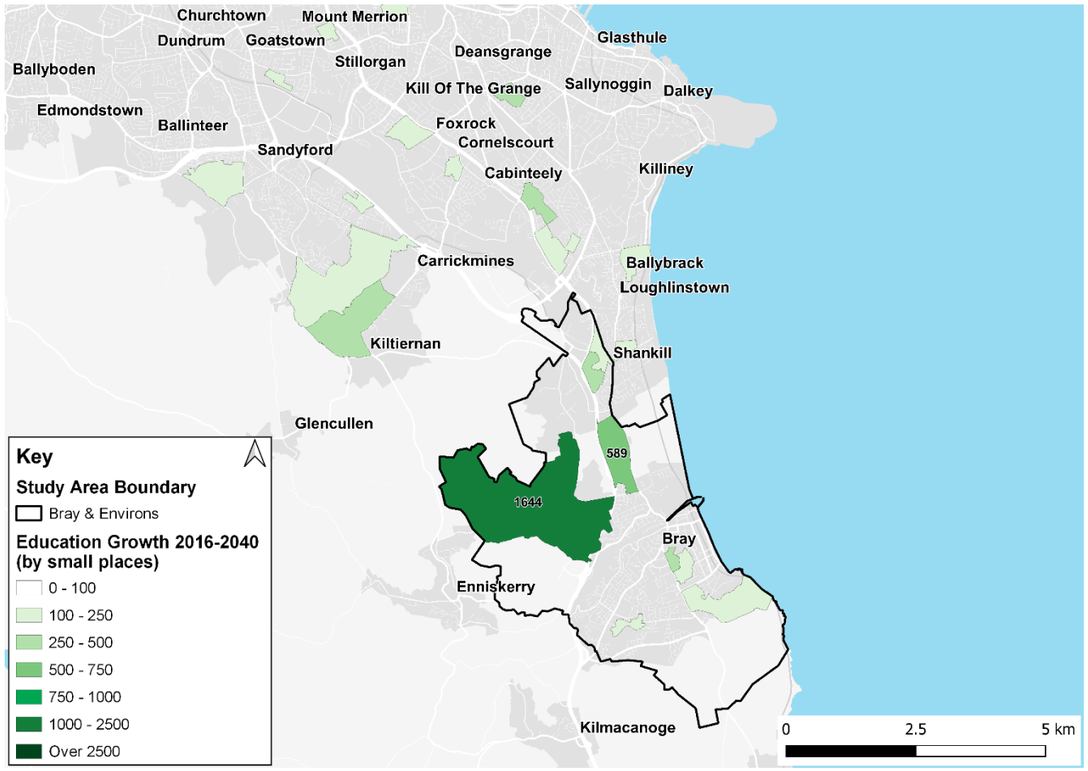


Figure 4-2: Employment growth in the Bray and Environs study area (2016 to 2040) *(© OpenStreetMap contributors)*

4.1.4 Education

Figure 4-3 shows the projected education growth within the Bray and Environs study area from 2016 to 2040. The highest increase in education growth is in the west of the study area and an area to the north of Bray. These areas roughly align with the locations of planned housing and employment development.

Overall, the projected number of educational places (e.g. school places) within the Bray and Environs study area is expected to grow from 7,288 in 2016 to 11,150 in 2040, an increase of 3,862 (+53%).



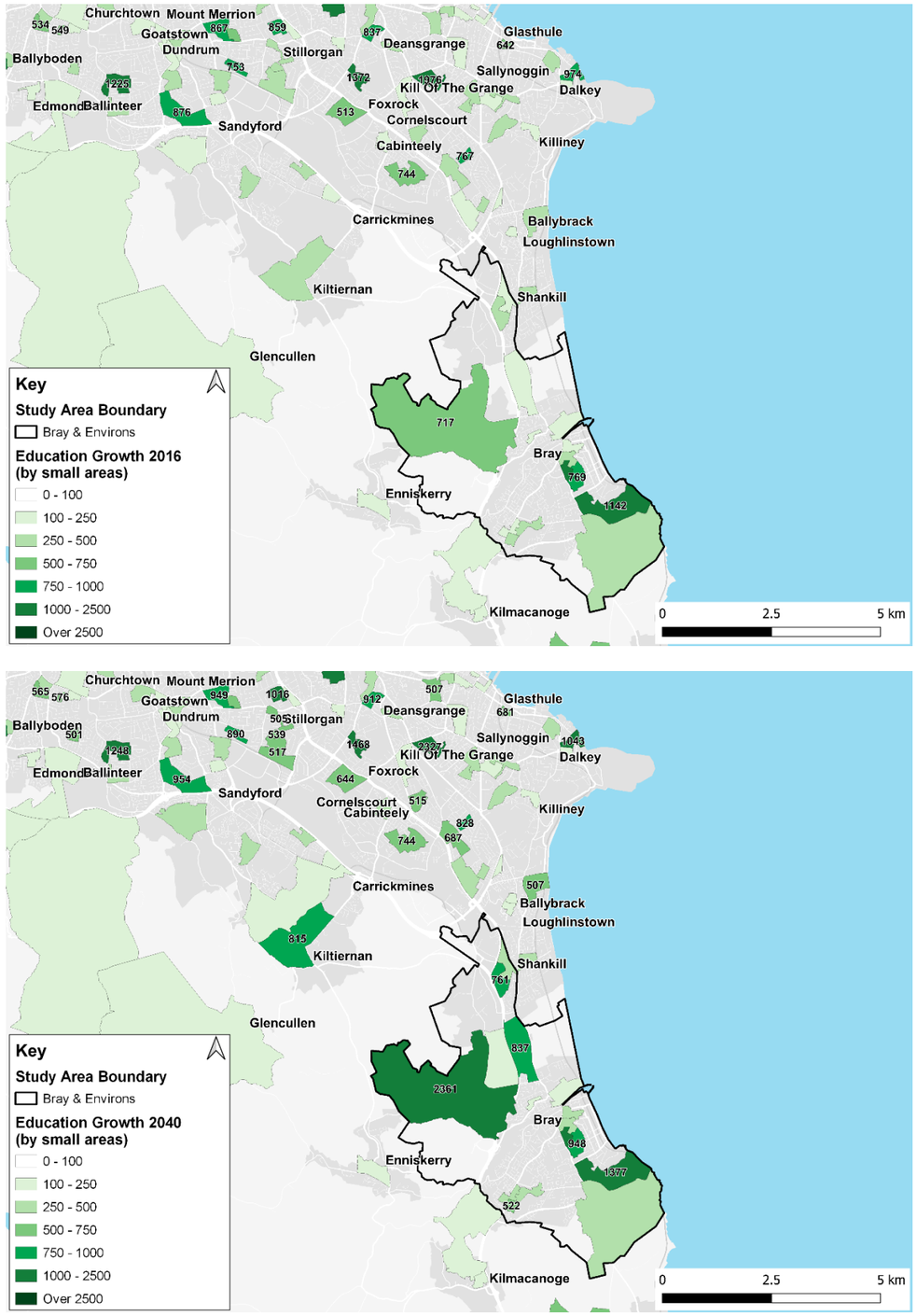


Figure 4-3: Education growth in the Bray and Environs study area (2016 to 2040) *(© OpenStreetMap contributors)*

4.2 Current proposals for transport interventions

This section has been informed by the GDA Transport Strategy (2016-2035) and the Bray and Environs Transport Study (2019). The GDA Transport Strategy sets out the following transport infrastructure improvements identified within the Bray and Environs study area. Bray and Environs sits on 'Corridor F' which stretches from the south east business districts of Dublin to Wicklow. The Bray and Environs Transport Study builds upon the GDA Transport Strategy seeking to facilitate the land use objectives of Wicklow County Council and Dún Laoghaire-Rathdown County Council as provided for in statutory regional, county and local plans.

This section provides a brief summary of those schemes which will be considered when identifying options to serve demand in 2042.

4.2.1 Heavy Rail

DART+

The Dublin Area Rapid Transit (DART) system is an electrified commuter rail railway network serving the coastline and city centre of Dublin. The service makes up the core of Dublin's suburban railway network, stretching 50km from Greystones, County Wicklow, in the south to Howth and Malahide in north County Dublin. DART and Commuter Rail make up the Heavy Rail network and provide the core high-capacity infrastructure that is central to the GDA public transport system.

DART+, to be delivered by 2027, will increase capacity on the northern commuter line and support ongoing large-scale urban expansion of the North Fringe lands and Donabate. On the south-eastern commuter line capacity is unlocked by a new station at Woodbrook - Shanganagh, with the consolidation and westward expansion of Bray to Fassaroe and Old Conna linked to improved public transport connections.

The DART+ Coastal projects include the following:

- Upgrading of existing infrastructure from Drogheda to Greystones to enable an increase in frequency of train services, including:
    - Upgrade of junctions and station turn-back facilities.
    - Assessment of and potential removal of level crossings, reducing constraints on both rail and road traffic.
    - Modifications to bridges and structures.
    - Provision of train stabling.
    - Upgrade of signalling, telecoms and power supplies.
    - Track modifications and additions to improve capacity.
- Extension of the current electrification from Malahide to Drogheda (approx. 37km)
- Modifications to the existing Depots at Drogheda and Fairview to support the new fleet.

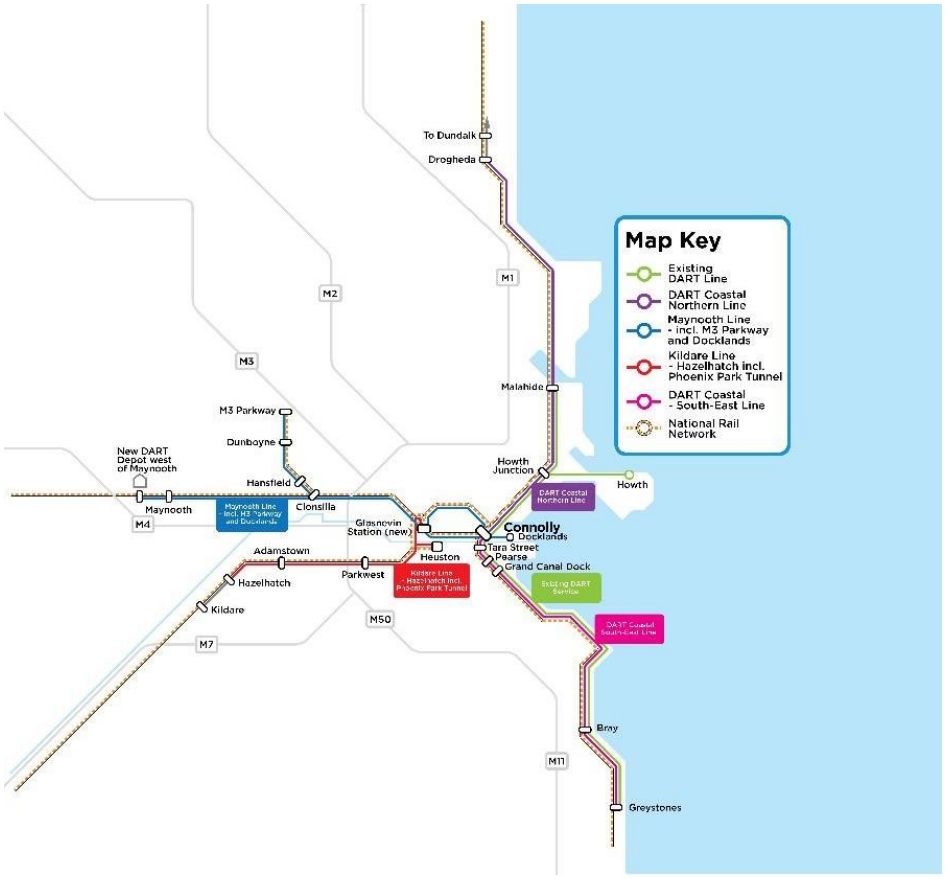


Figure 4-4: DART lines. (Source: Irish Rail – Transport for Ireland (TFI))

4.2.2 Light Rail

Luas Green Line (Light Rail Infrastructure) Capacity Enhancement

The Dublin Light Rail system (Luas) consists of two lines. The Luas Green Line currently provides services between Broombridge and Brides Glen (north of the study area). The red line provides services from Tallaght to The Point, with a spur from the north of Tallaght to City West at the western end, and from Busáras to Connolly in the city centre. These two lines provide high frequency, high-capacity services along these corridors, with trams operating at a frequency of up to every 3 minutes at peak hours.

The objective of the Luas Green Line Capacity Enhancement project is to provide extra capacity on the Luas Green Line, catering for the growing demand on the line in the short to medium term. It includes lengthening the existing Green Line trams to 55m length, plus the purchase of 8 additional 55m long trams. A major expansion of Sandyford Depot is underway to facilitate the growth in the Green Line fleet. The capacity enhancements to the Luas Green Line between St. Stephen's Green and Bride's Glen (in advance of Metro South – see section below) will allow for longer and higher capacity trams to be brought into service on this line.

Investment will also be required to maintain the existing light rail network in an adequate and safe condition, and ensure that services continue to be delivered efficiently. This will include expenditure to maintain, renew and manage the existing infrastructure and tram fleet. The 2035 Light Rail Network is shown in Figure 4-5.

Figure 4-5: 2035 Light Rail Network

New Metro Link South (Light Rail)

While the Luas Green Line Capacity Enhancement project will provide an additional level of passenger capacity, a significant further uplift will be required to cater for the longer term usage forecasts. This will require an upgrading of the line to Metro standard through the extension of new Metro North southwards, via a tunnel, to join the Green line in the Ranelagh area. This will enable the through running of Metro trams from Swords to either Bride's Glen (Cherrywood) or Sandyford.

The upgrading of the Luas Green Line to Metro will ensure that growth along this corridor can be accommodated and, in combination with new Metro North to Swords, will provide Dublin with a full north-south high-capacity, high-frequency cross-city rail corridor serving critical destinations at Dublin Airport, Dublin City University, the City Centre and Sandyford directly.

The connection between the extended new Metro North tunnel and the Luas Green Line, will facilitate services south of this connection point either running underground through the City Centre and onwards to Dublin Airport and Swords, or continuing on surface and linking with Luas Cross City.

Extension of Luas Green Line to Bray

It is proposed that the Luas Green line will be extended from Cherrywood where it currently terminates, to Bray Town Centre, providing a second rail alternative to this large town. This will occur after the Green Luas Line has been upgraded to Metro, in order to provide the necessary passenger capacity. While a decision on the final alignment has yet to be made, it is likely to run to Bray DART station via Shankill and the former golf club lands. It will provide a high frequency, high-capacity link between Bray and the key employment areas of Sandyford, Dundrum and Cherrywood, in addition to connecting to the City Centre. It is intended that a portion of the Metro

services commencing in Dublin Airport and Swords will run through to Bray, subject to the final design of the Cherrywood to Bray section accommodating the length of trams involved. Additionally, Luas services will operate between Bray and Broombridge/Finglas, allowing interchange with metro services to Dublin Airport and Swords.

Other rail investments

Investment will be required to maintain the existing rail network in a steady state and to ensure that services continue to be delivered efficiently. This will include expenditure to maintain, renew and manage the existing infrastructure and rolling stock plus funding to support the operation of services. In addition, other smaller interventions will be undertaken during the period of the Strategy. These include:

- Renewal, replacement, upgrading of ticketing systems;
- Platform changes /additions at stations;
- Additional works to maintain the operational efficiency of the railway network and additional works to enhance service provision;
- Rail safety systems; and
- Passenger information systems.

4.2.3 Bus Network

In June 2018 the NTA published the Core Bus Corridors Project Report. The report was a discussion document outlining proposals for the delivery of core bus corridor network across Dublin. It set out the vision for the provision of 230kms of dedicated bus lanes and 200km of cycle lanes/tracks on sixteen key bus corridors. Core Bus Corridors comprising 16 radial routes and 3 orbital routes in Dublin.

Core Bus Corridors Project

The Transport Strategy identified several radial and orbital routes where demand for travel necessitates significant infrastructural investment. Since the approval of the transport strategy, this measure has been taken forward and has formed part of the BusConnects programme – the Core Bus Corridors (CBC). The main route of relevance to the proposed development is the CBC route from Bray to the City Centre. Corridor 13 shown within the figure below illustrates the location of this route within the core bus network.

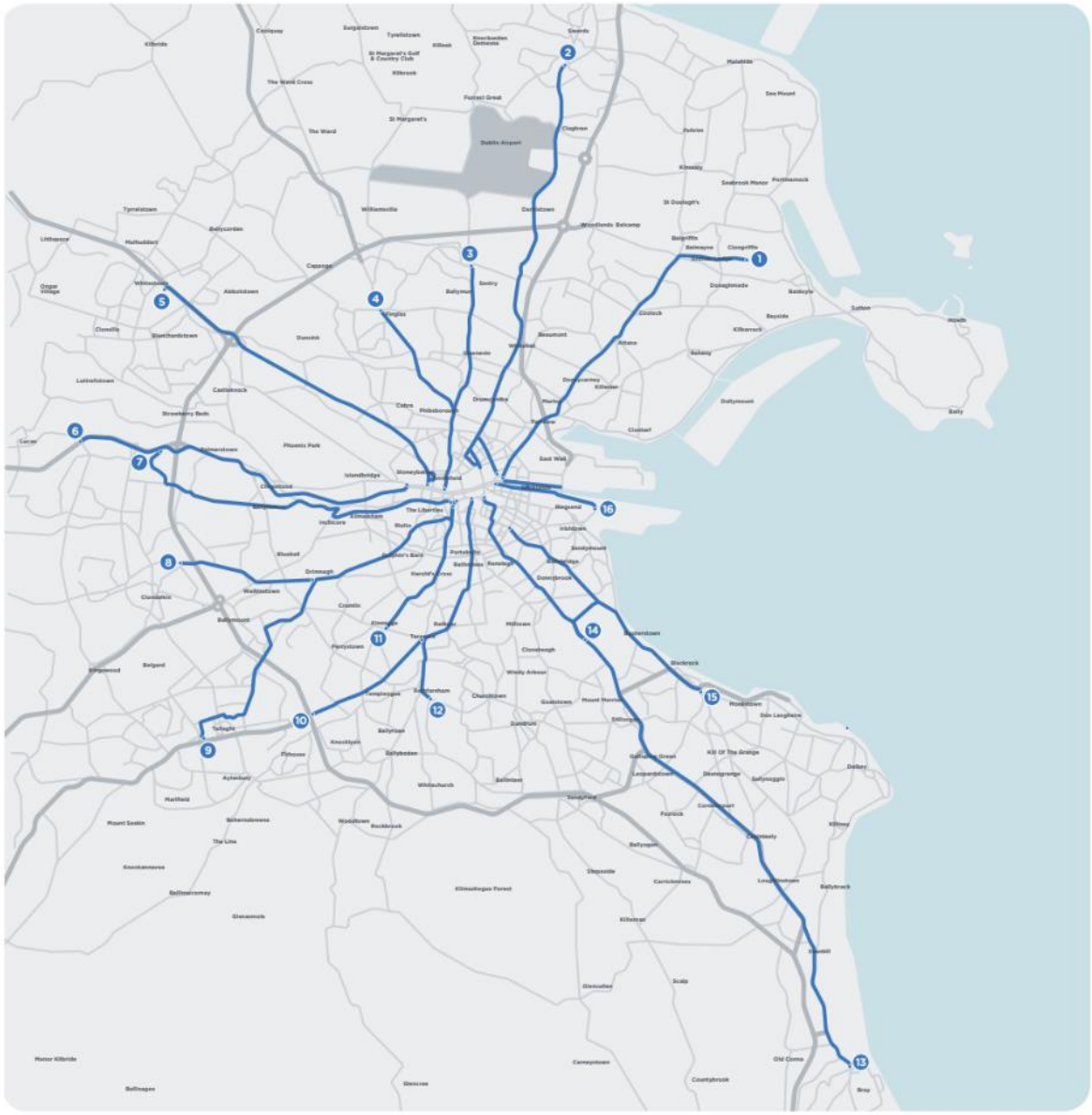


Figure 4-6: Core Bus Corridors

Bus Priority Network

The Bray and Environs Transport Study lists the following Bus Priority improvements within the study area:

- Busway from Fassaroe to Old Connaught over the County Brook at Ballyman Glen (which also facilitates walking and cycling).
- Support the delivery of a bus service from Sandyford via Rathmichael and Old Connaught to Bray DART Station until the Luas Green Line extension to Bray is suitably advanced.

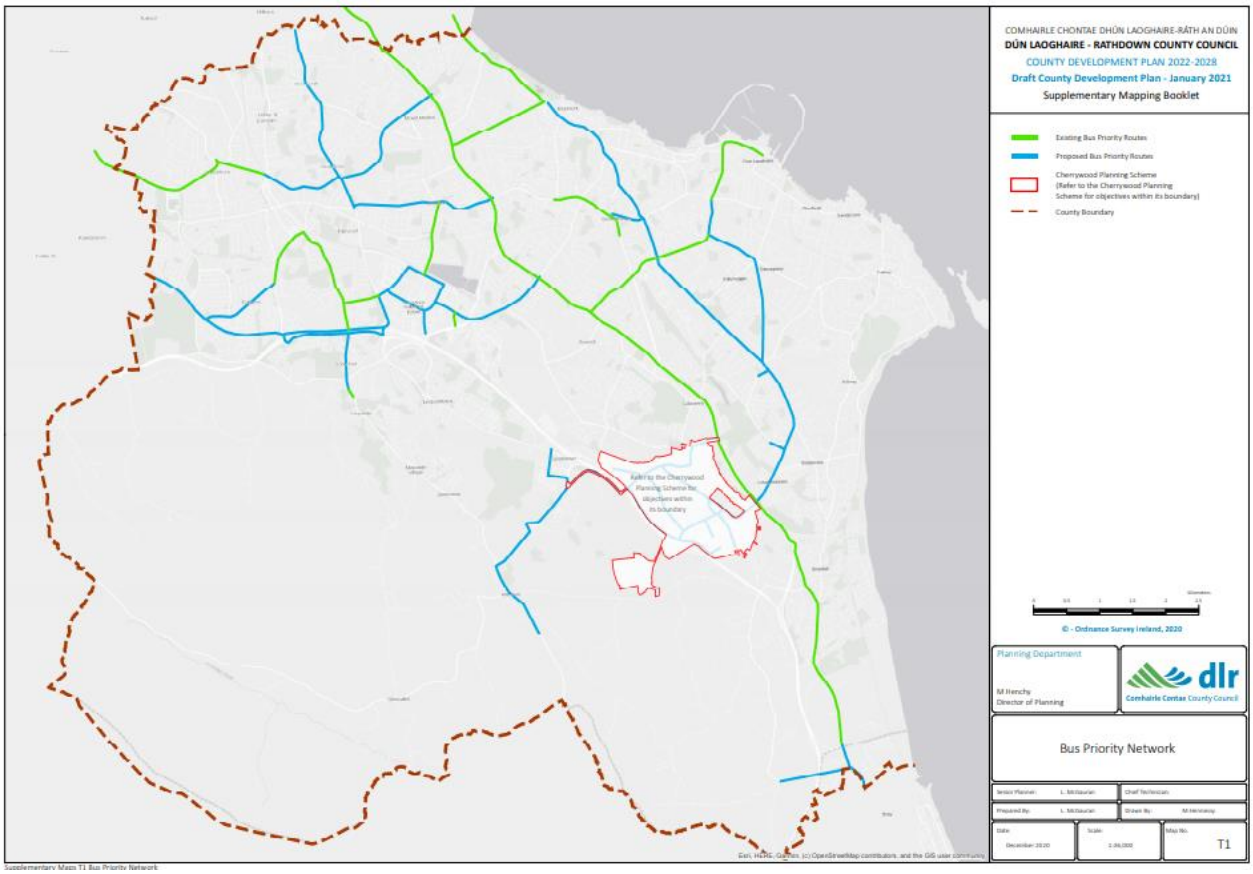


Figure 4-7: Bus priority network (Source: draft DLR County Development Plan)

4.2.4 Park and Ride

A Park-and-Ride Programme is to be developed where sites at Carrickmines and Woodbrook will be made available to the public. Both of these are in close proximity to the M50. The Woodbrook station will be located between Shankill and Bray and is proposed to be delivered within Phase A of the Bray and Environs Development (2019-2027)[8].

A planning application for a new Woodbrook DART Station has been submitted to support the Woodbrook-Shanganagh strategic residential development allocation. Funding for the station is to be provided by the NTA and, subject to planning, the station is anticipated to open in 2023[9].

Complementary parking controls, or charging, for on-street parking on roads within the walking catchment of park and ride car parks may be required, particularly in the case where the car park is charged or has the potential to be oversubscribed.

Regarding the above objectives, it is intended to:

- Develop a network of strategic rail-based park and ride facilities at appropriate points where rail services intersect with the national road network, adjacent to, or outside of, the M50. These facilities are, or would be, located at Swords, Finglas, Dunboyne, Liffey Valley, Naas Road, Carrickmines, Woodbrook and Greystones; and
- Further develop the provision of local park and ride facilities at appropriate locations on the rail network in the outer parts of the Metropolitan Area.

[8] 2019 Bray and Environs Transport Study
[9] https://www.rte.ie/news/dublin/2020/0831/1162347-woodbrook-dart-station/

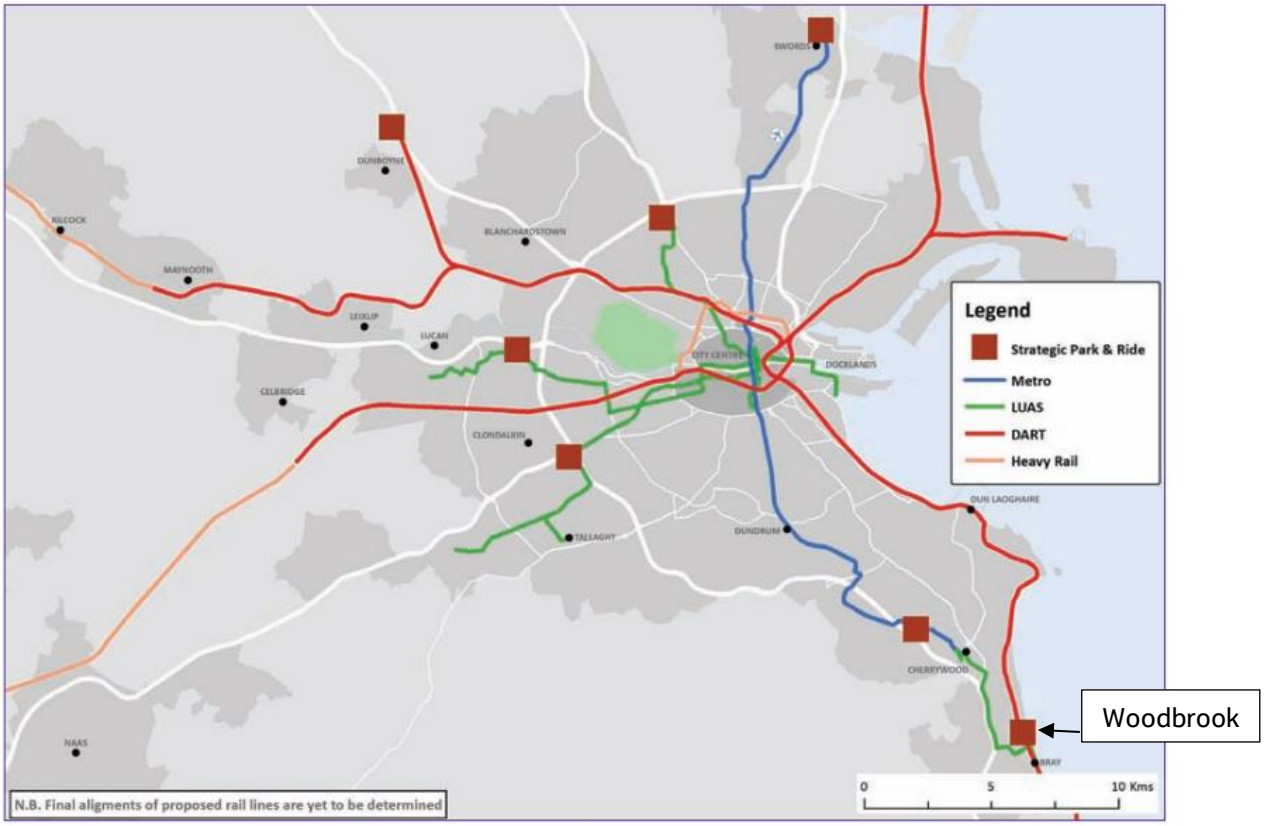


Figure 4-8: P&R site at Woodbrook

4.2.5 Roads

The following improvements are proposed along Corridor F (Arklow to Dublin City Centre via Bray) as part of the Transport Strategy for the Greater Dublin Area (2016-2035):

- Upgrades to the N11 and M50 between Newtownmountkennedy and Sandyford (including the M11/M50 junction);
- Loughlinstown roundabout will be improved; and
- A distributor road network will be developed to service development lands at Kiltiernan / Glenamuck.

Within the Bray and Environs Transport Study, the following improvements were proposed for Dún Laoghaire-Rathdown County Council area:

- Facilitate the implementation of demand management measures on the N/M11 and M50;
- Upgrade of the road system in Rathmichael and Old Connaught in order to facilitate the safe, convenient and reliable movement of public transport vehicles, cyclists and pedestrians – including:
- Upgrade of Ferndale Road;
- Development of a new link road from Ferndale Road to Dublin Road;
- M50 Cherrywood Interchange to Rathmichael Link Road;
- N11/M11 upgrade; and
- The westward expansion of Bray to Fassaroe and Old Conna linked to public transport improvements.

The MASP identifies infrastructure improvements within the GDA including enhancement of orbital movement, outside of the M50 C-Ring, between the N3, the N4 and N7 national roads, by the widening of existing regional and local roads and the development of new road links.

In addition, the following locations within the study area have been identified within the DLR County Development Plan[10] as potential locations for traffic management or active travel upgrades:

- Cherrywood Road;
- Cherrywood SDZ (road infrastructure to support the SDZ);
- Cherrywood to Dún Laoghaire Strategic Route (R118, Wyattville Road to Glenageary Roundabout);
- M11 Upgrade (M50 to Fassaroe);
- M50 Cherrywood Interchange to Rathmichael – new link road;
- Ferndale Road;
- Link from Ferndale Road to Dublin Road;
- Shanganagh Road;
- Sunnyhill to the Willows, Loughlinstown;
- Woodbrook/Shanganagh Access Road;
- Loughlinstown Roundabout (grade separation);
- M50 Third Lane (Sandyford Interchange to M11);
- M50 Western Parallel Road from Old Conna to Cherrywood environs; and
- Rathmichael Road.

4.2.6 Cycle Network Plan

The existing cycle network is described fully within Section 1.1.3. There are a number of on-road cycle lanes on the primary road network within Bray as well as some off-road segregated cycle lanes within the town. However, overall there is limited cycling infrastructure between Bray and the wider environs.

The GDA Cycle Network Plan outlines a number of proposed cycle routes within the Bray and Environs study area (see Figure 4-9). These include routes within existing urban areas, largely to connect missing links between existing routes and key destinations, and importantly routes within rural areas which provide new links to improve connectivity between Bray, Shankill, Enniskerry and Greystones.

[10] https://www.dlrcoco.ie/sites/default/files/atoms/files/chapter_5_transport_and_mobility.pdf

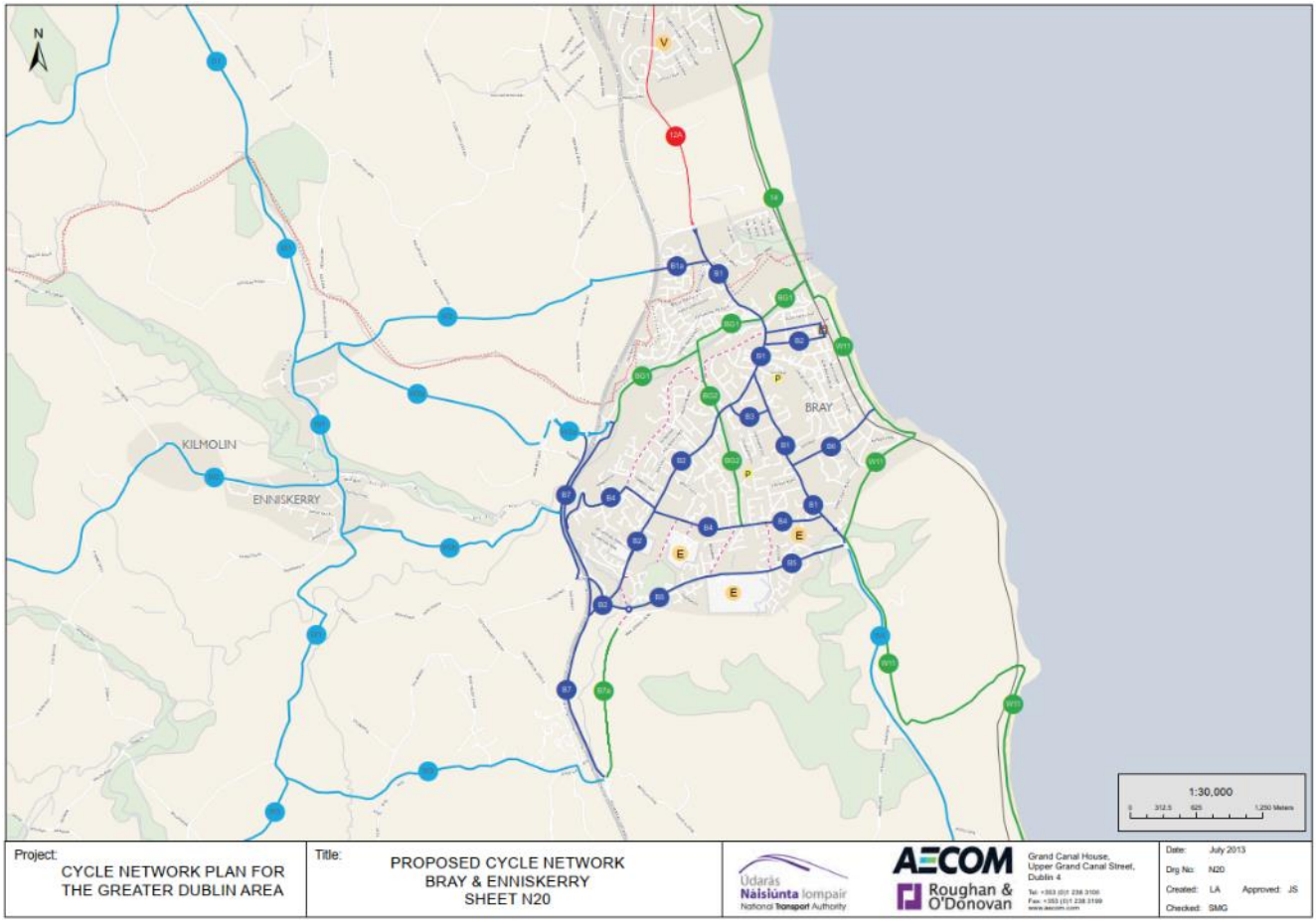


Figure 4-9: Proposed cycle network in Bray and Environs (Source: GDA Cycle Network Plan)

In addition, the MASP identified infrastructure upgrades including provision for sufficient on-street public cycle parking at key destinations such as bus and rail stations, schools, colleges, hospitals and large workplaces, particularly in urban areas.

4.2.7 Walking Network Improvements

The MASP identified walking network improvements across the GDA to improve accessibility and permeability within urban centres and communities, at junctions, in new developments and surrounding public transport stops and stations.

4.3 Future travel patterns

4.3.1 Model assumptions

The assessment of future travel demand is based on the outputs from the NTA Eastern Regional Model (ERM).

The ERM represents a 2042 scenario including:

Five time periods:

1) AM 07:00 to 10:00
2) Lunch time 10:00 to 13:00
3) School run 13:00 to 16:00
4) PM 16:00 to 19:00; and
5) Off peak 19:00 to 07:00.

Three mode classes;

6) Public transport (bus, Luas, rail and light rail);
7) Road (cars, LGV, HGV and taxi); and
8) Active modes (walk and cycle).

Five trip purposes:

9) Employers Business;
10) Education;
11) Commute;
12) Other; and
13) Retired.

Do Minimum

The model run represents a 'Do Minimum' scenario which includes proposed development, all existing transport provision, plus a number of changes to the transport network. Details of the transport schemes included are provided in Appendix A.

The model trips are assigned to a constrained network, meaning route choice of each trip is affected by capacities and journey times (e.g. impacts from queuing) in the model in relation to all the other trips. This means there is a likelihood that due to the volume of trips in the model, some journeys use routes through local roads, instead of using the key strategic corridors which are the focus of this study.

The ERM has been used to understand some of the key transport patterns in 2042 such as mode share, trip lengths, origins and destinations, route capacity and volume to capacity. These are described in the subsequent paragraphs in this section, and this information will be used to support the option development process.

4.3.2 Origins and destinations

Spatial analysis has been undertaken on trips that have an origin and/or destination within the study area, using the trip distribution from the model and the quantum of demand for the Bray and Environs study area from the planning sheet.

Trips from the Bray and Environs study area

Figure 4-10 shows the destinations of trips which originate in the study area in the AM peak (average hour 07:00-10:00).

For trips which originate in the study area in the AM peak, the main movements are from the north-west of the study area to areas in the north. There was high demand from the study area going to:

- Dún Laoghaire-Rathdown urban area; and
- The south east of Dublin City Centre.

The Key trip origins within the study area:

- Fassaroe;
- North side of Shankill-Rathmichael; and
- Bray town centre.

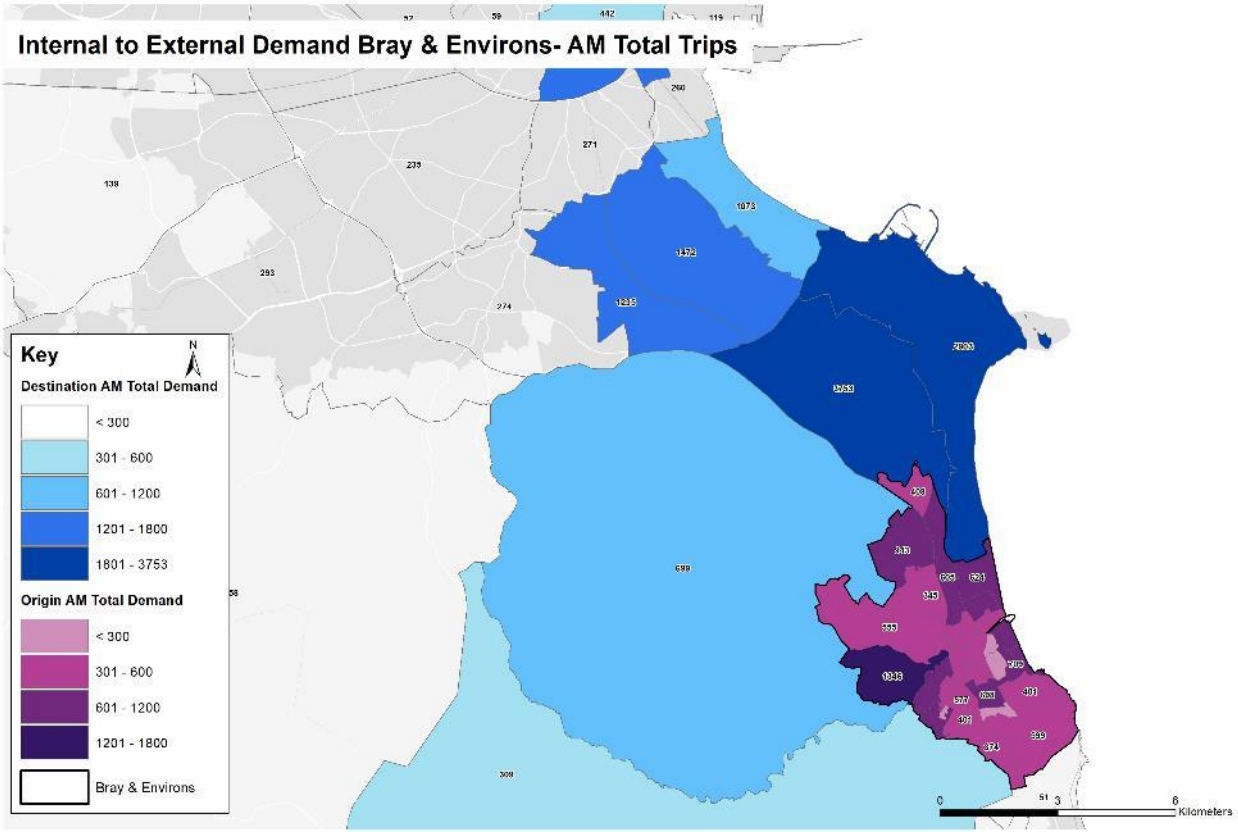


Figure 4-10: Total trips from the study area (AM peak)

Trips to the Bray and Environs study area

Figure 4-11 shows the origin of trips which have a destination in the study area in the AM peak.

The figure shows that the main movements into the study area are from the areas of Dún Laoghaire-Rathdown and Fassaroe (Wicklow).

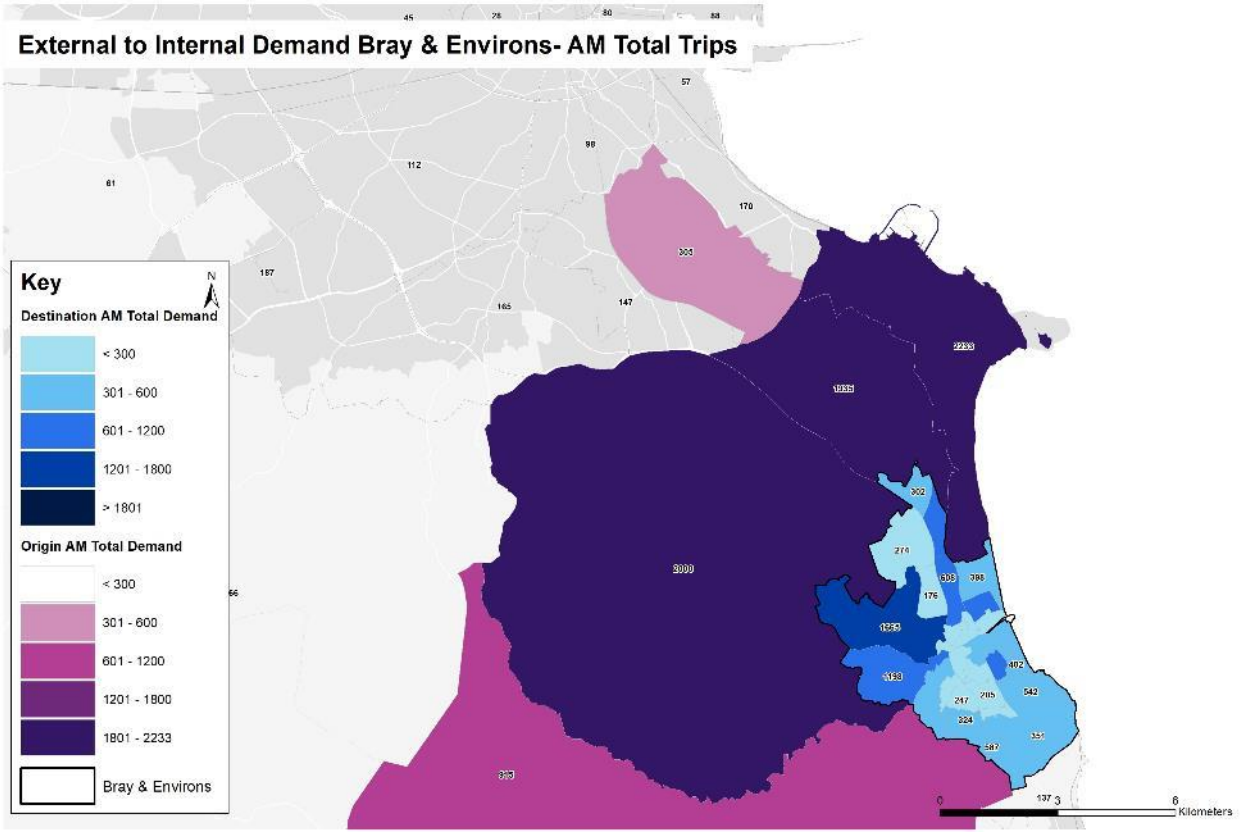


Figure 4-11: Total trips to the study area (AM peak)

Trips within the Bray and Environs study area

Figure 4-12 shows the internal movements in the Bray and Environs study area for all modes in the AM peak where the number of trips between any two zones is greater than 30.

The internal trips are predominantly within the western areas, between Shankill-Rathmichael and Fassaroe area, likely because of the new developments there. There are also some substantial movements within central Bray. For all modes, most of the main movements are short, between adjacent zones.

There are many car trips, especially between the new developments to the west of the study area. Walking trips make up the second highest number of trips, with the higher levels of demand being situated mainly within the area of Bray. Public transport and cycle trips are very low across the study area.

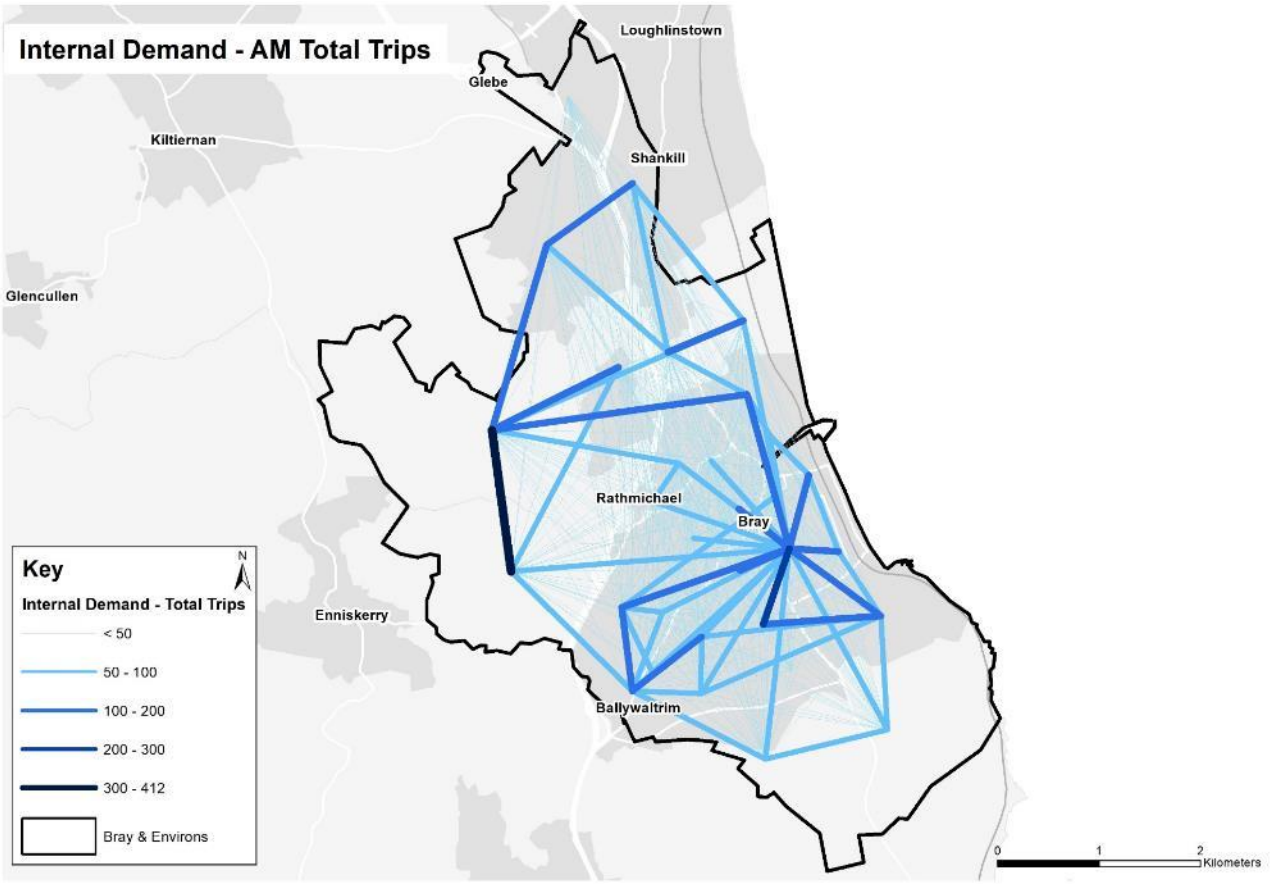


Figure 4-12: Total trips within the study area (AM peak)

Origins and destinations by mode

Trip patterns have been disaggregated by mode where either the origin or destination is within the Bray and Environs study area and the other origin or destination is outside the study area. Trips have been categorised as car, public transport and active mode trips. Maps are provided in Appendix B for the AM peak.

4.3.3 Mode share

Mode share data has been extracted from the model for trips originating in the Bray and Environs study area for car, public transport, cycling and walking trips. This has been spatially analysed for the AM peak and presented in Figure 4-13.

Overall, the AM peak data shows:

- Car is the dominant mode; across the study area car trips make up approximately 60% of the mode share. Car trips are particularly high to the west and south of the study area. This is likely due to the lack of public transport options within the western sections of the study area, as well as the distance to walk to shops and services from the western and southern parts of the study area.
- Public transport trips are highest to the north of the study area and central Bray. These areas are closest to the DART and rail services (Bray town centre) and Luas Green line stops (Bride's Glen). Across the entire study area public transport makes up approximately 22% of mode share.
- Approximately 16% of the mode share across the study area consisted of walking trips. These were slightly higher in a number of areas located east of the N/M11. This is possibly due to the proximity of some of these locations to areas of employment growth and to educational facilities, allowing local residents to commute by foot because of the shorter distances.

- Cycling is generally low within the study area, making up less than 1% of the mode share. This is potentially due to the distances from the study area to major employment centres such as Dublin City Centre.

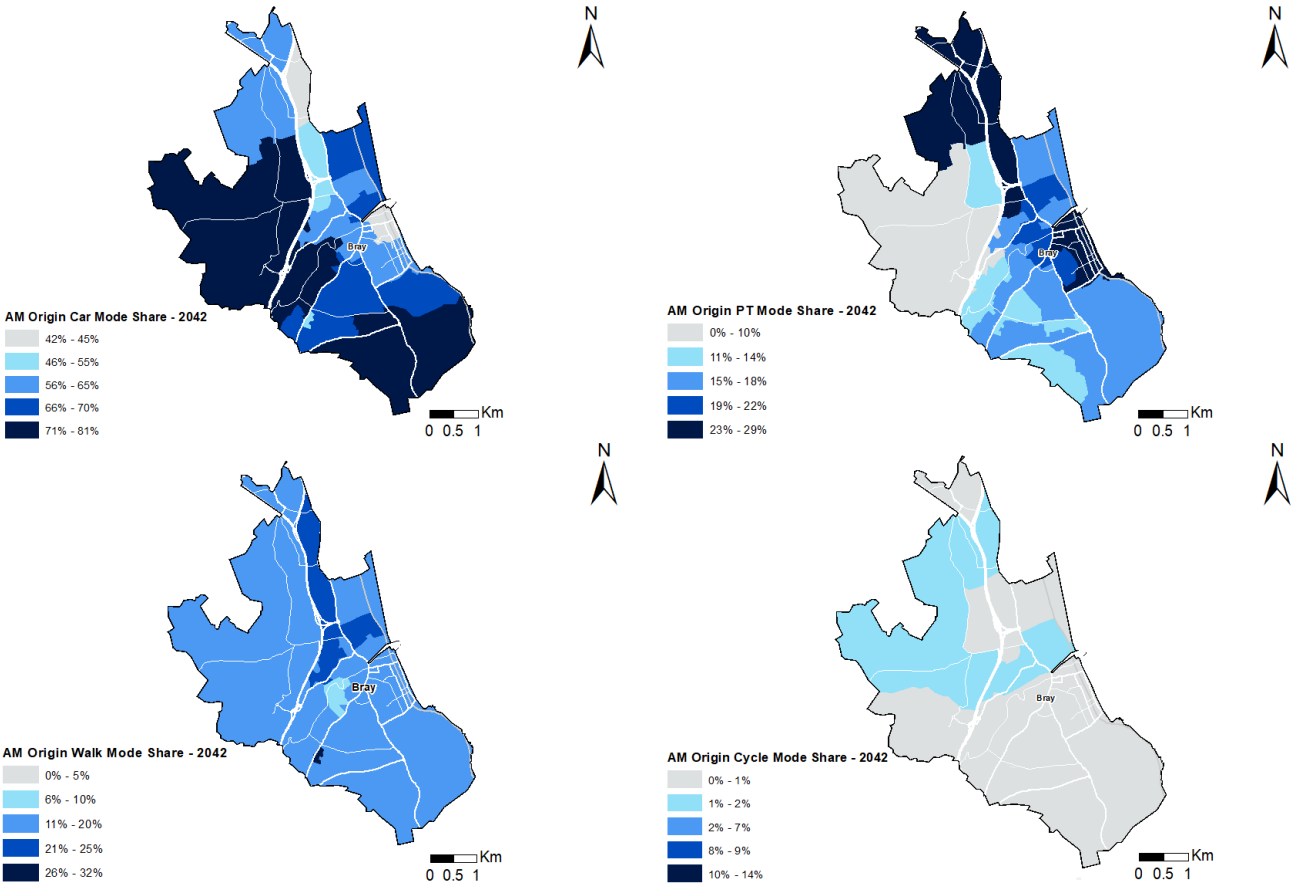


Figure 4-13: AM mode share in the study area

4.3.4 Capacity by mode

Roads

Figure 4-14 shows the volume over capacity (V/C) ratio at junctions on the road network within the study area and surrounding areas from the ERM within the AM peak. This shows severe congestion at the following locations on the network:

- N11 Junction 8;
- N11/R117; and
- N11/R118.

There is also heavy congestion at a number of locations including:

- N11 Junction 7;
- N11/R918;
- N11/R837; and
- N11/R116.

Figure 4-14: Volume over capacity ratio in the study area (AM peak)

Rail

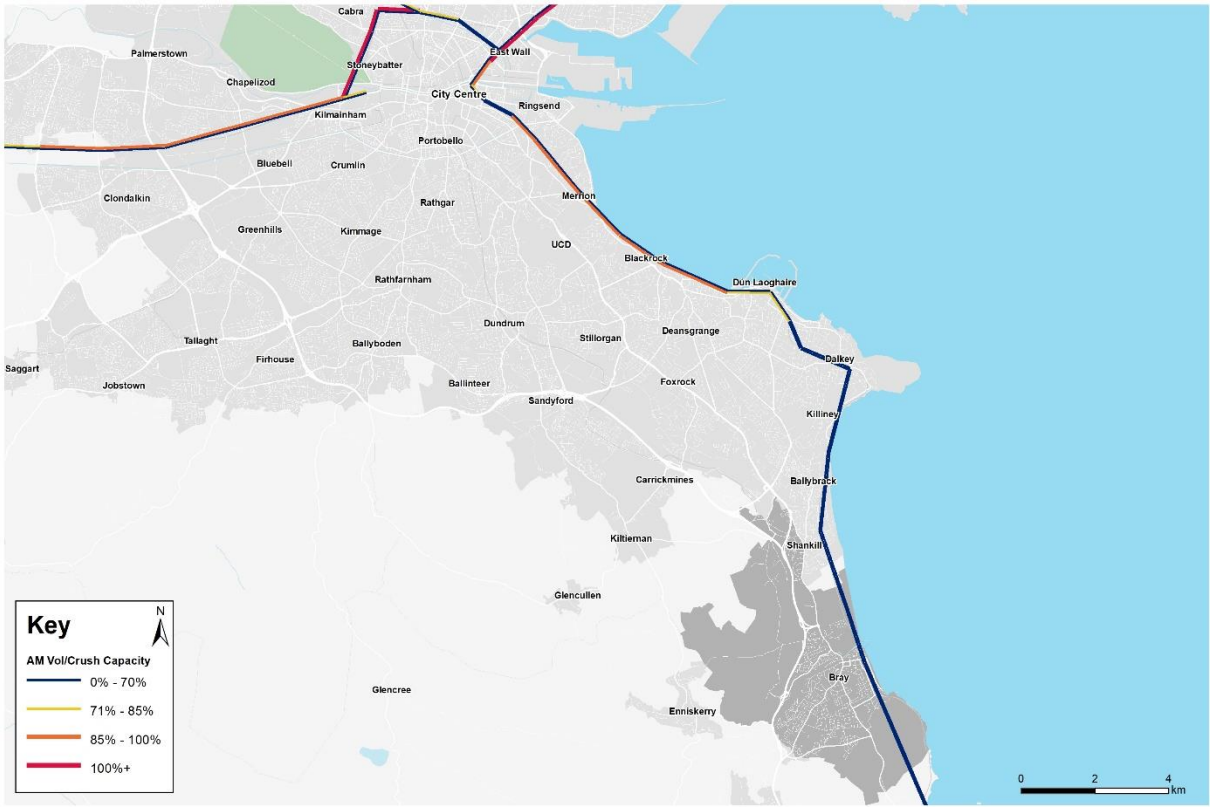


Figure 4-15: Volume over Crush capacity on DART train line

DART train line services data (2042) shows a volume over crush capacity (V/CC) up to 70% on both directions within Bray and Environs area. The service reaches higher V/CC as approaching Dun Laoghaire above 71% and then, even higher V/CC above 85% towards the Dublin city (North Bound). On southbound direction of travel, V/CC of the service is below 70% from Dublin city to Bray and Environs.

There is a need for capacity enhancement for the section from Dun Laoghaire to Dublin city to cater for the increase of demand and population generated from Bray and Environs area.

Bus

Figure 4-16 shows the volume to design capacity for each of the bus routes through the Bray and Environs study area. This figure highlights issues with capacity along the N11/M11 route through the study area, with the volume to design capacity at over 100%. This would impact on services such as the X1, X2 and Wexford Bus service 740 which travel along this route. In addition, bus services along the R119 to the north of Bray vary from 71% volume to design capacity, to over 100%. This would impact specifically on services such as the L11 and E1 which use this route.

The model shows that of the bus services through the study area, the E1 service has the highest usage, with a total of 5075 boardings (AM and PM) on the Ballymun to Ballywaltrim service, and a total of 4816 boardings on the Springfield Cemetery to Ballymun service (the majority of which are in the AM peak).

Other services which have a high modelled level of usage include:

- Bus Éireann 133 (Dublin Airport to Wicklow Gaol) – 722 boardings (PM peak);
- Bus Éireann 133 (Wicklow Gaol to Dublin Airport) – 997 boardings (AM peak);
- X1 (Kilcoole Beechdale Estate to Townsend Street) – 585 boardings (AM peak);
- X1 (Townsend Street to Kilcoole Beechdale Estate) – 739 boardings (PM peak);
- X2 (Newcastle_ Newcastle Road (Sea Road) to Prince's St South) – 405 boardings (AM peak);
- X2 (Townsend Street to Newcastle_ Newcastle Road (Sea Road)) – 335 boardings (PM peak).

However, the X1, X2, 133 and 740 are long distance or express services and have limited stops within the Bray and Environs study area.

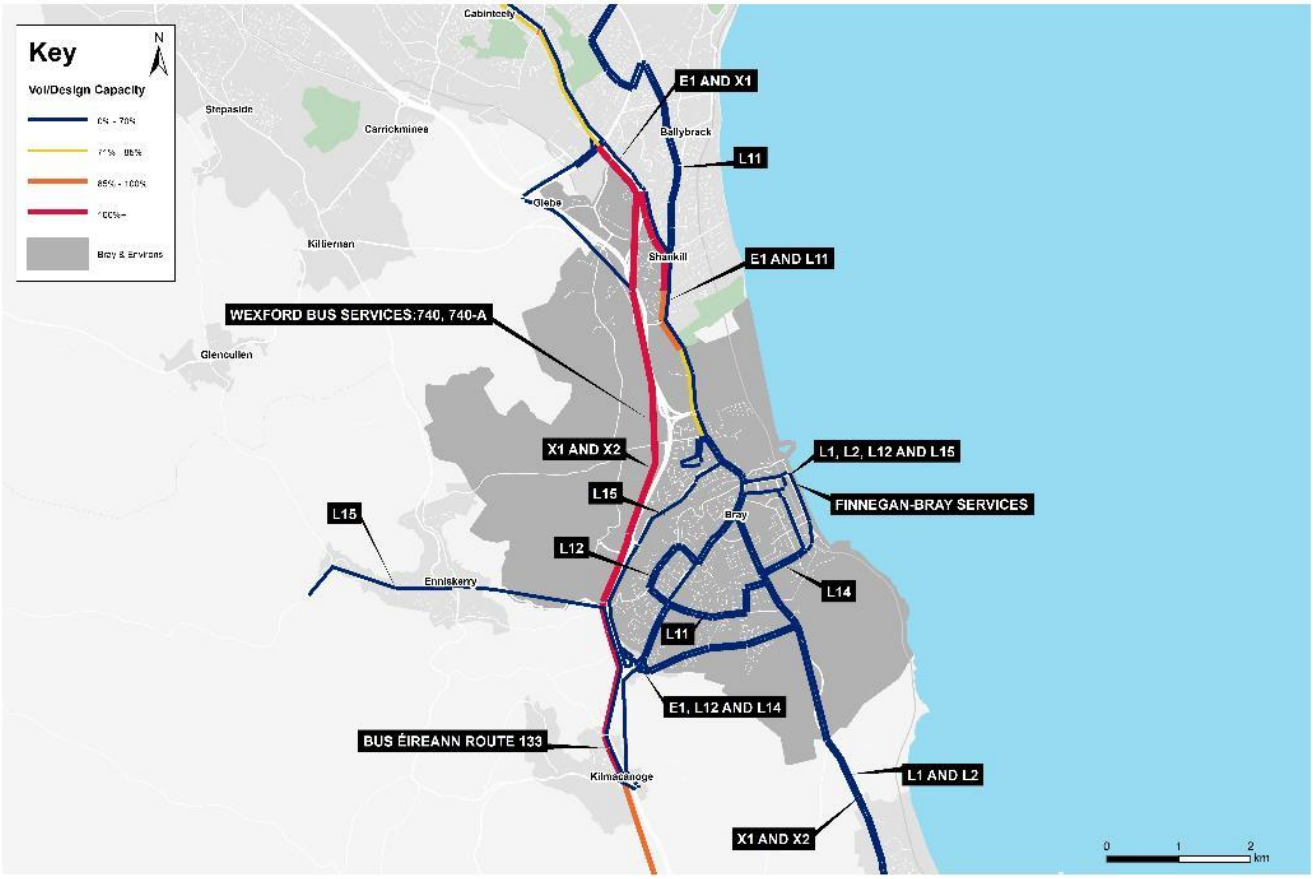


Figure 4-16: Volume over Design Capacity of Bus Routes *(© OpenStreetMap contributors)*

4.3.5 Trip length distribution

Data on the distribution of trip lengths for the Bray and Environs study area has been extracted from the model for the 2016 and 2042 forecast year. It is split by mode and is presented within Figure 4-17 to Figure 4-20.

Overall, the data shows:

- Car – Increase in short distance car trips between 2016 and 2042. Over 50% less than 6km;
- Walking – Many walking trips are short, with approximately 28% of walking trips less than 2km in distance.
- Cycling – Over 50% of cycling trips are less than 6km in distance, with a slight decrease in trips under 3km and slight increase in trips from 3-5km from 2016 to 2040.
- Public transport – There is expected to be a large increase in the number of trips made by public transport for journeys of approximately 23-29km from 2016 to 2040.

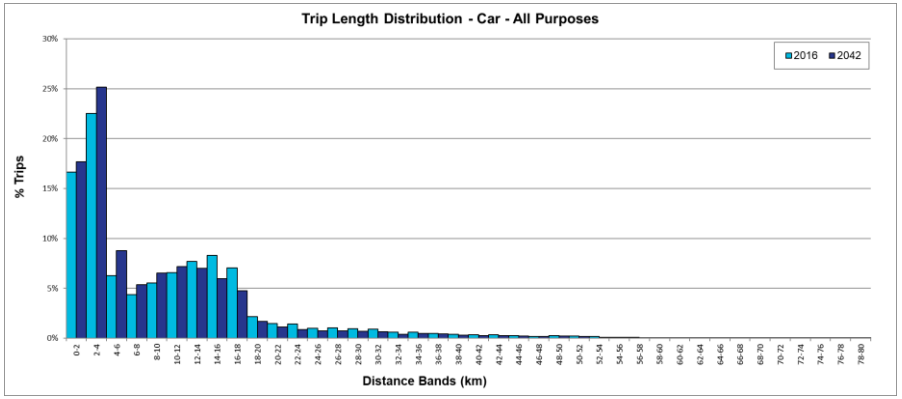


Figure 4-17 Car

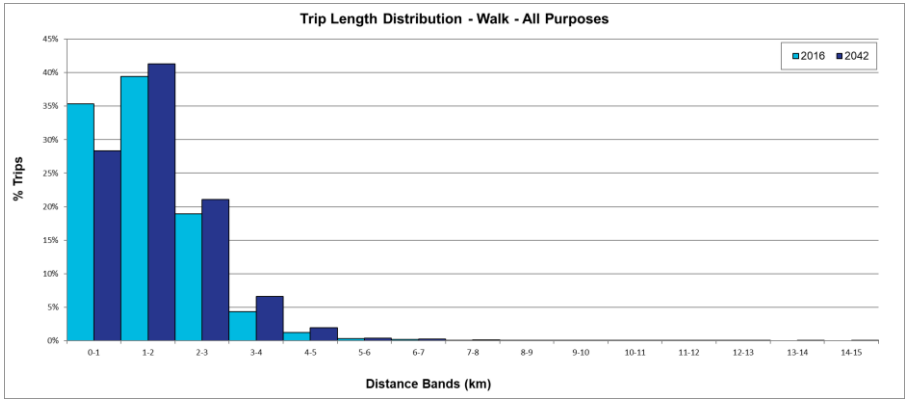


Figure 4-18 Walk

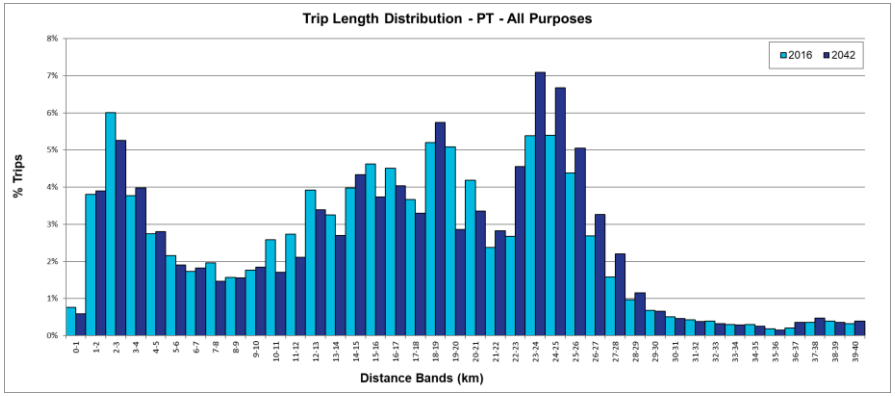


Figure 4-19 Public transport

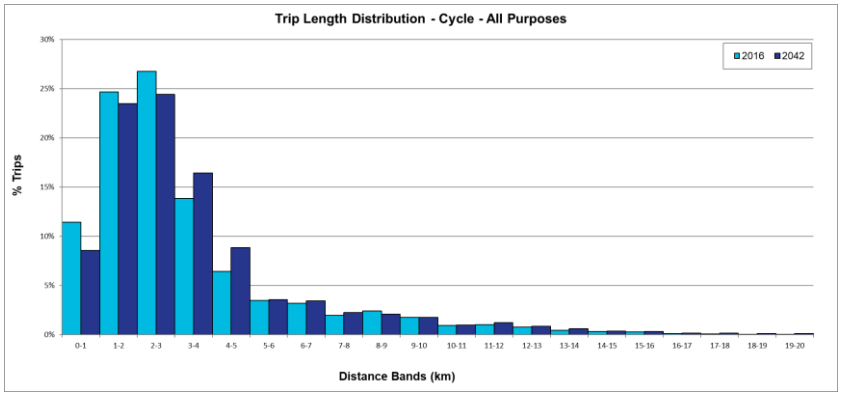


Figure 4-20 Cycle

4.3.6 Journey time by mode

Journey time data, disaggregated by sectors, has also been extracted from the model for car, public transport, cycling and walking.

Overall, the data indicates that public transport trips experience significantly higher journey times compared to car within the Bray and Environs study area. Public transport internal trips within the North-East district result in a smaller journey time than car. Also, public transport trips from North-East district to some areas of the Town centre district (sector 51) and the Southern district (Kilmacanogue: sectors 84 & 65) appear with smaller journey times, similarly for cycling for Southern area, but the difference is not significant compared to car. That is mainly due to the usage of the DART rail line (Bray station) and bus lines: E1, L11, L12 and L14.

The reason of car being the fastest travel option is the existing level of public transport services and lack of bus priority. Car is the preferred mode of transport for travelling in the Bray and Environs area, but this potentially generates an opportunity to improve public transport services by providing more services across the study area i.e. introducing new services or changing frequency of existing ones and providing infrastructure which reduces delay to services.

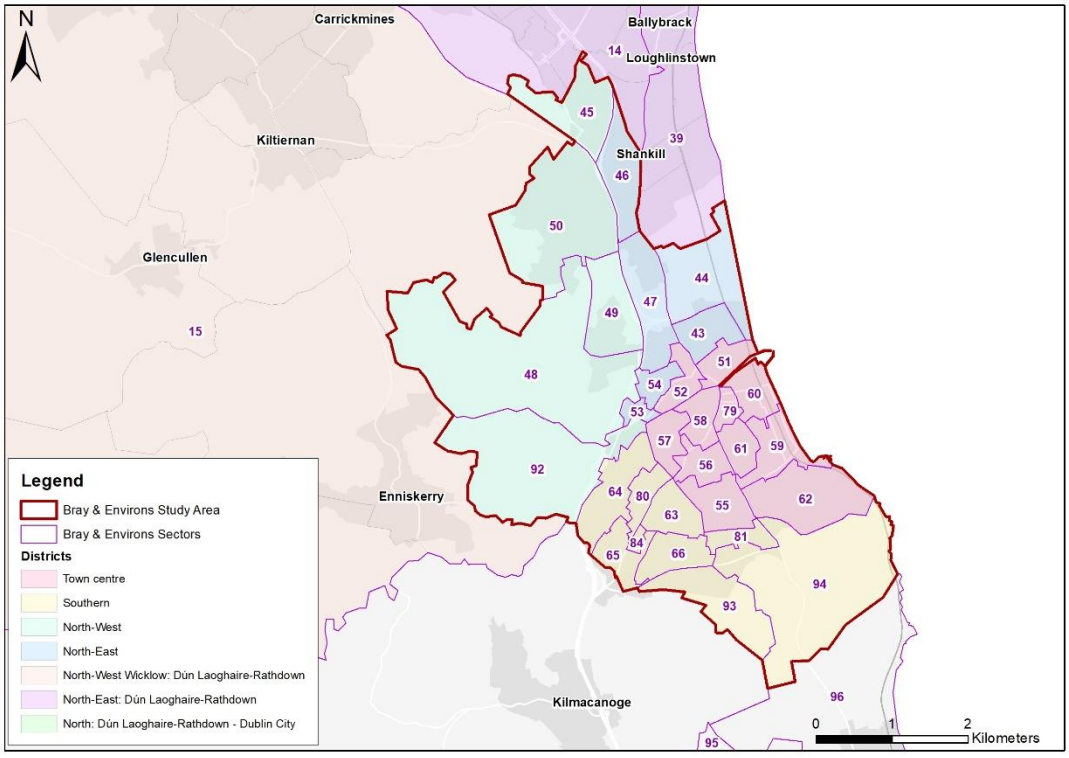


Figure 4-21: Bray & Environs Sectors and Districts *(© OpenStreetMap contributors)*

4.3.7 Bus speeds

Figure 4-22 illustrates the bus speeds along each of the routes within the Bray and Environs study area during the AM peak. Bus speeds are very low on the main links connecting Bray town centre with Kilmacanogue, which implies potential delays on bus services, and possibly a congested network due to high levels of car traffic, resulting in potential queues. The increased journey times resulting from the congested network reduces the attractiveness of bus services and the mode choice available.

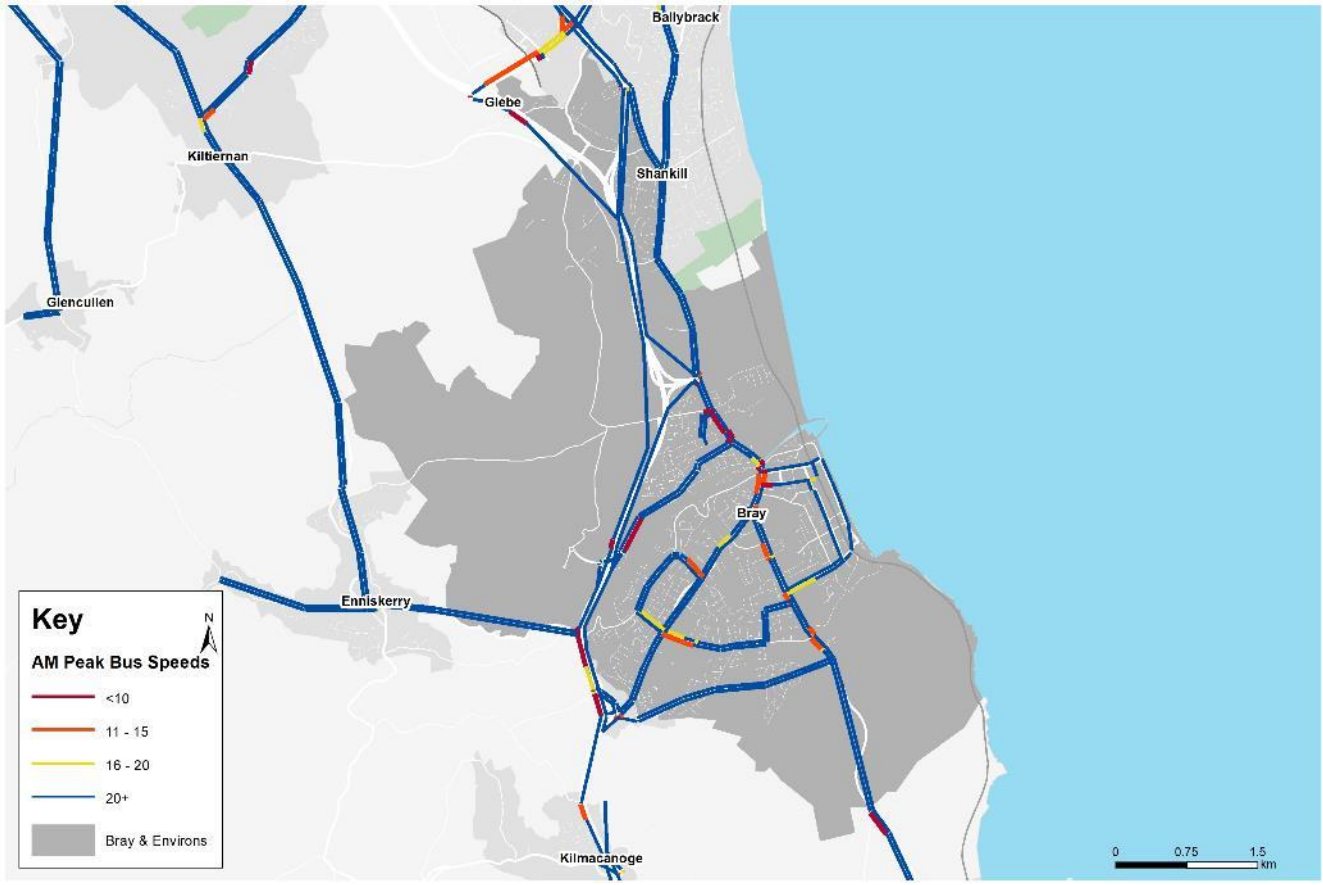


Figure 4-22: Bus speeds in the AM peak *(© OpenStreetMap contributors)*

4.4 Mode shift analysis

The previous section has considered the estimated travel demand and network performance in 2042 based on the output ERM data. However, as well as the public transport network needing to accommodate this public transport demand in 2042, there is also a need to cater for and encourage a mode shift from private car to sustainable modes such as walking, cycling and public transport. This section considers the demand impact of different levels of mode shift for key movement corridors through the study area.

4.4.1 Methodology

A process has been developed to simulate how a change in the degree of mode shift away from private car could increase the demand for public transport trips. The potential number of public transport trips from the shift can then be used to indicate the level of public transport improvements which would be needed to facilitate this mode shift. A summary of the methodology including flow chart is included in Appendix C.

This process has been undertaken for some key movements across a corridor passing through Bray and Environs study area towards the North i.e. Dublin city. The corridor was identified by considering key origins and destinations using the data discussed in section 4.3.2 and 4.3.3. Model sectors have been grouped into districts based on similar demographic characteristics as shown in Figure 4-23.

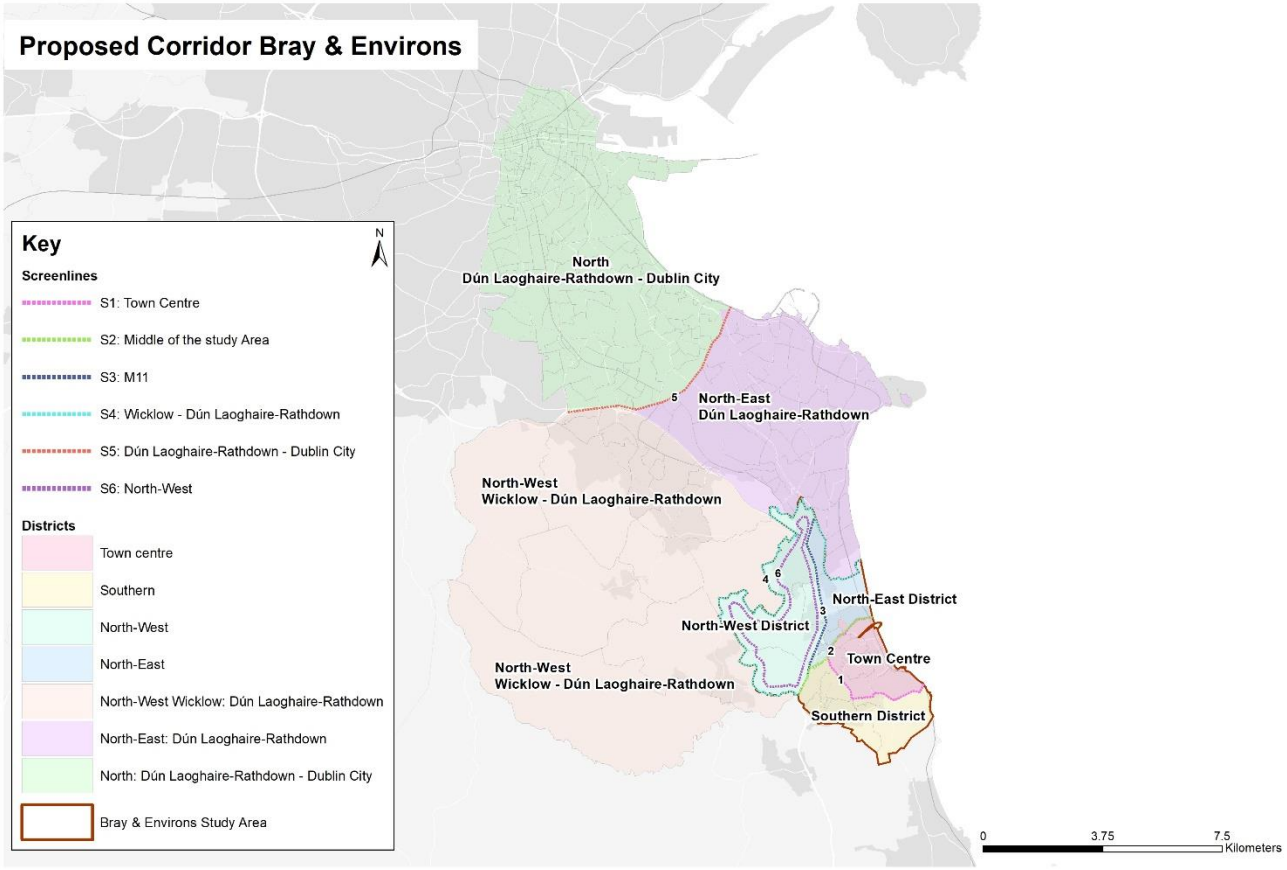


Figure 4-23: Proposed Corridor Bray and Environs: Screenlines and Districts (© OpenStreetMap contributors)

The mode share from the 2042 model and the development from the 2040 planning sheet have been combined to provide a baseline number of trips between each pair of districts for car, public transport, cycle and walk. For a specified percentage car mode shift, the process estimates how many of the car trips could become walk, cycle or public transport trips.

The distance between each pair of districts has been calculated by estimating the crow fly distance between the centroids of each district. This provides a proxy for the mode shift to be based on distance, as shorter trips are more likely to become walking trips and longer trips are more likely to become public transport trips. The distances have been divided into three bands based on the trip length distribution information. Each sector-to-sector movement is then allocated one distance band.

For each band, the shifted car trips have been converted to another mode, using the proportions in Table 4-2.

Table 4-2: Mode Splits by Distance Band – AM

Distance band (km)	Walk	Cycle	Public transport
0-2.3	71.1%	6.5%	22.3%
2.3-4.2	42.1%	10.6%	47.4%
4.2+	14.7%	7.5%	77.8%

Therefore, for all the captured car trips which have a trip length longer than 4.2km, 77.8% of them are converted to a public transport trip as a consequence of the process.

4.4.2 Results

The number of public transport trips for different levels of mode shift have then been calculated for all the districts in Figure 4-21 and summarised in Table 4-3.

Table 4-3: Car Mode Shift – all districts, AM peak

Car Mode Shift %	Existing PT demand	Shifted PT demand	Total PT demand after the mode shift
0%	69,239	0	69,239
25%	69,239	15,420	84,665
50%	69,239	30,841	100,075

It should be noted that this mode share has been calculated for the corridor using the demand data output from the model run and is therefore underpinned by the same assumptions. Car mode shift would be easier to be achieved for areas closer to Bray town, compared to more rural areas where mode shift away from car is likely to be more difficult to achieve.

To consider public transport capacity on existing services, movements across six screenlines have been analysed in more detail. A screenline is an imaginary line which enables movements that cross the line to be captured. The six screenlines, shown in Figure 4-23, have been chosen to capture radial movements into the city centre via M/N11 towards to Dublin city following the DART rail line:

- Screenline 1 – Town Centre
- Screenline 2 – Middle of the Study Area
- Screenline 3 – East of M/N11
- Screenline 4 – Wicklow - Dun Laoghaire-Rathdown
- Screenline 5 – Dun Laoghaire-Rathdown - Dublin City
- Screenline 6 – North West District (West of M/N11)

Movements between districts that cross each of the screenlines have been extracted for the analysis for the whole area, with the results provided in Table 4-4.

Table 4-4: Car mode shift by screenline (AM peak)

Screenlines	Car mode shift %	Northbound/Westbound/Outbound				Southbound/Eastbound/Inbound			
		Car Demand	Existing PT	Shifted PT	Total PT	Car Demand	Existing PT	Shifted PT	Total PT
Screenline 1 - Town Centre	0%	4,753	2,044	0	2,044	2,197	681	0	681
	25%		2,044	644	2,688		681	278	959
	50%		2,044	1,288	3,333		681	556	1,237
Screenline 2 - Middle of the Study Area	0%	5,861	2,768	0	2,768	2,129	839	0	839
	25%		2,768	1,027	3,795		839	479	1,318
	50%		2,768	2,054	4,822		839	959	1,798
Screenline 3 - M11	0%	7,893	3,941	0	3,941	4,260	1,131	0	1,131
	25%		3,941	1,435	5,376		1,131	748	1,879
	50%		3,941	2,869	6,811		1,131	1,496	2,627

Screenlines	Car mode shift %	Northbound/Westbound/Outbound				Southbound/Eastbound/Inbound			
		Car Demand	Existing PT	Shifted PT	Total PT	Car Demand	Existing PT	Shifted PT	Total PT
Screenline 4 - Wicklow - Dun Laoghaire-Rathdown	0%	9,080	4,545	0	4,545	4,421	1,306	0	1,306
	25%		4,545	1,751	6,296		1,306	1,025	2,331
	50%		4,545	3,502	8,047		1,306	2,050	3,356
Screenline 5 - Dun Laoghaire-Rathdown - Dublin City	0%	18,239	21,476	0	21,476	7,134	3,235	0	3,235
	25%		21,476	3,547	25,023		3,235	1,521	4,756
	50%		21,476	7,094	28,570		3,235	3,042	6,277
Screenline 6 – North West District (West of M/N11)	0%	3,067	791	0	791	456	362	0	362
	25%		791	497	1,288		362	457	819
	50%		791	993	1,784		362	915	1,277

Assuming a car mode shift of 50%, provision for approximately 8,000 public transport trips would need to be catered for in northbound demand from Bray and Environs to north of the study area (screenline 4). Screenlines 3 and 6 suggest that around 6,800 public transport trips would need to be catered for from the east of the study area and 1,800 from the west, respectively.

The bus services that cross each of the screenlines are displayed within Appendix D. The E1 service is the only route to cross screenlines 4 and 5.

The information in this section outlines high-level, indicative results to inform option development, by providing order of magnitude changes in demand resulting from an assumed mode shift for one particular key movement across the study area. Due to the number of assumptions underpinning the transport model run used for this initial study, it is not possible to provide exact figures for the demand relating to further mode shift without rerunning the model. The Transport Strategy development process tested options and mode shift assumptions within the model, based on the findings of this study, to understand the implications on public transport.

4.5 Summary

4.5.1 Issues

A large transformational change is expected in the Bray and Environs study area to 2040 and beyond. This includes significant growth in population (up to 68% increase) and employment (up to 47% increase). This will result in land use changes, with the west of the study area becoming urbanised as part of residential, employment and educational developments. All of these changes are expected to put pressure on the existing transport networks within the study area, with existing public transport infrastructure unable to accommodate such substantial changes in demand.

One of the key issues within the study area is the capacity and availability of bus services. Modelling shows that bus lines between Shankill and Bray are almost overcapacity by 2042. In addition, sections of the DART rail line southbound between Bray and Dublin appear to have capacity issues in 2042. The existing public transport infrastructure is not expected to have the capacity to deal with this increase in demand.

Additionally, modelling suggests that by 2042, many sections of the N11 will have issues with congestion. This is likely to be exacerbated by the high level of car use expected from within the new developments to the west of the N11.

4.5.2 Constraints

Cycle mode share within the study area is low, with limited cycle infrastructure between Bray and the wider Environs.

There are barriers to travelling from Fassaroe to more northern areas such as Shankill and Rathmichael without the use of private vehicles. Cycle infrastructure between these locations is very limited and there are no direct bus services on the BusConnects Network between these locations.

Car journeys within the study area are predominantly undertaken via the N/M11, R761 and R767. The N/M11 currently experiences significant over-capacity periods which results in congestion and increased journey times.

The mode share for public transport within sections of the study area is low, for example between 0%-10% within western areas and from 11% to 18% within the south of the Bray and Environs study area.

4.5.3 Opportunities

The main opportunities for the Bray and Environs study area are in providing increased frequency, capacity and accessibility of public transport to encourage people away from using the private car. Upgrading existing public transport services, in combination with provision of new bus or active mode schemes, would provide an opportunity to enable more modal shift towards public transport from private vehicle usage.

The M11 motorway is currently the primary way of travelling to north or south and within the study area, but it is heavily congested at some locations within the Bray and Environs area. The level of current public transport provision does not encourage mode shift.

Due to the increase in developments, particularly within the north west of the study area, there is the opportunity to improve the mode share of active and public transport to and from these areas. Improving cycle infrastructure and facilities will help to increase cycle mode share and therefore help to decrease the number of short trips made by car. Cycling levels are very low in the Bray and Environs area. Providing interchange facilities at key transport hubs will facilitate modal shift away from car to active modes and public transport for longer trips. There is the potential for walking trips to be promoted, particularly within the south of the study area.

5. Options Development and Assessment

5.1 Introduction

This section outlines the approach to option generation and development for the Bray and Environs study area. Due to the level of transformational change proposed, not just by 2040 but beyond, it is recognised that the capacity of existing public transport infrastructure is unable to cope with substantial changes in demand within the study area. Further significant developments proposed within the study area, such as Woodbrook and Fassaroe, will also have an impact on the capacity of existing public transport infrastructure.

5.2 Strategy objectives

To guide the identification of options for the Bray and Environs study area, the NTA has outlined a set of overarching themes, outcomes and objectives for the Transport Strategy for the GDA; these are outlined in Table 5-1.

Table 5-1: GDA Transport Strategy theme, outcome and objectives

Strategy theme	Strategy outcome	Strategy objective
Environment	An enhanced natural and built environment	To meet our environmental obligations by transitioning to a clean, low emission transport system through reducing car dependency and increasing walking, cycling and public transport use.
Community	Connected communities and better quality of life	To improve health and quality of life of our society by improving connectivity between people and places, delivering safe and integrated transport options, and increasing opportunities for walking and cycling.
Economy	A strong sustainable economy	Supporting economic activity and growth by improving the opportunity for people to travel for work or business where and when they need to and facilitating the efficient movement of goods.
Accessibility	An inclusive transport system	To deliver a high quality, equitable and accessible transport system, which caters for the needs of all members of society.

5.3 Option generation and development

To identify options to serve travel demand in the study area in 2042, the following steps have been completed:

- A review of relevant planning and transport policies and strategies has provided the overall context for options, and identified current thinking in relation to the future transport network;
- A baseline analysis of the existing transport network identified existing network issues and opportunities;
- An analysis of planning and travel data from the 2040 Planning Sheet and a Do-Minimum run of the Eastern Regional Model for 2042 provided insights into future travel demand and network capacity constraints; and
- A review of the GDA strategy objectives against which all options should be measured.

The flow diagram outlined in

Figure 5-1 summarises this option generation process. Two main categories of options were considered: those to enhance existing infrastructure and services and/or improve access to existing infrastructure and services; and new sustainable transport (public transport and active mode) infrastructure and services which could supplement the existing network to deliver a more holistic sustainable transport offering in the Bray and Environs study area.

Where enhancements and interventions have been identified for existing infrastructure and services, options previously proposed within existing local and regional strategies have been considered. Additionally, new options have been proposed for existing infrastructure where further enhancements could be beneficial to the wider accessibility of the study area, particularly due to the level of change proposed.

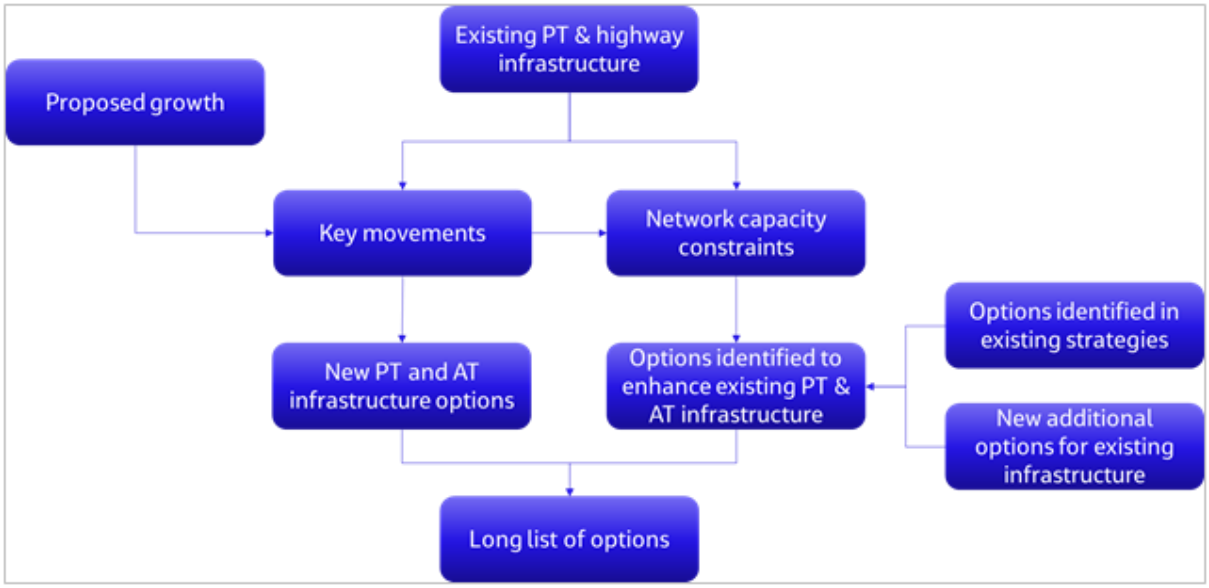


Figure 5-1: Option generation process flow diagram

The above steps resulted in the preparation of an options long-list for key transport patterns, as well as supplementary options to provide a more holistic sustainable transport network within the Bray and Environs study area, as detailed in Table 5-2. The options long list is discussed in more detail below.

Table 5-2: Long list of options

Ref.	Type of option (REF)	Description
Based on existing strategy or proposal		
1	Light Rail	Metro South to Sandyford
2	Light Rail	Metro South to Cherrywood
3	Light Rail	Luas Green Line extension to Bray town centre
4	P&R	Park & Rail facilities and associated DART station at Woodbrook
5	Bus	Bray Core Bus Corridor Dublin Rd/M11-N11
6	Bus	Busway from Fassaroe to Old Connaught over the County Brook at Ballyman Glen (which also facilitates walking and cycling)
7	Bus	Support the delivery of a bus service from Sandyford via Rathmichael and Old Connaught to Bray Dart Station until the Luas Green Line extension to Bray is suitably advanced.
8	Road	N11/M11 Junction 4 to 14 improvement scheme
9	Cycle	Improvements listed within Greater Dublin Area Cycle Network
New proposals		
10	Light Rail	Luas Green Line extension to west of N11
11	Bus	Increase bus service capacity along R119 through Shankill and north of Bray
12	Bus	Bus service to developments west of N11

5.4 Justification of options

5.4.1 Option 1 - Metro South to Sandyford

This option would involve the upgrade of Luas Green Line to Metro Standard, allowing for significant capacity enhancements and direct access via the Metro system to critical destinations such as Dublin Airport, Dublin City University and the City Centre. The total public transport demand (AM) for screenline 5 in Table 4-4 is 27,860 (northbound) and 5,973 (southbound) which suggests that a metro improvement may be justified in this area, in addition to existing public transport services.

Figure 5-2: Proposed Metro South route to Sandyford and Cherrywood *(© OpenStreetMap contributors)*

5.4.2 Option 2 - Metro South to Cherrywood

This option would involve the upgrade of Luas Green Line to Metro Standard, allowing for significant capacity enhancements and direct access via the Metro system to critical destinations such as Dublin Airport, Dublin City University, the City Centre and Sandyford. This has the potential to increase the mode share of public transport from the northern sections of the study area. The total public transport demand (AM) for screenline 5 in Table 4-4 is 27,860 (northbound) and 5,973 (southbound) which suggests that a Metro improvement may be justified in this area in addition to existing public transport services. Figure 5-2 shows the location of the proposed route to Cherrywood.

5.4.3 Option 3 and Option 4 - Luas Green Line extension to Bray town centre or west of the N11

These two options would involve the extension of the Luas Green Line from Cherrywood to either Bray town centre or alternatively to developments west of the M/N11.

An extended Luas line would provide a high capacity link between areas of high population (either Bray town centre or developments to the west of the M/N11) and key employment areas such as Cherrywood and allow interchange with Metro services. This could increase the public transport mode share from these areas, particularly the new developments west of the N11 which do not have access to rail services and are predicted to have a high level of car mode share by 2042. It would also cater for some of the demand from these areas travelling north towards Dublin.

The total public transport demand (AM) for screenline 6 in Table 4-4 is 1,685 (outbound) and 1,185 (inbound), and for screenline 2 (AM) these figures are 4,616 (northbound) and 1,702 (southbound).

Figure 5-3: Potential Luas Green Line extension routes *(© OpenStreetMap contributors)*

5.4.4 Option 5 - Park & Rail facilities and associated DART station at Woodbrook

This option would provide access to the rail and DART services for individuals beyond walking distance from a rail station, reducing the length of journeys made by car.

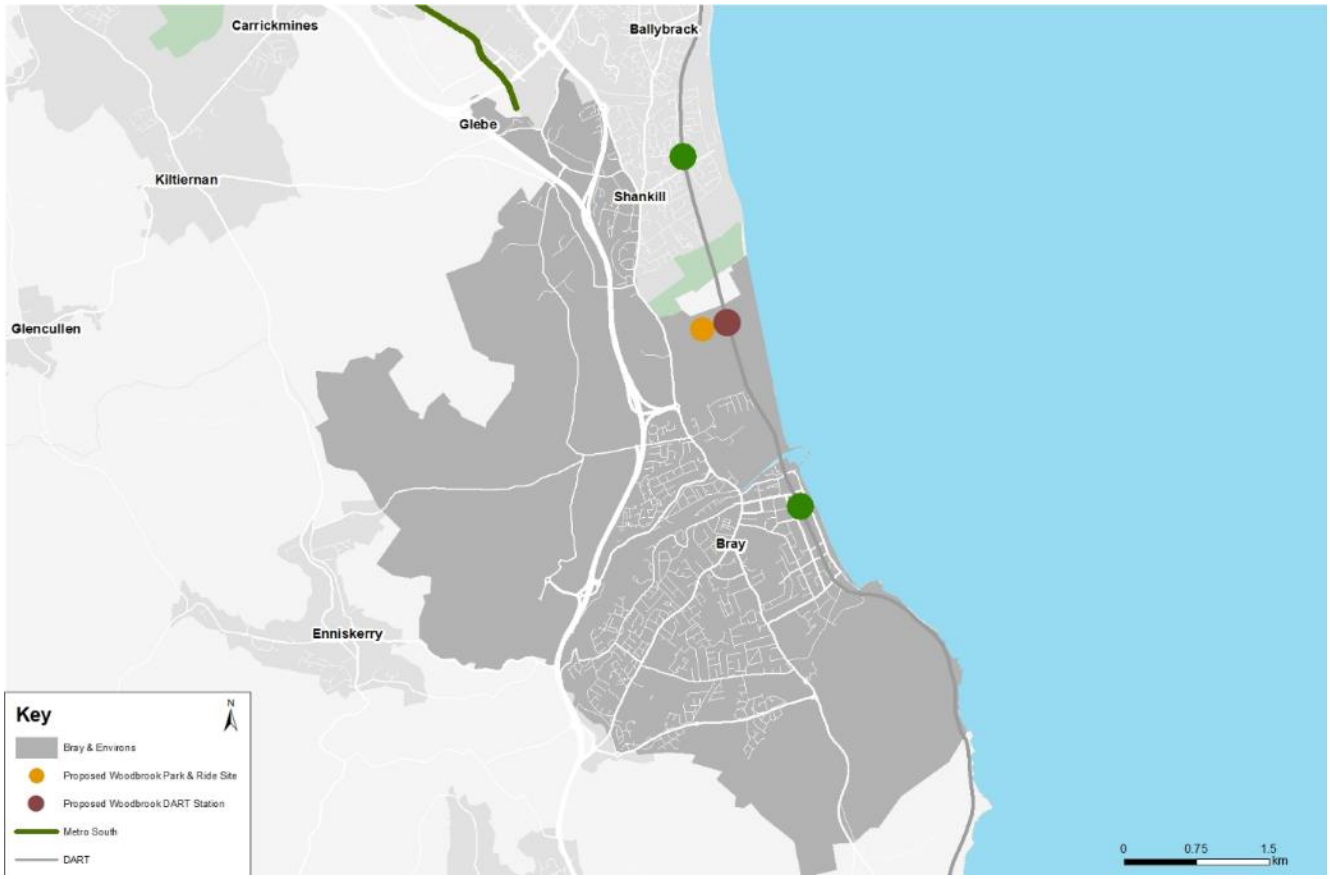


Figure 5-4: Proposed site for Woodbrook P&R *(© OpenStreetMap contributors)*

5.4.5 Option 6 - Bray Core Bus Corridor Dublin Rd/M11-N11

This option would involve the implementation of bus lanes, signal-controlled priority, segregated cycle tracks and new pedestrian crossings and footpaths.

This option would reduce journey times and improve reliability for bus services, increasing the attractiveness of this mode compared to the private car. It caters for some of the expected demand from within Bray and Environs, to areas north of the study area. This option increases accessibility to key destinations such as Dublin City Centre and Bray town centre.

However, this route would not serve developments to the west of the N/M11, which have shown a high level of outbound demand from the study area and fewer public transport options compared to other sections of Bray and Environs.

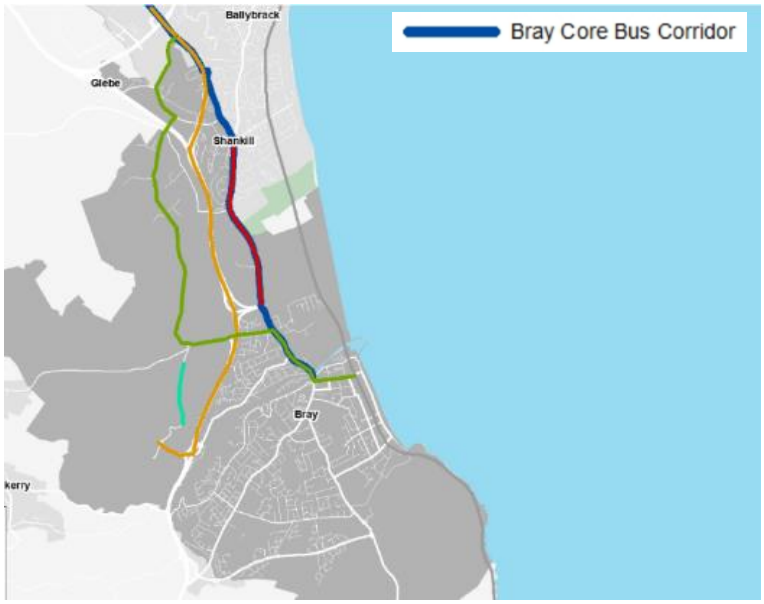


Figure 5-5: Bray core bus corridor *(© OpenStreetMap contributors)*

5.4.6 Option 7 - Busway from Fassaroe to Old Connaught over the County Brook at Ballyman Glen (which also facilitates walking and cycling)

This option would involve the implementation of a fully segregated dedicated bus link with pedestrian and cycle facilities running adjacent.

There is expected to be high levels of population and employment growth within the development areas to the west of the N11 by 2040. This option would improve bus journey times and reliability between these developments, increasing the attractiveness of this mode when compared to the private car.

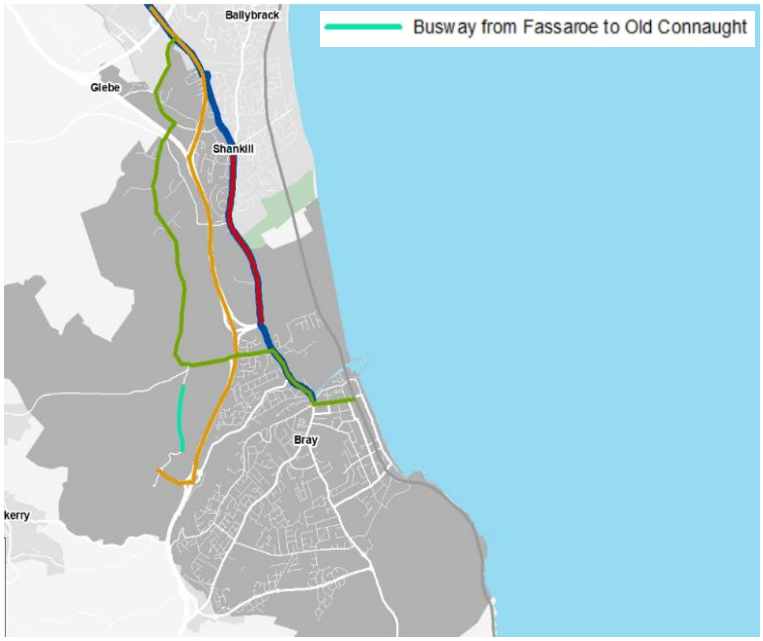


Figure 5-6: Location of proposed busway (© OpenStreetMap contributors)

5.4.7 Option 8 - Support the delivery of a bus service from Sandyford via Rathmichael and Old Connaught to Bray DART Station until the Luas Green Line extension to Bray is suitably advanced.

This option would be in place until the LUAS Green line extension to Bray was suitably advanced. This is a short-term solution to increase the range of public transport modes available within the study as an alternative to the car. It would increase accessibility to important destinations such as Bray town centre, Sandyford and could provide opportunities to interchange with other modes including the rail and Luas networks.

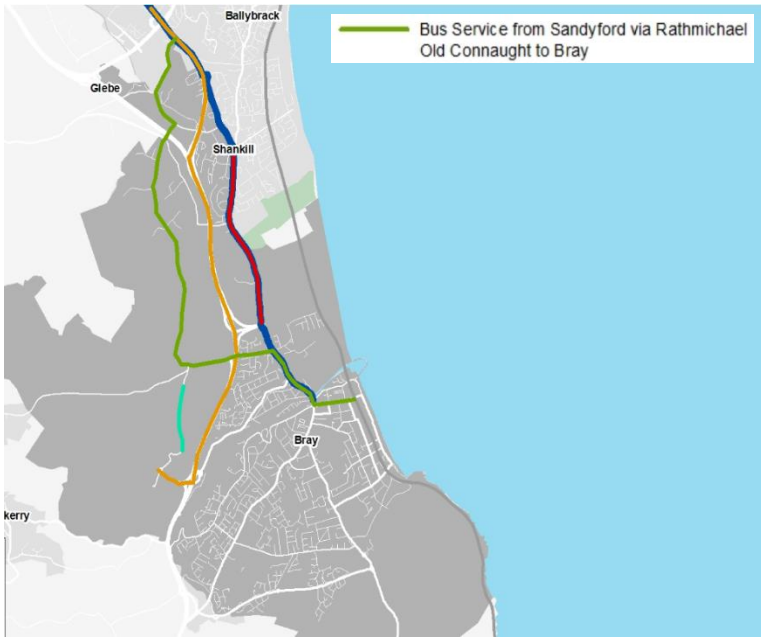


Figure 5-7: Approximate route of bus service from Sandyford to Bray *(© OpenStreetMap contributors)*

5.4.8 Option 9 - N11/M11 Junction 4 to 14 improvement scheme

This option would seek to improve junction capacity on the N/M11, including junctions 4-8 which area located within the Bray and Environs study area. Figure 5-8 identifies locations along the N/M11 which are expected to have severe congestion by 2042. This option would allow for greater accommodation of future growth and reduced congestion along this corridor and improve journey times for all highway modes including bus services. However, by reducing congestion on the highway network, it is likely that a greater number of people will be encouraged to travel by private vehicle. This is likely to result in additional air pollution and congestion as the number of vehicles increases to fill the available road capacity.

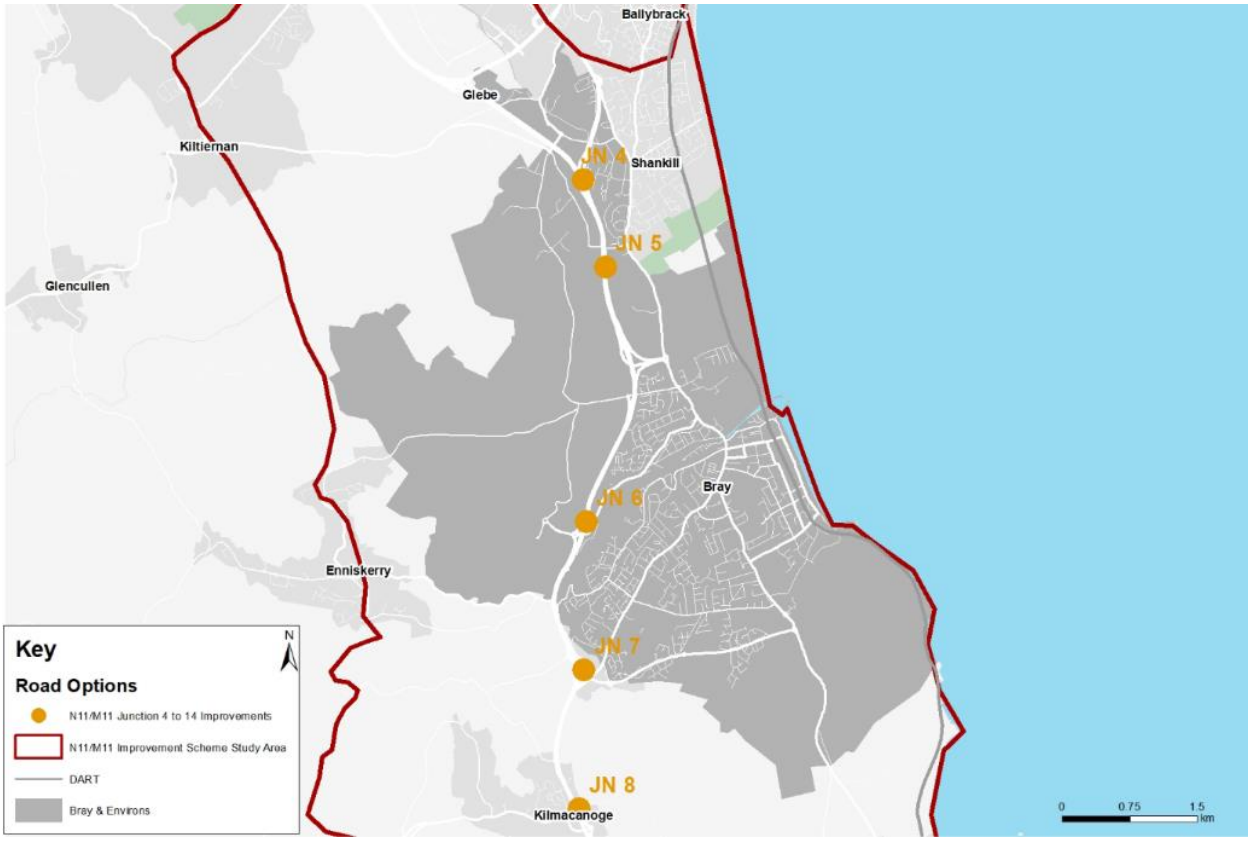


Figure 5-8: Junctions included within the N11/M11 Junction improvement scheme *(© OpenStreetMap contributors)*

5.4.9 Option 10 - Improvements listed within Greater Dublin Area Cycle Network

This option aims to make cycling a more attractive mode by improving accessibility across the study area through provision of a coherent and direct network. It would connect missing links between existing routes and key destinations within urban areas as well as providing new links between settlements within rural areas. Mode share is currently low for cycle trips and this option seeks to facilitate mode shift away from private vehicles.

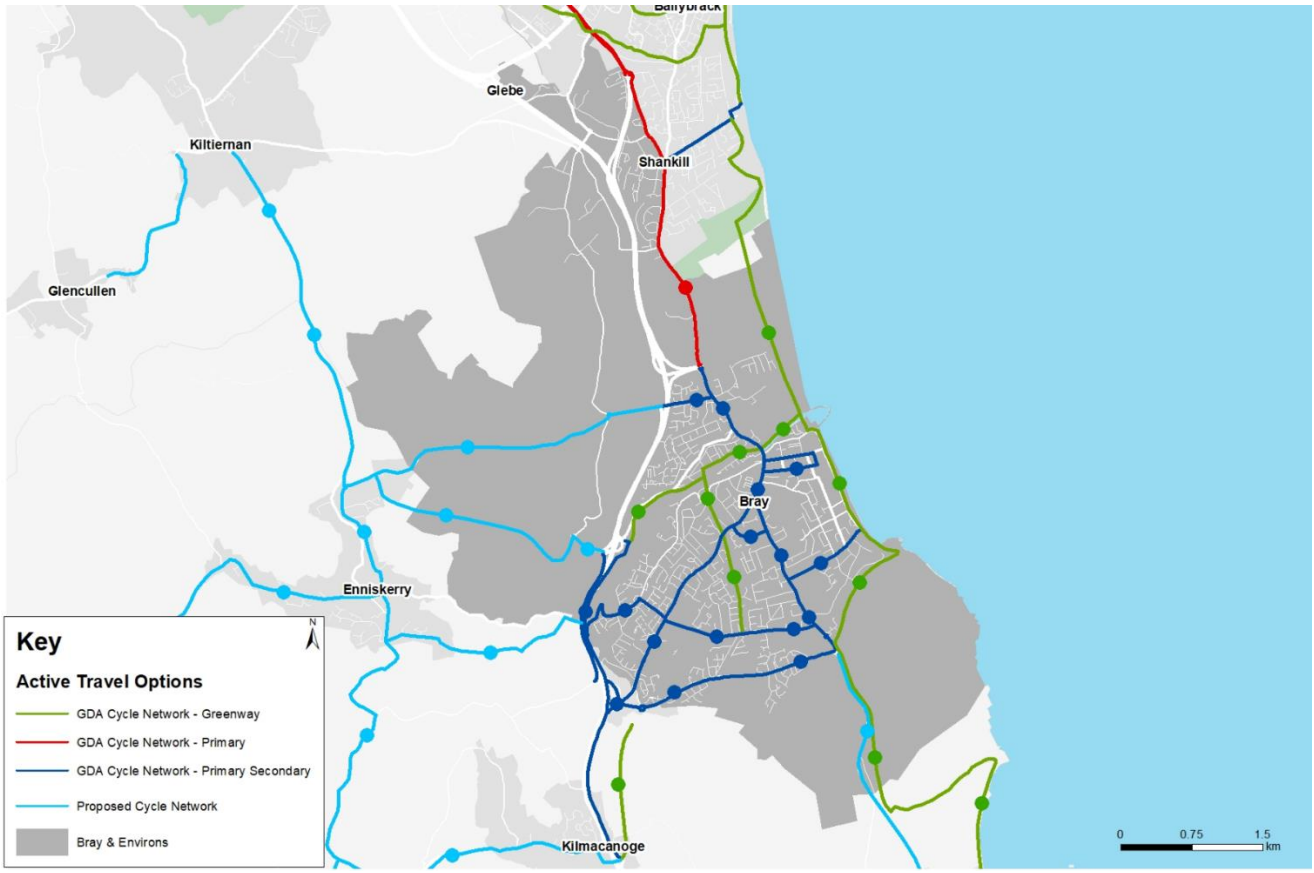


Figure 5-9: Potential improvements included as part of the GDA Cycle Network *(© OpenStreetMap contributors)*

5.4.10 Option 11 - Increase bus service capacity along R119 through Shankill and north of Bray

Modelling has indicated that there will be a lack of capacity on bus services along the R119 through Shankill and the area north of Bray by 2042 (see Figure 5-10). The route is expected to be operating at 71% to 100% volume/design capacity by 2042. At screenline 2 the shifted public transport demand (AM) is 2,031 (northbound) and 945 (southbound), which could be accommodated by a bus service. This option would seek to address these issues by providing additional capacity for services along this route, catering for the additional growth in demand.

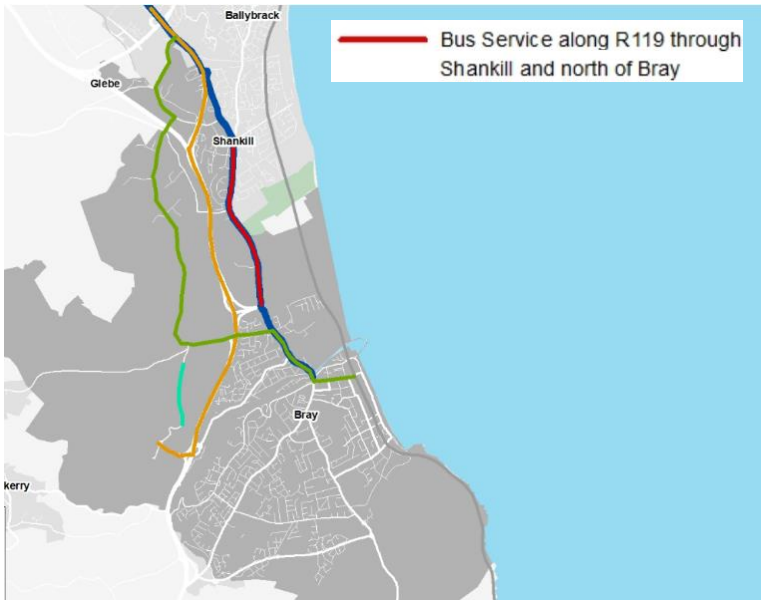


Figure 5-10: Bus services along R119 through Shankill and north of Bray *(© OpenStreetMap contributors)*

5.4.11 Option 12 - Bus service to developments west of N11

There are significant levels of housing and employment growth within the developments to the west of the N/M11, with a large proportion of the mode share from these areas accounted for by cars in 2042 (see Figure 4-19). The provision of additional bus services to the development site would increase the public transport options available to residents, reducing the reliance on private vehicles.

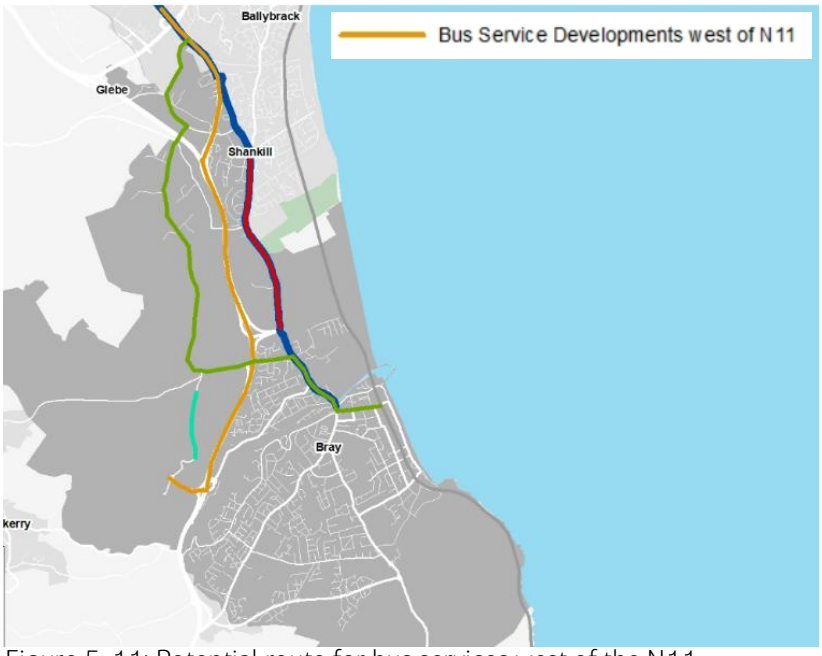


Figure 5-11: Potential route for bus services west of the N11

5.5 Options taken forward for further consideration

Following the above justification analysis, all options within Table 5-2 have been taken forward for further MCA consideration. The exception to this is the P&R option at Woodbrook and GDA cycle schemes option, which have been progressed past the MCA stage as they provide an alternative transport mode option for consideration.

5.5.1 Public transport options

Public transport options have been split into three categories, depending on the function they serve and areas of the study area which they provide accessibility to. These categories include:

- Access north of the study area;
- Access to developments west of M/N11; and
- Access between Dublin and south of study area.

Corridor demand for the study area has been used to inform the identification of appropriate options to serve this corridor. Different public transport modes have theoretical capacity ranges, and so demand level viabilities, which have been used as the basis by which to short-list options to progress through to the assessment stage. The capacity range for each mode is based on UITP's 'Making the right mobility choices.' It should be noted that the capacity range for these modes have significant overlaps and are approximate.

Table 5-3 and Figure 5-12 presents the approximate range in capacity for each public transport mode.

Table 5-3: Public transport modes: capacity range – passengers/direction/hour

Mode		Min	Max
1	Conventional Bus	0	2,500
2	Bus with priority infrastructure	2,400	4,000
3	Light rail	3,600	7,000
4	Heavy Rail	5,000	50,000
5	Metro	7,500	25,000

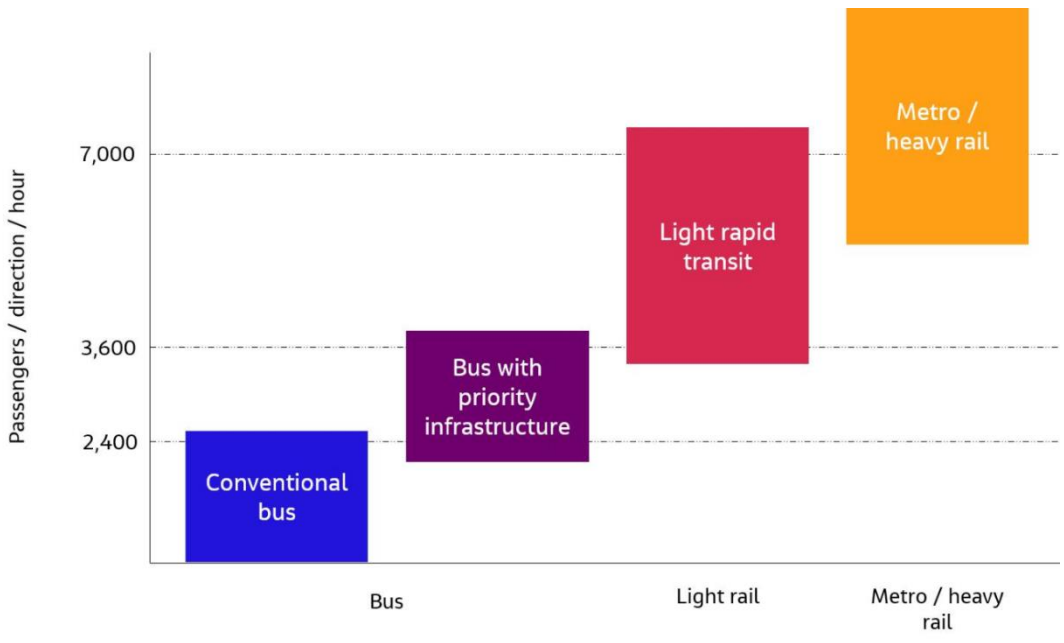


Figure 5-12: Public transport modes – capacity range

In order to undertake the initial sift of options to progress through to the assessment, the corridor demand has been compared against the mode capacity ranges above for Metro, bus and light rail. The corridor demand 'total' figures used for public transport have been obtained from Table 4-4. For each direction, this has been obtained from the most relevant screenline that has the highest level of demand when a 50% car mode shift is applied.

Table 5-4 presents the public transport options long list alongside the initial assessment results for each option.

Table 5-4: Public transport long list capacity

AM Demand (per hour) – PT total: 7-10am		Option	Min Capacity (per hr)	Max Capacity (per hr)	Initial Assessment	Reason
SB	NB					
Access north of study area: 'Screenline 5'						
6,277	28,570	Metro South to Sandyford	7,500	25,000	Progress	Provides additional capacity
		Metro South to Cherrywood	7,500	25,000	Progress	Provides additional capacity
Access to development west of M/N11: 'Screenline 6'						
1,277	1,784	Luas extension to west of N11	3,600	7,000	Discount	Insufficient demand
		Bus service to west of N11	0	2,500	Progress	Sufficient demand
		Busway from Fassaroe	2,400	4,000	Progress	Provides greater accessibility
Access between Dublin and south of study area: 'Screenline 2'						
1,798	4,822	Luas line to Bray town	3,600	7,000	Progress	Sufficient capacity
		Bray Core Bus Corridor	2,400	4,000	Progress	Provides greater accessibility
		Temporary bus service from Sandyford to Bray	0	2,500	Progress	Provides greater accessibility
		Increase bus capacity on R119	0	2,500	Progress	Provides greater accessibility

As a result of the initial assessment, all of the public transport options being suggested within Table 5-4, except for the Luas line extension to west of N11, are being progressed to the Multi-criteria Analysis (MCA) stage. It should be noted that, in the preparation of the Transport Strategy, the NTA takes into account a much wider range of considerations and network issues when developing and assessing light rail options than has been considered here in examining the Bray and Environs area.

For access to the north of the study area, the total demand is high (28,570 northbound). A Metro service would have the capacity to accommodate the majority of this demand, supported by existing public transport services along this corridor.

Access to developments west of the M/N11 has lower demand (1,784 outbound). This level of demand does not justify a Luas extension to this location as capacity would far exceed demand for the service. Therefore, this option has been discounted. However, a more suitable transport option would be to introduce a bus service west of M/N11 and/or a busway from Fassaroe. These services have the capacity to cater for the demand to and from this location.

The demand for access from the south of the study area towards Dublin is lower (4,822 northbound). However, it is still within the capacity range of a Luas service to Bray town centre, so this option has been retained. In addition, there are bus service options providing access between Dublin and the south of the study area. These

bus options could accommodate some of the demand travelling from these areas, although they are unlikely to have the capacity to cater for all trips. However, these bus options have been retained as they provide a greater number of stops and would cater for trips with origins and destinations which are not served by the Luas extension. Therefore, the Luas and bus options could provide complementary services catering for trips to a wider range of destinations across the study area, which could not be accessed with the provision of a Luas line alone.

6. Option Assessment

6.1 Methodology

The approach to the assessment of options is guided by the 'Guidelines on a Common Appraisal Framework (CAF) for Transport Project and Programmes' (Department of Transport, Tourism and Sport). This requires all schemes to be appraised under the general themes of:

- Economy;
- Environment;
- Safety;
- Integration; and
- Accessibility / Social Inclusion.

Given the early nature of this study, a largely qualitative Multi Criteria Analysis (MCA) was considered an appropriate tool to guide the assessment of options. Building on the key themes of the CAF, a set of criteria which sit within these overarching themes have been developed to enable a more detailed assessment of options to be undertaken. These criteria are based on the Transport Strategy for the GDA objectives provided by the NTA and outlined in Table 6-1.

Table 6-1: Assessment criteria

Theme	Criteria
Economy	Represents good value for money
	Provides competitive journey times
	Provides capacity aligned with demand
	Provides resilience for the future (beyond 2040)
Environment	Provide integration of transport with the local built and natural environment
	Encourages mode shift away from the private car
Safety	Improves road safety
Integration	Provides integration with the existing and future proposed transport network
Accessibility and Inclusion	Enhances accessibility and inclusion

The options identified have been assessed relative to each other against the aforementioned criteria using the rating scale outlined in Table 6-2.

Table 6-2: Rating scale

Colour	Definition
	The option has significant advantages over other options
	The option has some advantages over other options
	The option is comparable to others
	The option has some disadvantages over other options
	The option has significant disadvantages over other options

6.2 Results

6.2.1 Access to north of study area

Table 6-3: MCA results for options providing access to north of study area

Criteria	Description	Metro South Sandyford	Metro South Cherrywood
Environment			
Decarbonisation	Supporting the decarbonisation of transport by encouraging mode shift away from private car.		
Environmental impact	Provides positive impact on the local built and natural environment e.g. landscape, air quality etc.		
Economy			
Sustainable Growth	Support sustainable development and facilitate growth to 2040 by providing capacity aligned with demand.		
Journey Times	Improves time it takes to undertake similar end to end journey.		
Value for Money	Potentially provides good value for money.		
Resilience	Provide resilience for the future (beyond 2040).		
Integration			
Integration	Provide integration with the existing and future proposed transport network.		
Accessibility			
Accessibility and inclusion	Improves accessibility to public transport services and enhances inclusion, catering for the needs of all members of society.		
Safety			
Road safety	Improves road safety.		
Health			
Physical activity	Increases physical activity.		

Metro South to Sandyford scores less well than the Metro South to Cherrywood option, predominantly because of its location further from the study area, therefore reducing its accessibility and benefits within Bray and Environs.

6.2.2 Access to developments west of M/N11

Table 6-4: MCA results for options providing access to west of M/N11

Criteria	Description	Busway from Fassaroe	Bus service to west of N11
Environment			
Decarbonisation	Supporting the decarbonisation of transport by encouraging mode shift away from private car.		
Environmental impact	Provides positive impact on the local built and natural environment e.g. landscape, air quality etc.		
Economy			
Sustainable Growth	Support sustainable development and facilitate growth to 2040 by providing capacity aligned with demand.		
Journey Times	Improves time it takes to undertake similar end to end journey.		
Value for Money	Potentially provides good value for money.		
Resilience	Provide resilience for the future (beyond 2040).		
Integration			
Integration	Provide integration with the existing and future proposed transport network.		
Accessibility			
Accessibility and inclusion	Improves accessibility to public transport services and enhances inclusion, catering for the needs of all members of society.		
Safety			
Road safety	Improves road safety.		
Health			
Physical activity	Increases physical activity.		

Generally, both options performed similarly across the MCA sub-categories. The busway from Fassaroe option performed slightly better as it would provide priority infrastructure for bus services, thereby reducing journey times, and additionally has a slightly higher capacity due to this priority infrastructure (see Table 5-4), therefore providing greater resilience for future demand.

6.2.3 Access between Dublin and south of the study area

Table 6-5: MCA results for options providing access between Dublin and the south of the study area.

Criteria	Description	Luas line to Bray town	Bray Core Bus Corridor	Temporary bus service from Sandyford to Bray	N11/M11 junction improvements	Increase bus capacity on R119
Environment						
Decarbonisation	Supporting the decarbonisation of transport by encouraging mode shift away from private car.					
Environmental impact	Provides positive impact on the local built and natural environment e.g. landscape, air quality etc.					
Economy						
Sustainable Growth	Support sustainable development and facilitate growth to 2040 by providing capacity aligned with demand.					
Journey Times	Improves time it takes to undertake similar end to end journey.					
Value for Money	Potentially provides good value for money.					
Resilience	Provide resilience for the future (beyond 2040).					
Integration						
Integration	Provide integration with the existing and future proposed transport network.					
Accessibility						
Accessibility and inclusion	Improves accessibility to public transport services and enhances inclusion, catering for the needs of all members of society.					
Safety						
Road safety	Improves road safety.					
Health						
Physical activity	Increases physical activity.					

N11/M11 junction improvements score poorly against other options on decarbonisation, environmental impacts and accessibility because it would encourage the use of private vehicles and does not accommodate individuals without access to a motor vehicle. However it is expected to improve road safety at these junctions.

The public transport options are expected to increase mode shift away from private vehicles, therefore providing decarbonisation and environmental benefits.

The Luas service is expected to support sustainable growth and resilience due to the higher capacity enabling it to cater for greater demand.

Temporary bus services from Sandyford and increased capacity demand on the R119 are not expected to improve journey times as much as other options such as the Core Bus Corridor, as they do not have the same bus priority measures that are to be implemented as part of the Core Bus Corridor. Additionally, the temporary bus service from Sandyford scored less well on the economic categories such as resilience and sustainable growth as it will not be in place permanently and will need to eventually be replaced with another option to cater for this demand, so as a stand-alone option does not perform well.

The Luas line and Bray Bus Core Corridor are also expected to provide integration with existing public transport as they will provide a link with the public transport network across the GDA.

6.3 Summary

Based on the MCA assessment, the Metro South to Sandyford option has been removed from further analysis, due predominantly to its distance from the study area. However, the Metro South option to Cherrywood is recommended to be progressed and this option would encompass a Metro option through Sandyford. It should be noted that in the preparation of the Transport Strategy, the NTA must take account of a much broader range of considerations and options for the long-term development of the light rail network. This recommendation is based solely on the more focused assessment of the Bray and Environs area.

All of the remaining options proposed within the MCA are recommended to be brought forward to the next stage of analysis. While these options provide different functions, many of them have complementary purposes. For example, the busway from Fassaroe could work to improve the bus services to the west of N11 option.

7. Summary

This report has outlined the approach and results from the study of the Bray and Environs area, as defined by the NTA for the purposes of providing input into the preparation of the Transport Strategy. The study area is heavily reliant on the existing road network which is forecast to operate with a moderate level of congestion in 2042.

There is the opportunity to shift car trips from this area, particularly from the new developments within Fassaroe, to public transport and active modes through the provision of high-quality infrastructure and services.

7.1 Public transport options

Given the early nature of this study, a qualitative Multi Criteria Analysis (MCA) was considered to be an appropriate tool to guide the assessment of public transport options. Building on the key themes of the CAF, a set of criteria which sit within these overarching themes has been developed to enable a more detailed assessment of options to be undertaken. These criteria have been based on the GDA Transport Strategy objectives provided by the NTA. It should be noted that, while these options performed best in terms of meeting the objectives of this study, the NTA must take a much greater range of considerations into account when developing and assessing light rail options in the preparation of the Transport Strategy.

7.1.1 Metro Options

Based on policy, two Metro South options were identified as potential options for the Bray and Environs study area. These included an extension of the existing Metro line south to stop at Sandyford or alternatively the continuation of this line to stop at Cherrywood. Both of these options were progressed to MCA stage.

Of these options, the best performing at MCA was the Metro South to Cherrywood Option, which is expected to cater for sustainable growth, provide resilience for future demand beyond 2042 and increase the accessibility of the Metro network to individuals within the study area. The main drawback of the Metro South to Sandyford is its distance from the study area compared to Cherrywood, thereby making it potentially more difficult to access this service from Bray and Environs. Therefore the Metro South to Sandyford was not progressed from the MCA stage.

7.1.2 Luas Options

Extending the Luas Green Line to Bray town centre has been proposed previously within policy. In addition to an extension to Bray town centre, another option has been proposed to extend the Luas line to developments west of the M/N11 in order to facilitate more sustainable development.

The Luas extension to Bray town centre option is expected to cater for sustainable growth as well as providing good value for money and resilience for future demand. This option would provide accessibility to the wider Luas network within Dublin and reduce the reliance on private vehicles.

Demand analysis identified that there was insufficient demand in the study area to justify a Luas extension to west of N11 option (Table 5-4). Therefore, it was removed from consideration before reaching the MCA stage.

7.1.3 Bus Options

The Core Bus Network option is based on existing proposals, as are the options of 'Busway from Fassaroe to Old Connaught over the County Brook at Ballyman Glen (which also facilitates walking and cycling)' and 'Support the delivery of a bus service from Sandyford via Rathmichael and Old Connaught to Bray Dart Station until the Luas Green Line extension to Bray is suitably advanced'. In addition, another option was proposed for this study to provide bus services to the west of the N11 in order to cater for developments there.

All of the bus options were taken forward for MCA assessment. In terms of environmental impacts they are all expected to have comparable impacts to other options and all were considered to have some advantages over

other scheme options regarding integration with other public transport. The busway to Fassaroe option and bus services to the west of N11 option were considered advantageous for accessibility and inclusion as they serve the new developments.

7.1.4 P&R Options

A new DART station is proposed at Woodbrook. This option would provide Park and Ride facilities to serve this station.

This option was not assessed against the other options using the MCA and is recommended as being taken forward for further analysis as it provides an alternative transport option for consideration. It is expected to cater for sustainable growth and provide access to the rail network, although it still relies on private vehicle use.

7.2 Highway options

Upgrades to the N11/M11 have previously been proposed within the Transport Strategy for the Greater Dublin Area and the Bray and Environs Transport Study. The N11/M11 Junction 4 to Junction 14 Improvement Scheme is already in development and aims to alleviate congestion, improve safety and optimise efficiency of the highway[11]. This option is based on this scheme, although it would focus on the junctions located within the Bray and Environs study area only.

This option was progressed to the MCA, scoring highly on road safety. However, it does not contribute to inclusion for those without access to private cars, does not provide improvements in health, and has the potential for negative environmental impacts.

7.3 Cycle options

This option is based on routes identified within the Greater Dublin Area Cycle Network Plan, aiming to address missing links between existing routes and key destinations, and provide increased connectivity between Bray and the surrounding settlements.

This option was not assessed against the other options using the MCA and is recommended as being taken forward for further analysis as it provides an alternative transport option for consideration. It is expected to result in positive environmental impacts as well as improvements to health.

[11] https://n11m11.ie/

Appendix A. Do Minimum Model Run Transport Schemes

A.1 Road Schemes

The Do Minimum model run contains the following road schemes:

- N3 Castaheany Interchange Upgrade;
- N3-N4 Barnhill to Leixlip Interchange;
- North-South Road – west of Adamstown SDZ linking the N7 to N4 and on to Fingal;
- Glenamuck District Distributor Road;
- Leopardstown Link Road Phase 2;
- Porterstown Distributor Link Road;
- R126 Donabate Relief Road: R132 to Portrane Demesne;
- Oldtown-Mooretown Western Distributor Link Road;
- Swords relief Road at Lord Mayors;
- Poolbeg development roads;
- Cherrywood development roads;
- Widening of the M7 between Junction 9 (Naas North) and Junction 11 (M7/M9) to provide an additional lane in each direction; and
- 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.

A.2 Bus schemes

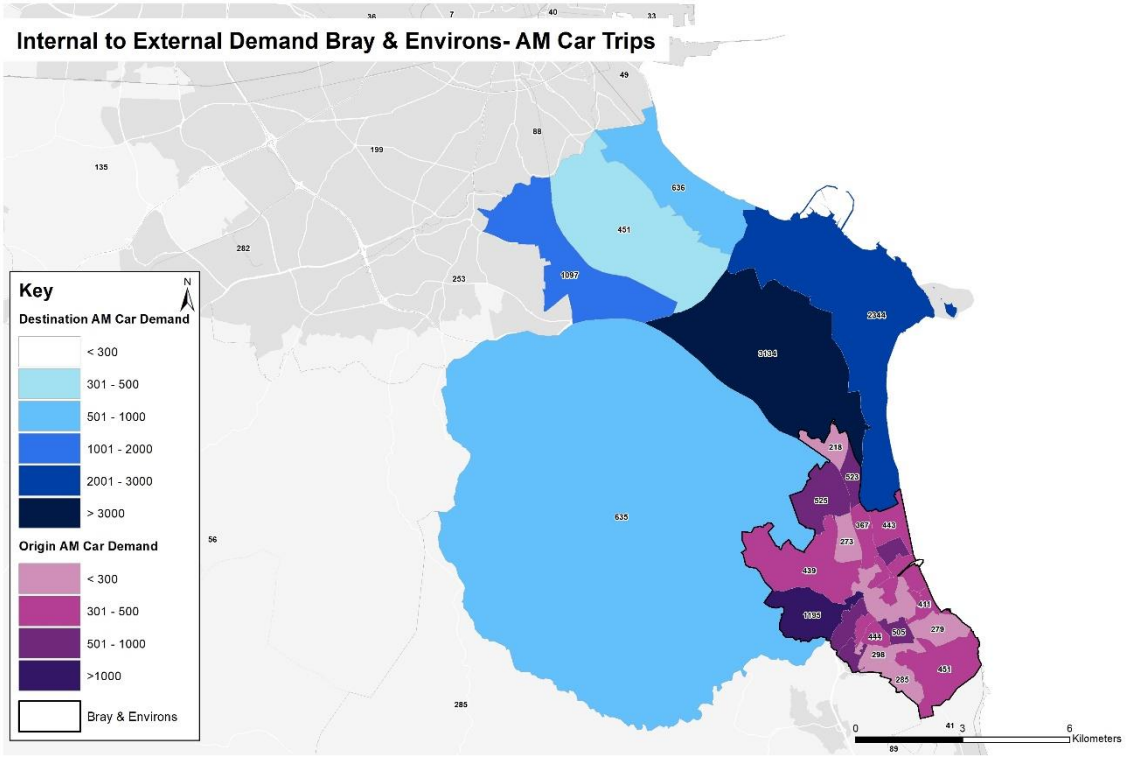
The Do Minimum model runs contains the bus services and frequencies related to the New Dublin Area Bus Network. The model does not include any of the of the associated BusConnects bus priority infrastructure proposals which would improve journey times.

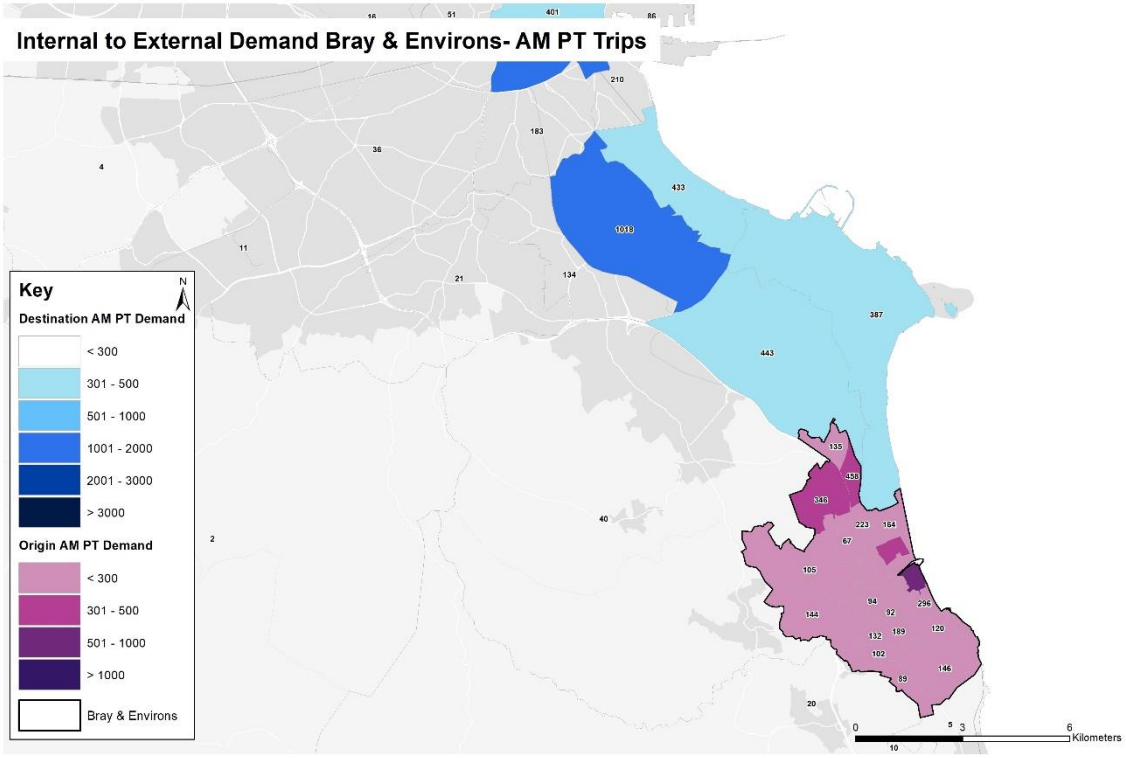
A.3 Rail schemes

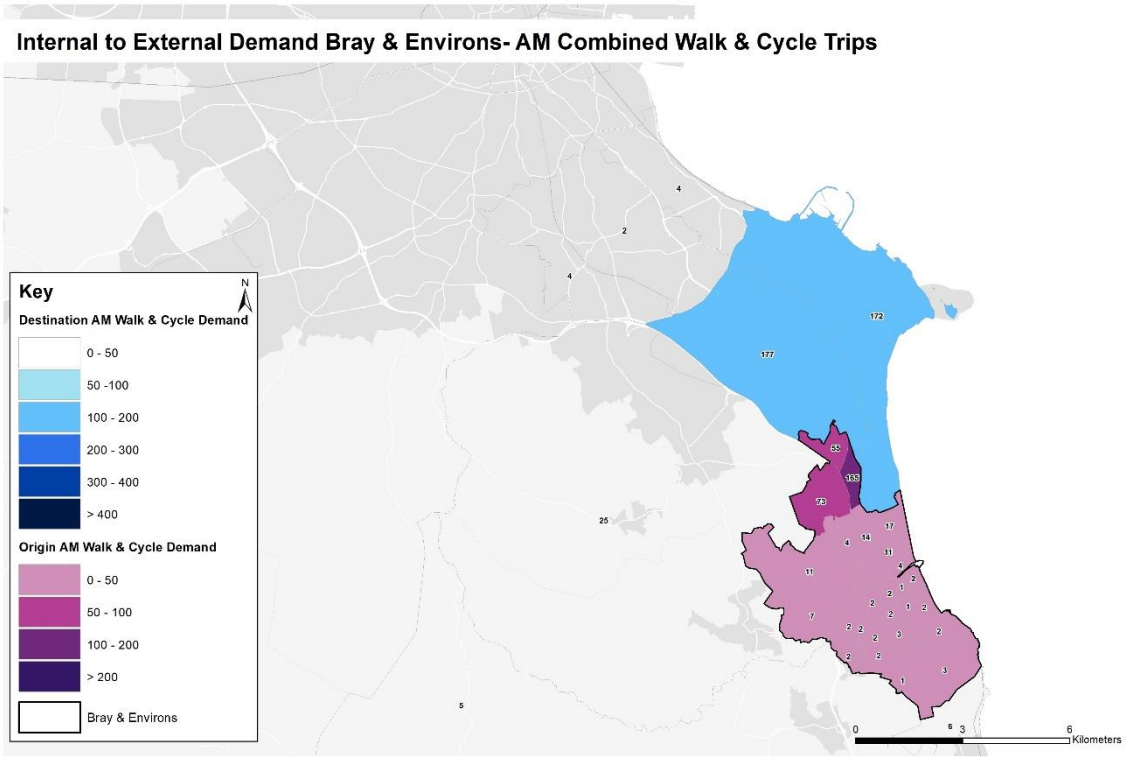
The Do Minimum model runs contains the following rail schemes:

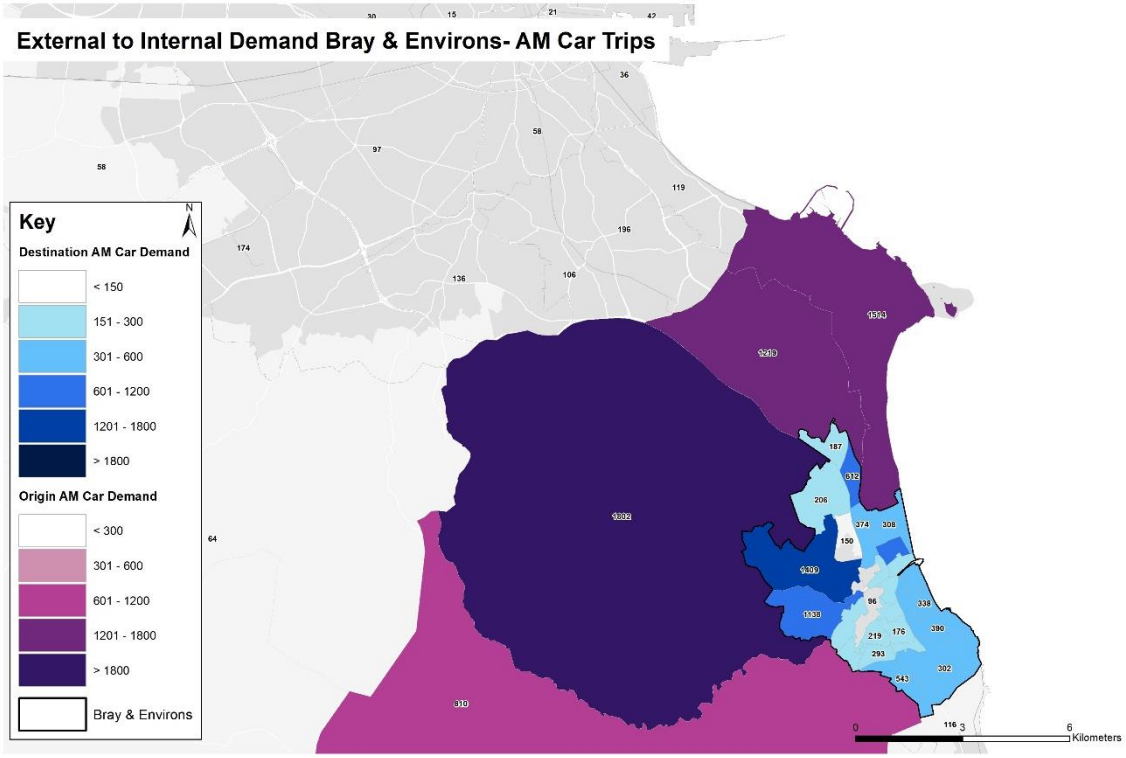
- Revised Irish Rail timetable;
- Interim DART Expansion Programme (non-tunnel elements) including additional stations at Kishogue and Pelletstown; and
- Luas Cross City incorporating Luas Green Line Capacity Enhancement - Phase 1.

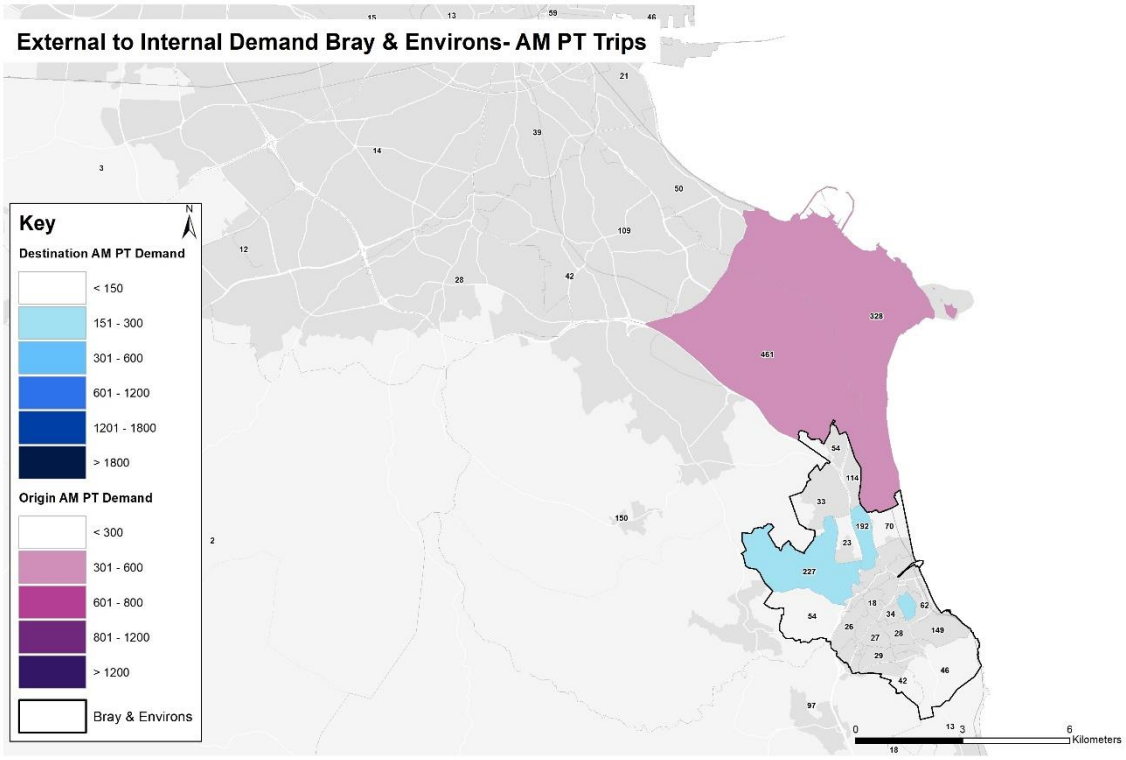
Appendix B. Demand Maps Split by Mode






Internal to External Demand Bray & Environs- AM Combined Walk & Cycle Trips
Key
Destination AM Walk & Cycle Demand
0 - 50
50 -100
100 - 200
200 - 300
300 - 400
> 400
Origin AM Walk & Cycle Demand
0 - 50
50 - 100
100 - 200
> 200
Bray & Environs
N
0
3
6
Kilometers


External to Internal Demand Bray & Environs- AM Car Trips
Key
Destination AM Car Demand
< 150
151 - 300
301 - 600
601 - 1200
1201 - 1800
> 1800
Origin AM Car Demand
< 300
301 - 600
601 - 1200
1201 - 1800
> 1800
Bray & Environs
N
0
3
6
Kilometers


External to Internal Demand Bray & Environs- AM PT Trips
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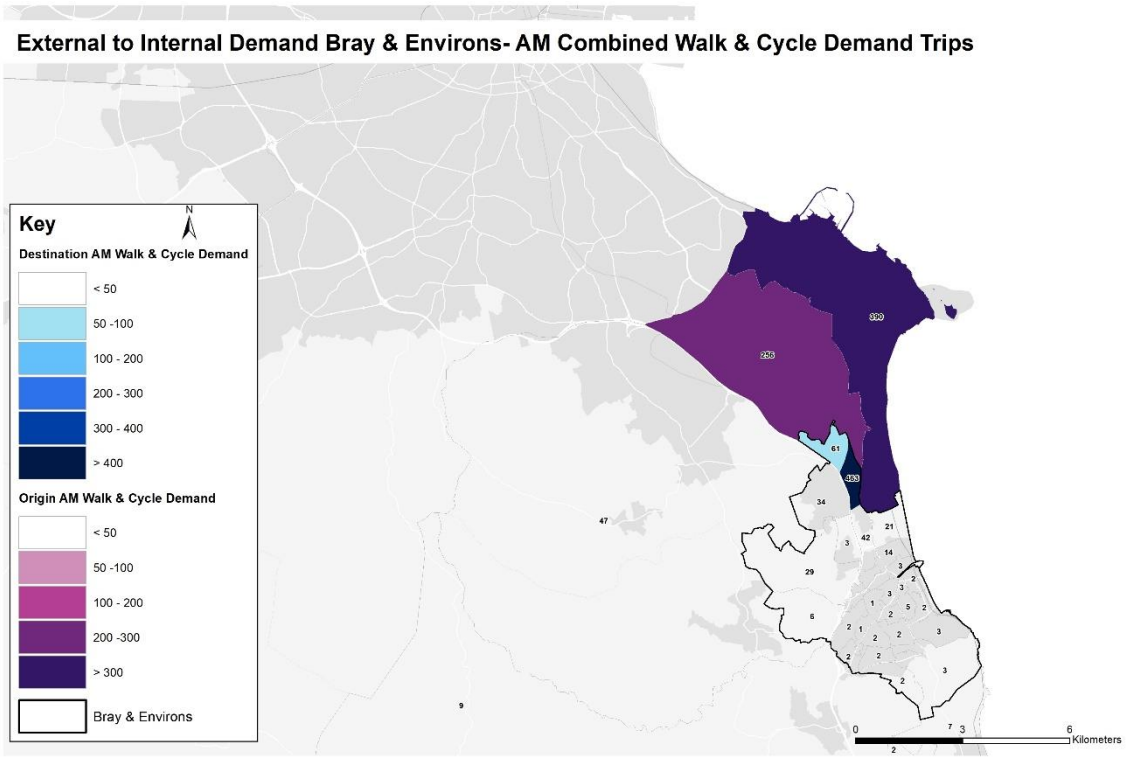
151 - 300
301 - 600
601 - 1200
1201 - 1800
> 1800
Origin AM PT Demand
< 300
301 - 600
601 - 800
801 - 1200
> 1200
Bray & Environs
N
0
3
6
Kilometers

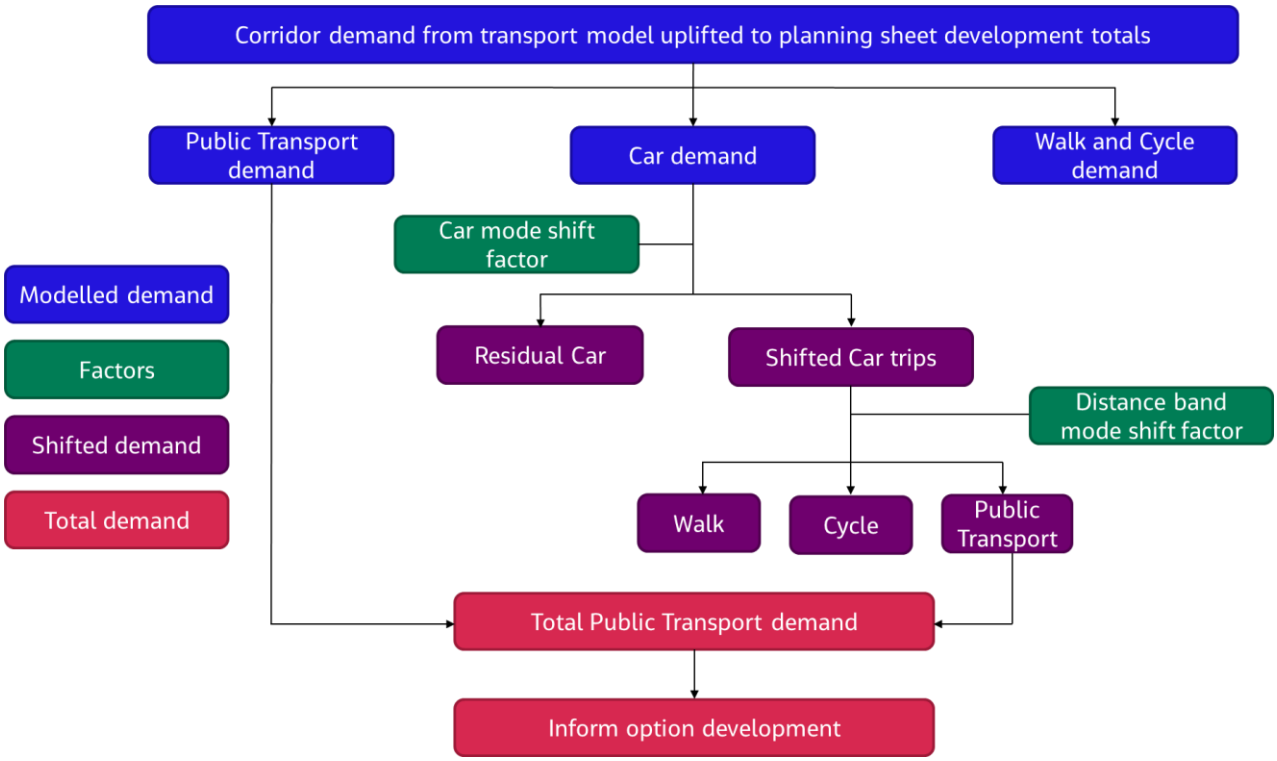

External to Internal Demand Bray & Environs- AM Combined Walk & Cycle Demand Trips
Key
Destination AM Walk & Cycle Demand
< 50
50 -100
100 - 200
200 - 300
300 - 400
> 400
Origin AM Walk & Cycle Demand
< 50
50 -100
100 - 200
200 -300
> 300
Bray & Environs
N
0
3
6
Kilometers

Appendix C. Mode shift analysis methodology

This technical note explains the mode shift calculation used to inform the option development process for each area being considered as part of the Greater Dublin Area Transport Studies. The mode shift calculation is based on the Eastern Regional Model (ERM) and the planning sheets provided by the NTA, with the results providing an indicative number of additional public transport trips which need to be catered for if a mode shift away from car is to be achieved.

This method produces an indicative set of results which provides the order of magnitude of changes in demand which is considered sufficient to inform option development at this early stage. It is noted that the results are affected by the underlying assumptions of the planning sheet and ERM i.e. demand is assigned to a constrained network and that no model run has been undertaken to identify mode shift.

This exercise has been undertaken for the AM period only when there is the largest car demand in the ERM. The flow chart below shows the overall process underpinning the mode shift calculation.



First a corridor is identified (e.g. outside the M50 into the city centre) and the transport demand using the corridor is obtained from the ERM, disaggregated by mode – public transport, car, and walk and cycle.

A factor is then applied to the car demand to create the mode shift away from car to one of the other modes. Two factors for mode shift have been applied in this study: 25% of car trips shift and 50% of car trips shift. This aims to provide a broad order of magnitude of demand to inform option development and assessment.

The shifted car trips are then allocated to become either a new walking, cycling or public transport trip. This decision is based on the trip lengths of the shifted car trips as it is assumed that shorter trips are more likely to become walking trips and longer trips are more likely to become public transport trips. The trip length distributions for each mode are obtained from the ERM.

Three bands were defined:

- A lower band bounded a distance which 75% of walking trips in the ERM are shorter than or equal to,
- A middle band bounded by a distance which 75% of cycling trips in the ERM are shorter than or equal to; and
- An upper band for any trips with a longer distance.

For the Bray and Environs study area, the following bands and mode shares by distance are obtained from the ERM:

Distance Band (km)	Walk	Cycle	Public Transport	Total
0-2.6	73%	6%	22%	100%
2.6-8.2	21%	18%	61%	100%
8.2+	0%	10%	90%	100%

In the lower band of trips less than 2.6km, 73% of the trips in the ERM are walking trips, but there are still 6% of trips which are cycle trips and 22% of trips which are public transport trips.

The proportion of trips in each band made by walk, cycle and public transport were derived from the ERM, and applied to the shifted car trips. This gives a number for the shifted public transport trips which can be added to the public transport trips from the ERM to provide a total public transport demand for the corridor. This number can then be used to inform the development of options to support the estimated demand along the corridor.

Appendix D. Screenlines crossed by each bus service

Service		Direction	Capacity			Screenlines Crossed by Service					
			Seated	Crush	Design	1	2	3	4	5	6
5097	Bus Éireann: 133: Dublin Airport to Wick	NB	76	80	76	X	X	X			
5099	Bus Éireann: 133: Wicklow Gaol to Bray	NB	60	64	60	X	X	X			
5100	Bus Éireann: 133: Wicklow Gaol to Dublin	NB	426	458	426	X	X	X			
4043	E1: Ballymun_ Ballymun Road to Balywaltr	NB	576	736	626	X	X	X	X	X	
4044	E1: Bray_ Springfield Cemetery to Ballym	NB	576	736	626	X	X	X	X	X	
5590	Finnegan-Bray Ltd: 143: Sandyford_ Black	NB	51	55	51	X					
5591	Finnegan-Bray Ltd: 143: Southern Cross R	NB	51	55	51	X					
5592	Finnegan-Bray Ltd: 144: Outside Train St	NB	51	55	51	X					
5593	Finnegan-Bray Ltd: 144: Southern Cross R	NB	51	55	51	X					
4085	L1: Outside Train Station to Quinnsborou	NB	108	138	117	X					
4090	L11: Dun Laoghaire_ Crofton Avenue to Ki	NB	216	276	235	X	X				
4091	L11: Kilmacanogue_ Rock Valley to Dun La	NB	216	276	235	X	X				
4092	L12: Balywaltrim to Outside Train Statio	NB	216	276	235	X					
4093	L12: Outside Train Station to Balywaltri	NB	216	276	235	X					
4096	L14: Bray_ Maple Grove to Bray_ Southern	NB	144	184	156	X					
4097	L14: Bray_ Southern Cross Road (Killarne	NB	144	184	156	X					
4098	L15: Enniskerry_ Enniskerry Golf Course	NB	72	92	78	X	X	X			X
4099	L15: Outside Train Station to Enniskerry	NB	72	92	78	X	X	X			X
4086	L2: Outside Train Station to Bray_ Main	NB	108	138	117	X					
5789	Wexford Bus: 740: Main Street to Dublin	NB	51	55	51	X	X	X			
5791	Wexford Bus: 740: Redmond Square to Dub	NB	152	160	152	X	X	X			
5787	Wexford Bus: 740-A: Main Street to Dubli	NB	51	55	51	X	X	X			
4148	X1: Kilcoole_ Beechdale Estate to Townse	NB	288	368	313	X	X	X			
4150	X2: Newcastle_ Newcastle Road (Sea Road)	NB	144	184	156	X	X	X			
5097	Bus Éireann: 133: Dublin Airport to Wick	SB	76	80	76	X	X	X			
5099	Bus Éireann: 133: Wicklow Gaol to Bray	SB	60	64	60	X	X	X			
5100	Bus Éireann: 133: Wicklow Gaol to Dublin	SB	426	458	426	X	X	X			
4043	E1: Ballymun_ Ballymun Road to Balywaltr	SB	576	736	626	X	X	X	X	X	
4044	E1: Bray_ Springfield Cemetery to Ballym	SB	576	736	626	X	X	X	X	X	
5590	Finnegan-Bray Ltd: 143: Sandyford_ Black	SB	51	55	51	X					
5591	Finnegan-Bray Ltd: 143: Southern Cross R	SB	51	55	51	X					
5592	Finnegan-Bray Ltd: 144: Outside Train St	SB	51	55	51	X					
5593	Finnegan-Bray Ltd: 144: Southern Cross R	SB	51	55	51	X					
4085	L1: Outside Train Station to Quinnsborou	SB	108	138	117	X					
4090	L11: Dun Laoghaire_ Crofton Avenue to Ki	SB	216	276	235	X	X				
4091	L11: Kilmacanogue_ Rock Valley to Dun La	SB	216	276	235	X	X				
4092	L12: Balywaltrim to Outside Train Statio	SB	216	276	235	X					
4093	L12: Outside Train Station to Balywaltri	SB	216	276	235	X					
4096	L14: Bray_ Maple Grove to Bray_ Southern	SB	144	184	156	X					
4097	L14: Bray_ Southern Cross Road (Killarne	SB	144	184	156	X					
4098	L15: Enniskerry_ Enniskerry Golf Course	SB	72	92	78	X	X	X			X
4099	L15: Outside Train Station to Enniskerry	SB	72	92	78	X	X	X			X
4086	L2: Outside Train Station to Bray_ Main	SB	108	138	117	X					
5789	Wexford Bus: 740: Main Street to Dublin	SB	51	55	51	X	X	X			
5791	Wexford Bus: 740: Redmond Square to Dub	SB	152	160	152	X	X	X			
5787	Wexford Bus: 740-A: Main Street to Dubli	SB	51	55	51	X	X	X			
4148	X1: Kilcoole_ Beechdale Estate to Townse	SB	288	368	313	X	X	X			
4150	X2: Newcastle_ Newcastle Road (Sea Road)	SB	144	184	156	X	X	X			
Rail	Dart Line	NB	2120	4678	3977	X	X		X	X	
Rail	Dart Line	SB	2209	4891	4157	X	X		X	X	