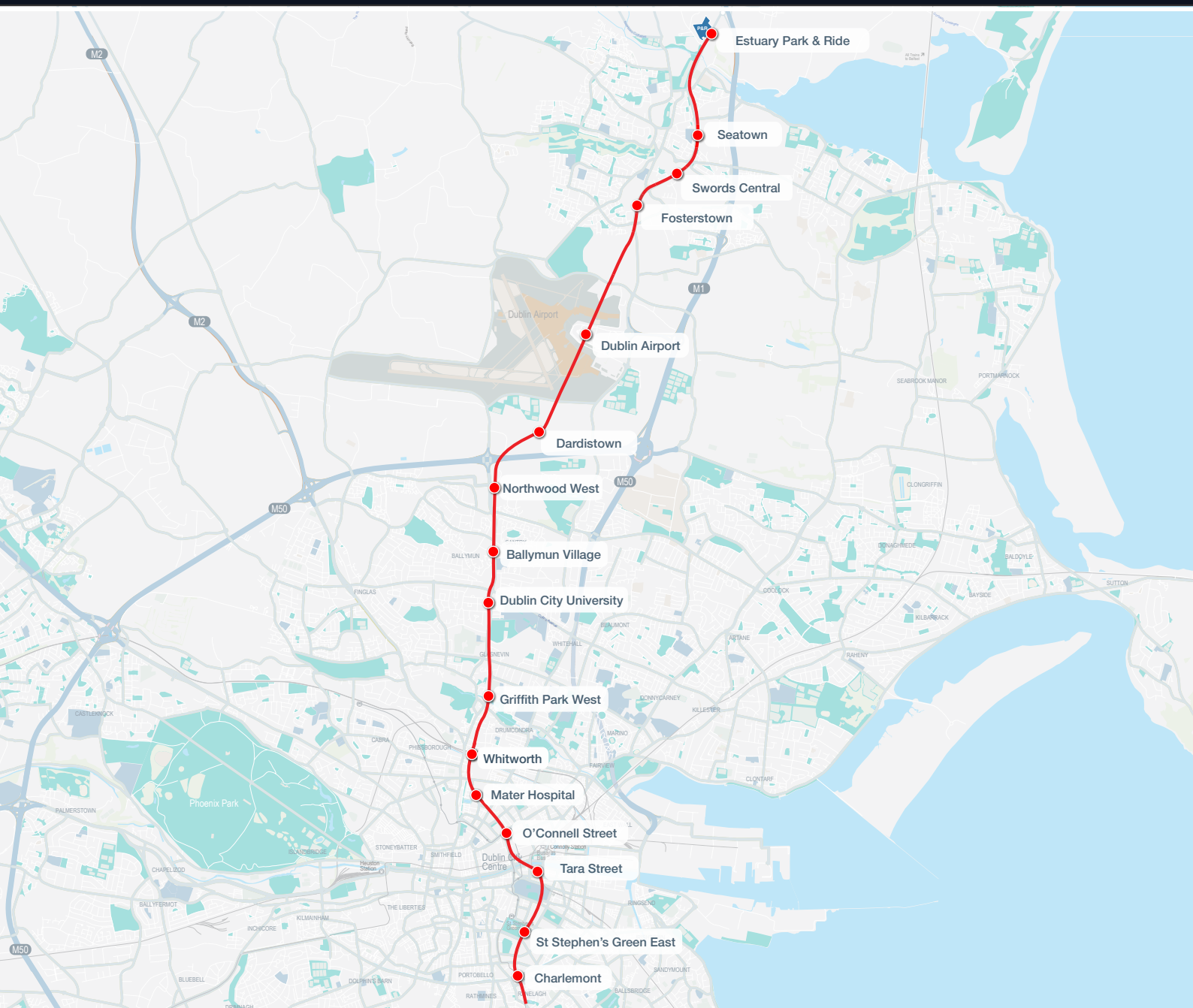


New Metro North

Alignment Options Report

Volume 1: Main Report



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Executive Summary

In October 2016, the National Transport Authority (NTA) commissioned Arup consulting engineers to carry out an Options Assessment Study to identify the Emerging Preferred Route (EPR) for the New Metro North (NMN) scheme. The objective of NMN is to provide a safe, high frequency, fast, efficient and sustainable public transport light rail service connecting Swords, Dublin Airport and Dublin City Centre.

Approach and Methodology

To determine the EPR for NMN all possible route options within a defined study area were assessed against a set of agreed criteria to identify the EPR taking into account all opportunities and constraints.

The first step in this study was to define the study area extent to ensure that all possible options are considered. The defined study area was a broad corridor extending from Estuary to the north of Swords town centre to its proposed tie-in to the existing Luas Green Line at Charlemont in South Dublin City Centre. To capture all possible options for assessment in a rigorous and robust manner the overall study area was sub-divided into three distinct geographical areas.

The overall study area and the sub-divided study areas are shown in **Figure 1**.

Next all possible route options within each study area that best served the scheme objective were identified and screened using a Pass/Fail Preliminary Assessment. Then all of the route options were assessed using a two stage Multi Criteria Analysis (MCA) against a defined set of criteria. The criteria used are in line with the criteria outlined in the 'Common Appraisal Framework for Transport Projects and Programmes' (CAF). The Assessment criteria included Economy, Integration, Environment, Accessibility and Social Inclusion.

A preliminary assessment of possible options was carried out which identified twenty Assessment Options across the study areas which merited further consideration and analysis. To enhance the analysis concept designs were developed for each of these options to enable more a detailed assessment. To sift the number of route options down into a more manageable number, the first stage MCA was carried out to identify the best performing set of Options within each study area.

Following the first stage MCA a total of eight options within the overall study area were identified for further consideration; three in Study area A, three in Study area B and two in Study area C. These options were combined to form ten end-to-end route options, each running from Estuary to the tie-in location at Charlemont.

The ten end-to-end route options were then subjected to a second stage multi criteria analysis. This MCA included a full transport demand and cost benefit analysis for each of the ten options. Following the second stage MCA the EPR for NMN was identified. The EPR is shown in **Figure 2** and is described overleaf.

Rationale for Emerging Preferred Route

The EPR compares most favourably to other options as overall it best serves demand along the corridor, providing interchange with other public transport modes and thereby generating the most positive economic return on investment of public funds.

The route provides interchange with commuter rail services, at Tara (existing) and Whitworth (new) stations, which facilitates ease of transfer for rail passengers travelling to the city centre or Dublin Airport.

The route integrates comparably better with current planning policy, supporting and facilitating land use development envisaged within the relevant development plans and local area plans along the corridor from Dublin City Centre to Swords. It takes due cognisance of other constraints afforded protection by planning policy and integrates well into the existing public realm, with tunnelling utilised in sensitive areas to limit intrusion.

The EPR also serves key trip attractors, employment centres and provides significant interchange opportunities and the forecast patronage is among the highest of the options considered. As its route is segregated from other transport modes over its entire length, it offers better journey time reliability as there is no interference from congestion on other transport networks.

The high patronage numbers together with the certainty on journey time achievable contribute to the positive economic return, and as a result the EPR has one of the highest benefits to costs ratios of the options considered.

In summary, the EPR has been selected for the following reasons:

- In terms of Economy, it delivers substantially more benefits than most of the options resulting in the joint highest BCR;
- It performs among the best in terms of public transport usage i.e. boarding's over 24 hours, which in turn provides a positive economic return;
- In terms of Integration, it integrates better with the wider transport network with better potential for seamless interchange with other modes, particularly heavy rail in the city centre and bus in Swords, than other options considered;
- In terms of Integration, it integrates better with current Land Use Policy particularly in Ballymun and Swords; and
- In terms of Environment, while there are some impacts in terms of Landscape and Visual and Archaeology, Architecture and Cultural Heritage, these impacts can be mitigated through design.

Emerging Preferred Route

The Emerging Preferred Route starts at Charlemont Station, at the Green Line Tie-In, in the vicinity of the existing Luas Stop at Charlemont which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the station on the eastern side of St. Stephens Green.

From here it continues north to the station adjacent to the existing DART station at Tara before crossing under the River Liffey and running northwards to the station at O'Connell Street and onwards to the station at the Mater Hospital before arriving at Whitworth.

It then runs from Whitworth northwards in a bored tunnel with a station provided at Griffith Park West before continuing to Ballymun Road where the station is located serving Dublin City University (DCU) and surrounding residential areas.

The metro continues under Griffith Avenue/Collins Avenue junction with Ballymun Road to Ballymun Village where the next station is located. From here, the metro stays in tunnel to an underground station located on the western side of Northwood Business Park.

From here the metro travels under the M50 through Dardistown where the next station is provided. It then travels in tunnel to the Airport perimeter road with the station provided in the Airport at the Ground Transportation Hub.

The metro then runs in tunnel from the Dublin Airport station to a portal located in green belt lands north of the Naul Road. From here it runs at-grade in a segregated corridor before entering an underpass under the junction of the R132 with Nevinstown Lane/L2300.

An at-grade station, Fosterstown is then provided in lands to the north side of Airside Retail Park. The route then rises on to a viaduct to run elevated over the Pinnock Hill Roundabout. It stays elevated along the median of the R132 where the station, Swords Central, is provided between the Pavilions Shopping Centre to the west and the Barrysparks Development lands to the east.

Staying on elevated viaduct it then continues to the station at Seatown at the entrance to the Swords Business Park before crossing over the Seatown and Estuary Roundabouts where it returns to at-grade running along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

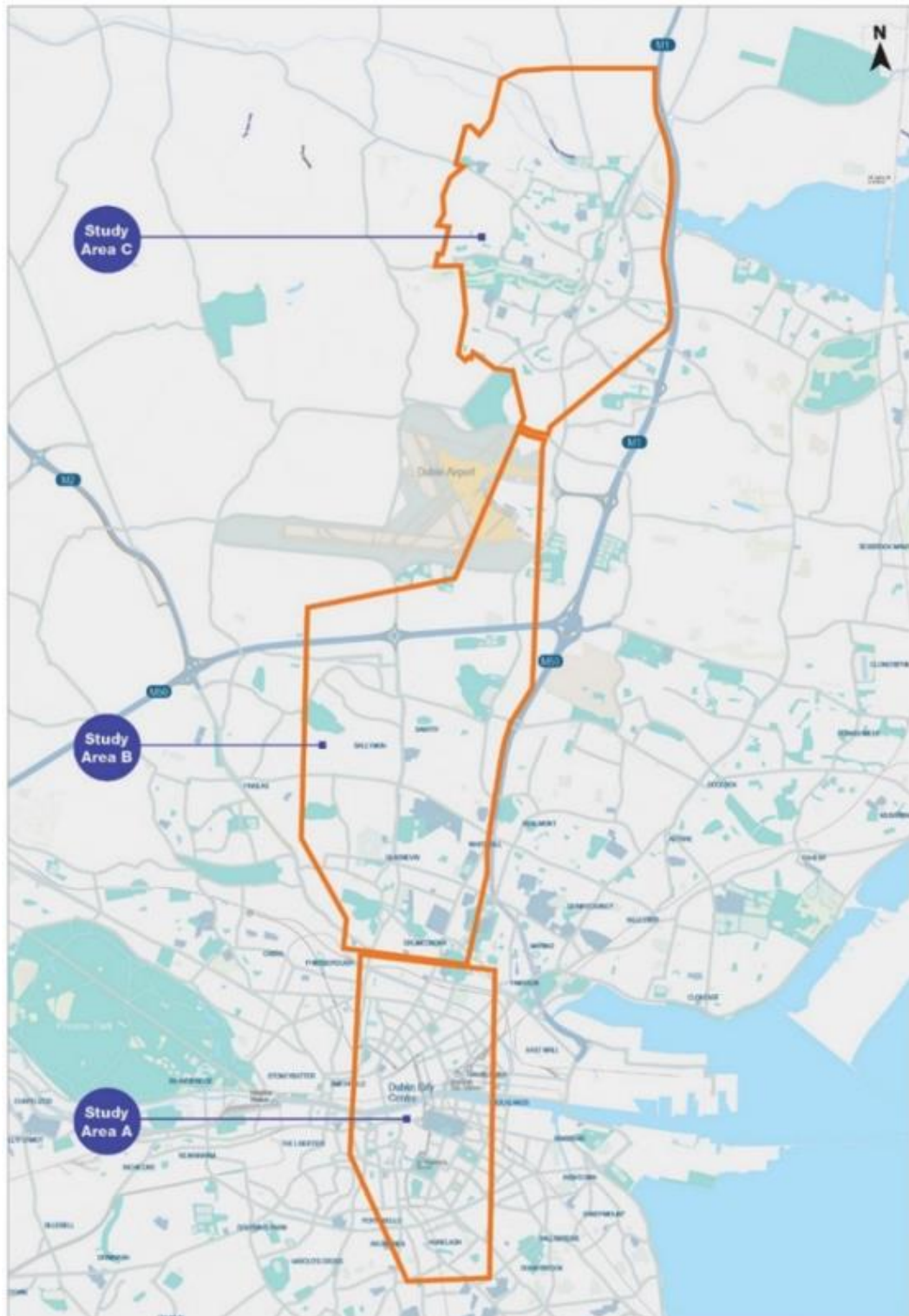
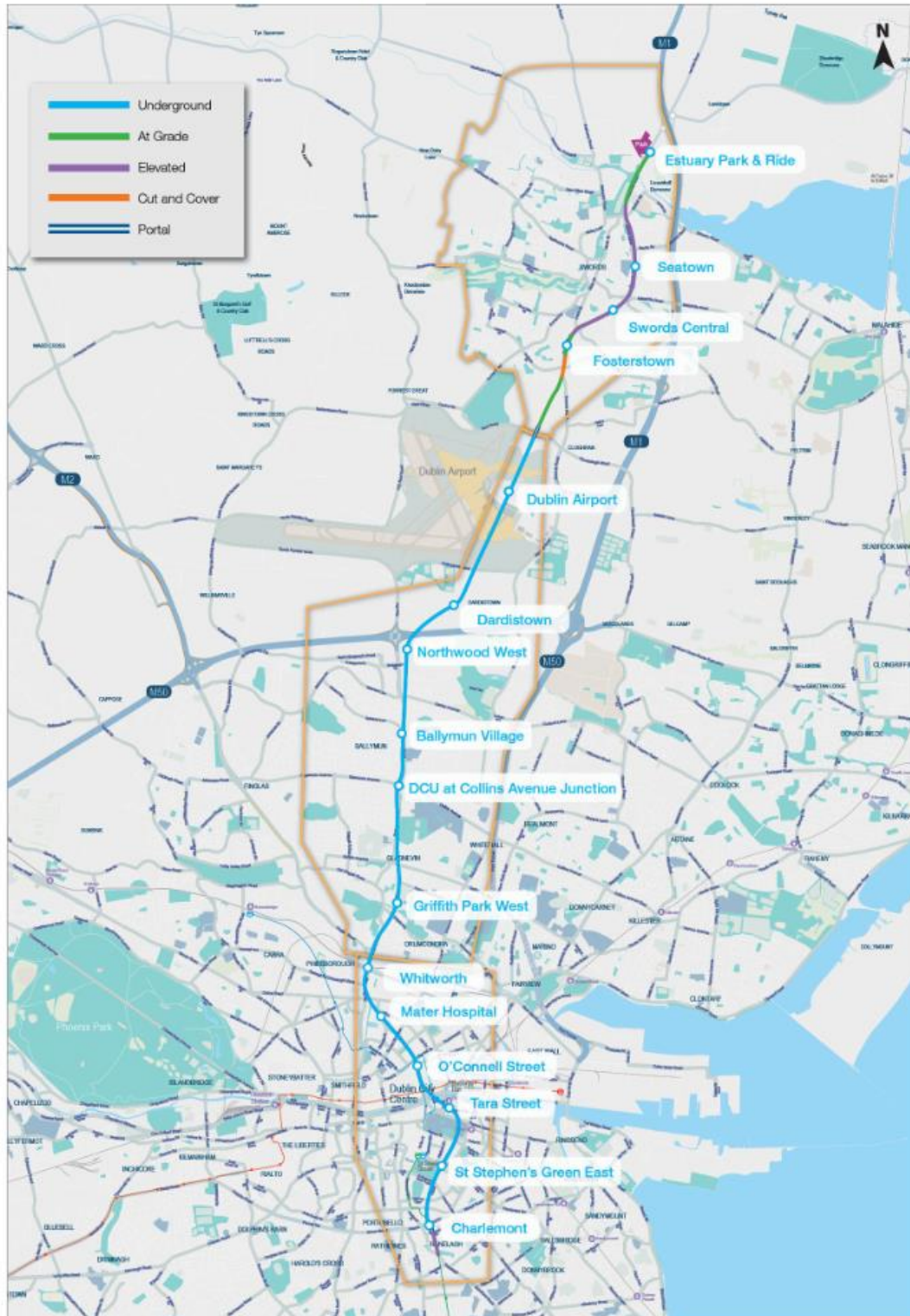
Figure 1: Broad Study Corridor/ Study Area

Figure 2: Emerging Preferred Route

Next Steps

A non-statutory public consultation will be undertaken on the Emerging Preferred Route whereby all information concerning the scheme will be presented to the public, and submissions will be invited in order to inform the scheme design development.

Following completion of the non-statutory public consultation, modification may be required to the emerging preferred route taking into consideration submissions received.

A detailed Environmental Impact Assessment Report (EIAR) and a Rail Order Application will be prepared for the preferred scheme. The EIAR and Rail Order Application will be progressed through the Statutory Planning and Compulsory Purchase Order (for land acquisition) processes by means of an application to An Bord Pleanála (ABP).

There is a statutory consultation period following submission of this application whereby members of the public can make further submissions to ABP, following which ABP will convene an Oral Hearing.

Following completion of the Oral Hearing and assessment of the scheme by ABP, a decision is given by ABP to grant, grant in part or refuse permission for the scheme.

Subsequent to the planning stage, the detailed scheme design will be finalised and tender documents for infrastructure procurement, associated systems and fleet acquisition will be prepared.

Subject to funding approval, the proposed scheme would then proceed to procurement and construction stages. It is anticipated that the construction period would be approximately six years.

The full Alignment Options Report is publicly available on the Metrolink website via the link below:

<https://www.metrolink.ie>

1 Introduction

1.1 Preamble

The National Transport Authority (NTA) appointed Arup to undertake an Alignment Options Study to determine the Emerging Preferred Route (EPR) for the New Metro North (NMN) Scheme as included in the ‘Transport Strategy for the Greater Dublin Area 2016–2035’ (hereafter referred to as the ‘GDA Transport Strategy’). The project is being managed by Transport Infrastructure Ireland (TII) on behalf of the NTA.

The objective to provide a Metro connection between Dublin City Centre, the Airport and onwards to Swords was identified in the 2001 Dublin Transportation Office’s (DTO) ‘A Platform for Change (An integrated transportation strategy for the Greater Dublin Area 2000 to 2016)’. Based on this initial objective, a scheme called Metro North was proposed for development as part of the Government’s ‘Transport 21’ investment programme in 2005 and a Railway Order for the scheme granted in 2010. The approved scheme was approximately 16.5kms in length and ran from St Stephen’s Green to Estuary, to the north of Swords, via Dublin Airport. Despite granting of a Railway Order as well as progressing to an advanced procurement stage, the scheme was deferred in 2011 due to financial constraints.

The GDA Transport Strategy provides for a metro connection from the city centre to Swords, New Metro North.

The proposed NMN scheme objective within the GDA Transport Strategy was informed by the findings of the 2015 NTA commissioned ‘Fingal/North Dublin Transport Study’ which assessed a wide range of public transport options to connect Dublin City Centre, Dublin Airport and Swords. The recommended optimum medium and long term public transport solution was defined as being an ‘Optimised Metro North’.

Having established the optimum long term public transport solution for the corridor, as set out above, this report presents the work subsequently undertaken to assess in detail the most appropriate route, scheme, station locations and type of metro system to implement. The resulting established emerging preferred route for NMN as recommended in this report allows the scheme to:

- Advance in accordance with the NTA Project Management Guidelines; and
- Progress an initial concept design for the proposed NMN scheme on the EPR in order to undertake a Public Consultation on the options assessment process undertaken.

1.2 Scheme Objectives

The overall project objective of the NMN Scheme, as established by the NTA and TII, and as informed by planning policy context, is set out below.

“To provide a safe, high frequency, high capacity, fast, efficient and sustainable public transport light rail service connecting Swords, Dublin Airport and Dublin City Centre.”

This gives an overview of a metro – a rail transit system in an urban environment capable of transporting large passenger numbers efficiently. Therefore, in delivering this objective NMN will:

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

1.3 Planning Context

An overview of the relevant National, Regional and Local land-use and transport planning policy which sets the context for the New Metro North scheme is presented in this section of the report. A more comprehensive review of Planning Context is included in **Appendix 1.1, Volume 2**. Consideration of environmental effects at plan and programme level has been undertaken by means of Strategic Environmental Assessment. Strategic Environmental Assessment (SEA) is a process for evaluating, at the earliest appropriate stage, the environmental consequences of Plans or Programmes (PP) initiated by statutory bodies. The purpose is to ensure that the environmental consequences of plans and programmes are assessed both during their preparation and prior to their adoption which may also include a programme of monitoring. The SEA process also gives interested parties an opportunity to comment on the environmental impacts of the proposed Plan or Programme and to be kept informed during the decision making process.

The need for ‘Appropriate Assessment’ (AA) or ‘Habitats Directive Assessment’ (HDA) arises out of Article 6(3) and 6(4) of the Habitats Directive (92/43/EEC) (*on the conservation of natural habitats and of wild fauna and flora*). This is an assessment of a Plan or Programme that is not directly connected with, or necessary to, the management of a Natura 2000 site (also known as European Site) or the Natura 2000 network but where it may have potential implications for the conservation condition, or integrity, of the site. Natura 2000 network / sites comprises areas designated as Special Areas of Conservation (SACs) and / or Special Protection Areas (SPAs).

Therefore, the plans and programme which form the basis for NMN have been subject to environmental assessment at an early stage.

1.3.1 National Level

NMN is supported by wide ranging National land-use and transport planning policy and plans, including:

- Smarter Travel – A Sustainable Transport Future (DoT 2009), which sets out government policy to achieve a modal shift from the private car to public transport. It forms the basis on which all land-use and transport plans throughout the country are developed;
- Building on Recovery: Infrastructure and Capital Investment 2016-2021. This Capital Plan presents the Government’s framework for infrastructure in Ireland over the period 2016-2021 and acknowledges that ‘the single largest project will be a new metro link in Dublin’ indicating that the metro is scheduled to commence construction in 2021 and be operational by 2026/2027;
- The Draft National Planning Framework (‘Ireland 2040 Our Plan’) released in September 2017 replaces the National Spatial Strategy for Ireland 2002-2020. This document is a long term, 20-year National Plan which seeks to provide a ‘*spatial expression of government policy*’ and provide ‘*a decision-making framework from which other plans will follow – such as Regional Plans, City and County Development Plans*’; The ‘Strategic Investment Framework for Land Transport’ (DTTaS 2015);
- The ‘Climate Action and Low Carbon Development Act 2015’; and
- The ‘National Mitigation Plan’ (DCCA 2017).

1.3.2 Regional Level

At a regional planning level, NMN is supported by the following land-use and transport planning policy and plans:

- GDA Regional Planning Guidelines (RPGs) 2010–2022 - The Regional Planning Guidelines (RPGs) for the GDA 2010–2022 is a policy document which “*aims to direct the future growth of the Greater Dublin Area over the medium to long term and works to implement the strategic planning framework set out in the National Spatial Strategy (NSS) published in 2002*”.

The RPGs specifically acknowledge the importance of the Metro North in serving the airport through the provision of “a high capacity, high speed connection from the airport to the city centre, feeding local, regional and national public transport hubs, improving the connectivity and operation of the airport”;

Further reference is made to the Metro North and its role in *‘providing opportunities to develop new integrated economic development areas or regenerate existing sites and to broaden sectoral business opportunities at strategic locations, taking advantage of fast access to the Airport and the City Centre’*;

- The GDA Transport Strategy identifies NMN as a vital component of the overall, integrated public transport network for Dublin;

The GDA Transport Strategy and the RPGs are required under legislation to be consistent with each other. It is therefore the role of the Strategy *‘to establish the framework for the transport provision necessary to achieve the land use vision set out in the Regional Planning Guidelines’*; and

The purpose of the GDA Transport Strategy is *“to contribute to the economic, social and cultural progress of the Greater Dublin Area by providing for the efficient, effective and sustainable movement of people and goods”*.

1.3.3 Local level

At a local planning level, the planning context for NMN is set out within the Dublin City Council Development Plan (2016–2022) and the Fingal County Council Development Plan (2017–2023).

Dublin City Council Development Plan (2016-2022)

Core Strategy

The ‘Core Strategy’ of the City Development Plan supports Metro North through *‘the policies and objectives in this plan promote intensification and consolidation of Dublin City. This will be achieved in a variety of ways, including infill and brownfield development; regeneration and renewal of the inner city; redevelopment of strategic regenerations areas; and the encouragement of development at higher densities, especially along public transport catchments’*.

Policy and Objectives

NMN is supported by a number of land-use and transport policies and objectives within the City Development Plan, including specifically ‘Policy MT3’, which seeks *“to promote and facilitate the provision of Metro, all heavy elements of the DART Expansion Programme including DART Underground (rail interconnector), the electrification of existing lines, the expansion of Luas, and improvements to the bus network in order to achieve strategic transport objectives”*.

Land Use Zoning

The City Development Plan seeks to ensure a balanced approach to land-use zoning whilst ensuring the necessary services, including public transport facilities, are in place to support planned growth.

There are a number of Local Area Plans (LAPs) within the broad NMN corridor which the Options Assessment process needed to take cognisance of, including the George's Quay LAP (2012) and the Ballymun LAP 2017 (Draft).

The delivery of a Metro system through Ballymun is identified as a key enabler in achieving the aims and objectives as set out in the draft Ballymun LAP.

Specifically in this regard, the Draft LAP states that while it “...*fully supports the route, it is imperative that any rail line through the Main Street does not segregate east and west Ballymun as was the case pre-regeneration.....In order to prevent the segregation which a heavy rail transport system requires, the LAP calls for any future metro line to have regard to the LAP objectives to create an urban Main Street with enhanced permeability and to ideally run the Metro underground through the Main Street..*”

Fingal County Council Development Plan (2017-2023)

Core Strategy

The ‘Core Strategy of the Fingal Development Plan includes planning for, and to support the sustainable long-term development of Fingal as an integrated network of vibrant socially and economically successful urban settlements and rural communities, strategic greenbelts and open countryside, supporting and contributing to the economic development of the County and of the Dublin City Region. Allied to this is the promotion of an appropriate balance of development across the County, by developing a hierarchy of high quality, vibrant urban centres and clearly delineated areas of growth, and favouring expansion in areas nearest to existing or planned public transport nodes.

A key challenge identified within the Development Plan is the need for investment in transport infrastructure and services “to ensure that employment generating lands are easily accessible by good quality public transport networks, in particular that there is an accessible public transport system to serve Swords and the Airport”.

Policy and Objectives

The delivery of NMN is identified within a number of land-use and transport policy and objectives within the Fingal Development Plan, including specifically **Section 1.6**, Strategic Policy, where it states that the Development Plan will “*seek the development of a high quality public transport system throughout the County and linking to adjoining counties, including the development of the indicative route for New Metro North (emphasis added) and Light Rail Corridor, improvements to railway infrastructure including the DART Expansion Programme, Quality Bus Corridors (QBCs) and Bus Rapid Transit (BRT) systems, together with enhanced facilities for walking and cycling considered a key*”.

Land Use Zoning

Land-use zoning within the Development Plan has had regard to both the strategic policies of the Core Strategy, and the specific NMN related policies underpinning the Development Plan, including the principles of sustainable development and of consolidation, the integration of land use and transportation planning, and the maintenance of the quality of life within the County as a whole.

Within the broad corridor for NMN, the Dublin Airport (DA) zoning is a unique economic development zoning within Fingal, which seeks to safeguard the current and future operational, safety, and technical requirements of a critical national asset and provide for its ongoing development. The Dublin Airport Central Masterplan, completed in March 2016, has been prepared to serve as a design framework for the future development of strategically located lands within the airport. It is intended that the Metro North have a Station at the planned Ground Transport Centre (GTC) further enhancing accessibility to the airport by public transport.

Parking provision within the planned development at Dublin Airport Central will be restricted to encourage access by public transport and the success of this strategy is largely reliant on further enhancements to the public transport facilities serving Dublin Airport.

FCC have also created and retained within the Development Plan a dedicated Metro Economic Corridor (ME) zoning along the anticipated route of NMN. The purpose of the zoning is to facilitate opportunities for high density mixed use employment, commercial and residential along and adjacent to the Metro route through the County.

The Development Plan sets out a vision for the Metro Economic Corridor to *“provide for an area of compact, high intensity/density, employment generating activity with associated commercial and residential development which focuses on the Metro within a setting of exemplary urban design, public realm streets and places, which are permeable, secure and within a high quality green landscape. Landmark buildings will provide strong quality architectural features, which respect and enhance the character of the area into which they sit. The designated areas will form sustainable districts which possess a high degree of connectivity and accessibility and will be developed in a phased manner subject to the necessary provision of social and physical infrastructure”*.

The ME zoning is one of the largest economic development zonings in Fingal with 390 hectares of ME zoned lands located principally in Santry/Ballymun and in strategic locations in the Swords area, including the strategic land bank at Lissenhall. Within the lifetime of the Development Plan, it is intended to prepare a LAP at Lissenhall. In planning for achieving growth targets within the County as set out in the RPGs, and in anticipation of the development of the indicative route for New Metro North, Fingal County Council have identified a strategic land bank at Lissenhall “for the development of a sustainable, vibrant, attractive and well-connected mixed use urban district on the northern side of Swords..... These lands would be the subject of an approved Local Area Plan and be developed over the period of several Development Plans i.e. over the next 20 – 25 years”.

In addition, a number of Masterplans for ME zoned lands located at Estuary West, Estuary Central and Estuary East, Northwood, Seatown North and Seatown South and Watery Lane.

There are a number of adopted LAPs and Master Plans within the Metro Economic Corridor at the following locations:

- ‘Your Swords An Emerging City Strategic Vision 2035’ (2008) – Sets out a vision for Swords *‘To promote and facilitate the sustainable development of Swords Town as a vibrant consolidated major town with a thriving economy; an integrated public transport network; an attractive and highly accessible built environment with the highest standards of housing, employment, services, recreational amenities and community facilities.’* This supports Swords designation within the RPGs as a Metropolitan Consolidation Town.

The Development Plan provides for significant economic growth and population expansion in the area and states that *‘In the long term it is envisaged that Swords will grow significantly, up to a population of 100,000’*; Fosterstown Local Area Plan (2010) - The Fosterstown LAP comprises of approximately 13 hectares of lands located to the south of Swords, at the boundary with the town centre to the west of the R132. The LAP, adopted in September 2010, proposes high quality residential development. The LAP acknowledges the importance of Metro North in facilitating high density at this location stating that *‘given the location of the LAP lands within easy walking distance of the Fosterstown metro stop and immediately adjacent to the town centre zoned land, an average net density of circa 80 - 90 units per hectare is considered appropriate for the plan lands subject to appropriate design and amenity standards as stated in this LAP, being met’*. The importance is further stressed noting that the LAP would be revised in the event that Metro North was not to be progressed. Development within the Fosterstown LAP is directly linked to the delivery of metro, with the LAP stating that *“no residential development shall commence within the LAP lands until the Government approves the awarding of the main infrastructural contract by the RPA for the construction of Metro North to Swords”*;

- Barrysparks Local Area Plan (2011) - The Barrysparks LAP comprises 10 hectares of lands located southeast of Swords town centre, east of the R132. The LAP, adopted in July 2011, proposes a high density mixed use development on these lands and will *“support the consolidation and sequential expansion of Swords over time, providing for a high density and high quality range of uses and activities that complements the function of the town centre, whilst supporting and enhancing the social and economic base”*. The development of Barrysparks is considered to be important in supporting Swords status as a Metropolitan Consolidation Town, as set out in the RPGs. As with the Fosterstown LAP, development within the Barrysparks LAP lands is directly linked to the delivery of NMN, with the phasing requirements set out in the LAP stating that *“no development shall commence within the LAP lands until the Government approves the awarding of the main infrastructural contract by the RPA for the construction of Metro North to Swords”*; and

- Dardistown LAP (2013) - The Dardistown LAP lands are an important strategic development landbank located between Dublin City Centre and Dublin Airport comprising approximately 154 hectares. The vision for the LAP, adopted in January 2013, is *‘To provide for a strategic employment node, comprising inter alia, research and development and high technology manufacturing, maximising opportunities presented by the lands strategic location well served by air, existing and planned high capacity public transport and the national road network, and all within a high quality sustainable environment’*.

1.4 Consideration of Alternatives

As set out in **Section 1.1**, in 2014 the NTA commissioned ‘Fingal/North Dublin Transport Study’ to identify the optimum long term public transport solution to connect three core areas, namely Dublin City Centre, Dublin Airport and Swords, running north/south through the Dublin City and Fingal local authority areas.

The study considered numerous and varied public transport service and infrastructure alternatives to address the needs of this Swords/Airport to City Centre corridor up to a study year of 2035. The study also took cognisance of other major public transport proposals within the corridor study area that are likely to influence the assessment of potential alternatives namely DART Expansion Programme, Luas Cross City and the Swiftway Bus Rapid Transit proposals.

The strategic context for the public transport infrastructure development within this particular study area is based on the population of the Dublin region growing by approximate 23% by 2035 with Dublin City and Fingal being the two administrative areas within the Greater Dublin Area that are forecast and planned to experience the largest increase in housing provision. This is supported in the land use development plans of Dublin City and Fingal respectively and also underpins the NTA’s GDA Transport Strategy.

Following an initial assessment of 25 alternative transport options to serve the corridor, a total of six options were identified and taken through Stage 1 ‘Multi-Criteria Analysis’ (MCA), formed the basis for a Public Consultation process undertaken and considered further at a Stage 2 more detailed economic appraisal.

These are summarised as follows:

- A heavy rail spur from Clongriffin to the Airport and Swords (identified as Option HR2 in the Study);
- A new heavy rail line from the Maynooth Line to the Airport and Swords, mainly in tunnel (HR8);
- A light rail from Luas Cross City to Airport and Swords. Two variations of this option were considered for the city centre section to account for tunnelled or at-grade options (LR3);

- An optimised version of Old Metro North with cost savings as a result of scaling down the system and replacing sections of tunnelling with at-grade running (LR7);
- A high capacity network of Bus Rapid Transit (BRT)/Conventional bus schemes along different routes to serve both the Airport and Swords as well as Ballymun (BRT5); and
- A Light Rail from Cabra to Swords and Heavy Rail Link from Clongriffin to Airport (Identified as a ‘Combination Option’ C1).

Further detail on each of these options and the findings of the assessment undertaken as part of the ‘Fingal/North Dublin Transport Study’ is included in **Appendix 1.1, Section 1.3.2.**

The study concluded with the identification of an Optimised Metro North (LR7) as the preferred scheme to meet the transport needs of the Fingal/North Dublin Area for the following reasons:

- It was the most economically advantageous scheme, delivering the highest benefit to cost ratio (BCR) of 1.5, almost double the BCR of the next best scheme (Tunnelled Luas);
- It generated the highest level of transport benefits, with the highest number of additional public transport trips in the morning peak travel period, from all of the options assessed;
- It provided a new strategic public transport corridor, avoiding reliance on either the existing heavy rail lines or the Luas Cross City line;
- It delivered a connection right into the heart of the city, serving O’Connell Street and St. Stephen’s Green;
- It retained the opportunity to extend Luas Cross City to Finglas, which would not be feasible if Tunnelled Luas were selected;
- It avoided reducing the service level on Luas Cross City to Cabra and Broombridge;
- Due to the high level of segregation, it was considered to significantly increase capacity to allow for potential future growth; and
- It could potentially be extended southwards in the longer term to alleviate high travel demand on the Luas Green Line, and ultimately form a complete north-south metro corridor traversing both the north and south city.

The indicative alignment for New Metro North in the GDA Transport Strategy was informed by the recommendations from the ‘Fingal/North Dublin Transport Study’, with the selection of a more detailed Emerging Preferred Route now being the subject of this Alignment Options Assessment.

1.5 Alignment Options Report

This Alignment Options Report is presented as follows;

- Executive Summary

- Volume 1 – Main Report;
- Volume 2 – Supporting Technical Appendices;
- Volume 3 – Route, Scheme Options and EPR Drawings; and
- Volume 4 – Environmental Constraints Report, Annexes and Figures.

Subsequent chapters of this Volume 1, the ‘Main Report’ are as follows:

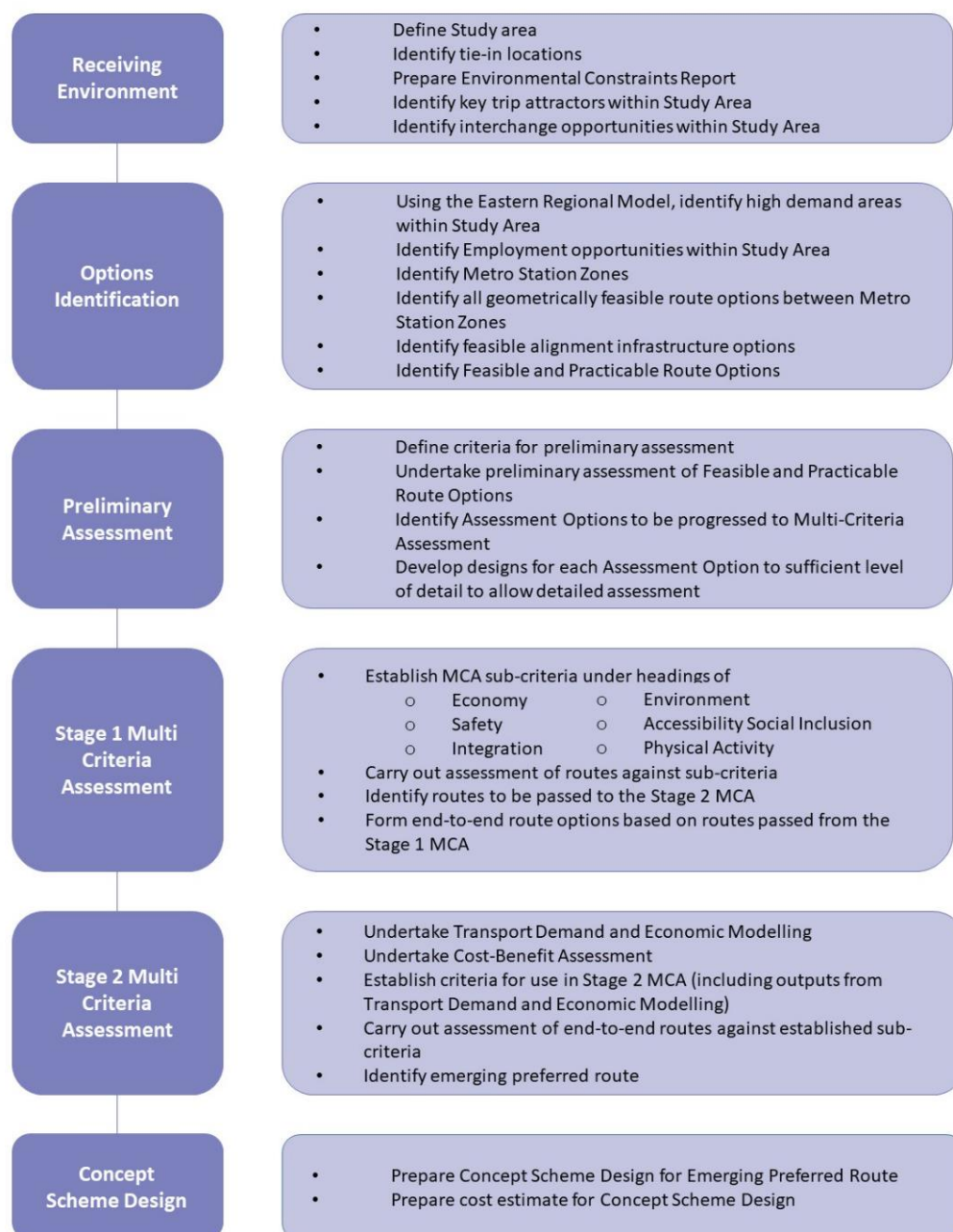
- Chapter 2 (**Methodology**) introduces the study area adopted for the NMN scheme, sets out the methodology adopted for the identification and subsequent appraisal of route options for NMN, and the selection of an Emerging Preferred Route (EPR);
- Chapter 3 (**System Description**) provides a description of the anticipated NMN system requirements and design principles adopted for the study in, so far as they informed and influenced the alignment options assessment process;
- Chapter 4 (**Receiving Environment**) provides a description of the existing environment within the study area for NMN, including the data collection exercise undertaken, with reference to detailed studies presented in technical appendices in Report Volume 2;
- Chapter 5 (**Options Identification**) describes the initial options identification process with the Study Area and presents the route alignment options arising;
- Chapter 6 (**Preliminary Assessment**) presents the findings from the preliminary assessment of initial route options undertaken, effectively comprising a screening of appropriateness of options to meet the overall scheme objectives set out in **Section 1.3**;
- Chapter 7 (**Stage 1 MCA**) sets out the development of route options which passed the preliminary assessment process and their subsequent evaluation under the ‘Stage 1 Multi-criteria Assessment’ process. The output from this stage in the process, being the emerging most appropriate route and scheme options within each Study Area are presented;
- Chapter 8 (**Stage 2 MCA**) presents the output from the ‘Stage 2 Multi-criteria Assessment’, representing an evaluation of complete ‘end-to-end’ route options within the overall Study Area, made up of from potential combinations from each Study Area route options, which emerged from the Stage 1 assessment process. The conclusion of this Chapter is a recommendation on the EPR for the NMN scheme;
- Chapter 9 (**Emerging Preferred Route**) subsequently presents a detailed description of the route; and finally
- Chapter 10 (**Next Steps**) sets out the next steps in the NMN project in accordance with the NTA’s project approval and statutory planning processes.

2 Methodology

2.1 Introduction

This chapter sets out the methodology followed in undertaking the alignment options assessment study and the selection of a recommended Emerging Preferred Route for NMN. The methodology is summarised in **Figure 2.1**.

Figure 2.1: Study Methodology



A more detailed description of the methodology for each stage is presented in the following sections.

2.2 Study Area

Prior to commencing route option development or defining a study area within which to develop route options for a metro, a review of the consideration of alternatives was undertaken. As set out in Chapter 1, the ‘Fingal/North Dublin Transport Study’ considered numerous and varied public transport service and infrastructure alternatives to address the needs of the Swords/Airport to City Centre corridor up to a study year of 2035. This study identified and assessed all reasonable alternatives to address this transport need.

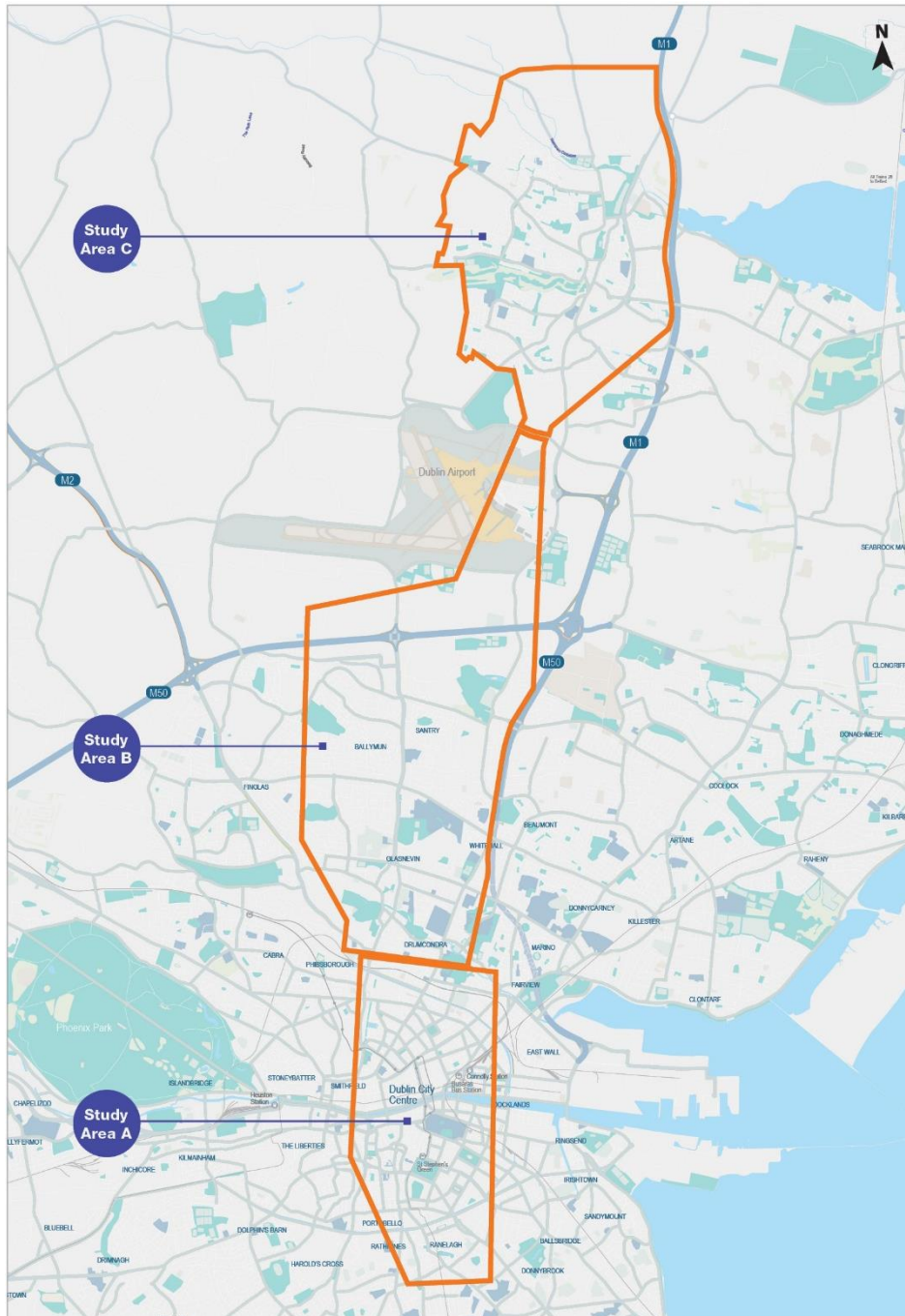
The proposed NMN scheme objective within the GDA Transport Strategy was informed by the findings of the ‘Fingal/North Dublin Transport Study’ which assessed a wide range of public transport options to connect Dublin City Centre, Dublin Airport and Swords. The recommended optimum medium and long term public transport solution was defined as being an ‘Optimised Metro North’.

The objective of the Alignment Options Study is to determine the Emerging Preferred Route (EPR) for the New Metro North (NMN) Scheme as included in the ‘Transport Strategy for the Greater Dublin Area 2016–2035’ (hereafter referred to as the ‘GDA Transport Strategy’).

The initial task is to define a study area for this Alignment Options Study. This is contained principally within the urban area of what is defined as ‘Demand Corridor A’ in the GDA Transport Strategy. The extents of the study area also take cognisance of other radial transport corridors and proposed public transport schemes outlined in the GDA Transport Strategy for delivery up to 2035.

For the purposes of assessment, this overall area was further broken down into three sub-areas, as set out below, and as illustrated in **Figure 2.2**:

- Study Area A – City Centre;
- Study Area B – Ballymun/Airport; and
- Study Area C – Swords.

Figure 2.2: Study Area

2.3 Receiving Environment

A review of the receiving environment was undertaken to identify constraints and opportunities within the study area. The methodology for this review is presented in the following sections.

Within the study area, a data collection exercise was undertaken in order to establish a baseline of the receiving environment from which to identify constraints and opportunities which would influence the identification and subsequent assessment of potential route options.

2.3.1 Constraints

At this stage of the assessment two types of constraints were considered, as set out below and described in the following sections;

- Tie-In Locations; and
- Environmental Constraints.

Tie-In Locations

There are a number of locations within the study area into which NMN is required to tie, namely the southern tie-in, northern tie-in and Dublin Airport. A separate study which included an environmental assessment was undertaken to establish the optimum tie-in at the southern end of the scheme, namely the Luas Green Line Tie-In Study. The tie-in at Dublin Airport is a fixed location as set in the Dublin Airport Masterplan and this site has been specifically developed to receive the metro, therefore ensuring that such a location is the optimum location from a constraint avoidance perspective.

The northern tie-in or scheme terminus is not a fixed point but as per the GDA Transport Strategy, NMN should consider a link to a strategic park and ride site. As part of this study, the optimum tie-in point for the northern terminus was identified taking cognisance of environmental constraints identified in Volume 4 Environmental Constraints.

Environmental Constraints

An Environmental Constraints Report (Volume 4) was prepared to identify constraints across a wide range of environmental subjects from Population and Human Health to Biodiversity and Archaeology. While the full Constraints Report is presented in Volume 4, only those constraints which were considered to directly influence the development of route options at this stage are summarised below:

- Architectural Heritage: Identification of Recorded Protected Structures (RPS), Architectural Conservation Areas (ACA's) and National Inventory of Architectural Heritage (NIAH) structures within each study area;
- Archaeology: Identification of national monuments and recorded monuments in each study area;
- Biodiversity: Identification of Natura 2000 sites (Special Areas of Conservation (SAC) and Special Protection Areas (SPA)) and proposed Natural Heritage Areas (pHNAs)), within each study area; and
- Landscape and Visual: Identification of areas of specific character and visual sensitivity including urban landmarks, land uses, spaces and streetscapes.

2.3.2 Opportunities

Key Trip Attractors and potential for integration with other public transport modes were considered as key opportunities within the study area.

Key Trip Attractors

Key trip attractors which would generate significant demand for metro services were identified within each study area. For the purposes of this assessment, the following land uses have been considered as key trip attractors.

- Education (universities);
- Commercial centres (shopping centres, town centres);
- Healthcare (hospitals);
- Leisure (sport stadiums, theatres, cinemas) etc.; and
- Employment (business parks, large office developments etc.).

Integration with Other Transport Modes

Opportunities for integration with other public transport modes were identified in each study area. Integration with other high capacity public transport services, namely heavy rail and Luas (existing and future) is considered to be a key opportunity. Integration with the bus network and specifically the NTA's planned Core Bus Corridor Network for the GDA (which includes potential for higher capacity bus levels of services in the future), have been considered in terms of integration.

Opportunity for interchange with heavy rail and Luas is only applicable in Study Area A as there are no heavy or light rail networks in Study Areas B and C.

Strategic Park and Ride

The GDA Transport Strategy identified park and ride as an opportunity for modal transfer from the private car to the public transport network and it contains an objective to develop a network of strategic park and ride facilities at appropriate points where rail services intersect with the national road network. Swords has been identified as a location for such a strategic park and ride within the NMN Study Area and the location of this has therefore been considered in developing route options for Study Area C.

2.4 Options Identification

The following section sets out the process undertaken to identify 'feasible and practical' route options for New Metro North within the Study Area by considering transport demand, and potential station locations and alignments to serve this demand which had the potential to meet the scheme objectives.

2.4.1 Identification of Metro Station Zones

The first step in the route options identification process was to identify Metro Station Zones (MSZs) within which a station could be located.

MSZs were defined as broad areas which serve areas of high transport demand, could facilitate access to areas of high employment density, serve key trip attractors and may also provide opportunity for interchange with other high capacity transport modes as part of the developing integrated public transport network for the Greater Dublin Area.

In determining the location of MSZs, due consideration was given to the environmental constraints identified in the Environmental Constraints Report (Volume 4) with constraints avoided where possible. However, the potential impact of MSZs on environmental aspects were not considered at this stage of the assessment as the initial focus was identifying MSZs that would meet the operational needs of the NMN project (i.e. serve as many people as possible).

2.4.1.1 Transport Demand

Identifying the transport demand patterns along the corridor that will be served by NMN was a key step in the identification of Metro Station Zone.

The primary tool in this element of the process was the NTA's East Regional Model (ERM). The ERM covers the whole of the Greater Dublin Area and utilises a detailed zone system. Using the ERM zone system, 275 assessment cells were identified which covered the study area of the NMN corridor plus an area directly surrounding the NMN corridor study area, to ensure that all potential transport demand for NMN is identified, particularly if a route option is located close to the study area boundary.

The transport demand data extracted from the ERM covers multiple journey purposes (e.g. commute to work, retail trips etc.), all common modes (walk, cycling, car and public transport) and extends over four time periods (AM, Inter-Peak, PM and Off Peak). The ERM considers growth in transport demand due to increasing population and development ensuring an understanding of the future travel patterns that NMN will serve when operational.

The potential transport demand was derived from 24-hour trip demand data for all modes of transport extracted from the NTA's GDA Strategy ERM Model scenario for the future year of 2035. The use of the NTA's 2035 GDA Strategy transport demand is appropriate for this stage of the assessment for the following reasons:

- It takes account of the 'ultimate' modal interactions between the various public transport schemes proposed in the NTA GDA Strategy (i.e. Luas Cross City, DART Expansion, other Luas line proposals etc.);
- It provides a strong basis for early phase route option selection and for identifying those areas within the NMN corridor which would generate strong levels of demand to support a Metro; and
- The Metro North Corridor and study areas are derived from the GDA Strategy so use of the 2035 Strategy demand as a starting point for Metro route option development and sifting is entirely appropriate.

Trips with origins and destinations within the 275 assessment cells were identified as they will have the potential to be directly served by NMN.

Trips of less than 2km were excluded as it was assumed that most of these shorter distance trips would be catered for by walking and cycling rather than by NMN. As the 275 assessment cells are not of uniform size, transport demand by area was used (i.e. transport demand density per km²).

To assist with the assessment, a threshold was established to identify assessment cells which may support NMN. To allow for the determination of a reasonable pass/fail point, the trip density per 24-hour period was analysed and 7,000 trips/km²/24-hour period was found to be the mid-point with 50% of cells having a lower trip density and 50% of cells having a higher trip density. A conservative pass/fail point, 6,000 trips/km²/24-hour period was identified with any cell with a potential transport demand density of less than 6,000 trips/km²/24-hour period deemed to be a low demand area which would not provide the level of trip demand to support NMN. This allowed for 55% of assessment cells to be used in the identification of potential high demand areas.

2.4.1.2 Employment Opportunities

In addition to transport demand, the 2035 forecast employment density within the study area was extracted from the ERM for each assessment cell as described in **Section 2.4.4.1**. This allowed for a deeper understanding of the high demand areas within the study area.

2.4.1.3 Key Trip Attractors and Potential for Interchange

Key trip attractors and potential for interchange with other public transport modes were identified within the study area as detailed in **Section 2.3**. These elements were considered in combination with the transport demand and employment opportunities to assist in the identification of MSZs.

2.4.1.4 Identification of Metro Station Zones

The first step in the route options identification process was to identify MSZs within which a station could be located. MSZs were defined as broad areas which serve areas of high demand (demand greater than 6,000 trips/km²/24-hour period where possible), could facilitate access to areas of high employment density, serve key trip attractors and may also provide opportunity for interchange with other high capacity transport modes as part of the developing integrated public transport network for the Greater Dublin Area.

At this initial stage in the process, route options were considered in terms of connecting between MSZs as opposed to detailed station locations, with more refined station details within MSZs being developed at the end of the Stage 1 Multi-Criteria Assessment process.

The potential trip demand within walking catchment of each MSZ was extracted from the 2035 GDA Strategy ERM scenario. For Study Area A this was calculated for a catchment within a 500m walk of the centroid of the metro station zone.

However, for Study Area B and C, this was extended to 1km as people are likely to walk a longer distance to a metro service in these areas compared to the city centre where a denser network of public transport options is available and interchange with other modes is more likely.

The initial MSZs identified in this process were subjected to an initial high level qualitative and quantitative assessment to rule out MSZs which could clearly not be used to form feasible and practical route options.

2.4.2 Identification of Feasible and Practical Route Options

Having established potential Metro Station Zones within each study area, geometrically feasible route options which connected feasible MSZs were generated. The initial geometrically feasible route options identified were then assessed at a high level to rule out routes which would clearly not meet the project objectives. In particular, consideration is given to station demand and the directness of routes. As with the identification of MSZs, consideration was given to the environmental constraints identified in the Environmental Constraints Report (Volume 4) with constraints avoided where possible.

The route options identified as being geometrically feasible were combined to form individual end-to-end route options within each study area defined as Feasible and Practical Route Options. At this stage, achievable vertical alignments along these route options were also identified.

2.5 Preliminary Assessment

This assessment stage comprised a more detailed qualitative assessment using relevant criteria to establish Assessment Options for consideration at the detailed Stage 1 Multi-Criteria Assessment stage.

Although it is known what is feasible along various route options in terms of infrastructure (e.g. at-grade, tunnel, cut and cover or elevated), the criteria selected for the Preliminary Assessment focus on the merits of routes rather than infrastructure proposed along them. The criteria selected are deemed appropriate for the purposes of identifying Assessment Options with other criteria such as cost, environmental, integration and journey time are considered in detail at the next assessment stage, based on further design development of Assessment Options identified from the Preliminary Assessment process.

The criteria considered in the Preliminary Assessment, and associated qualitative assessment metric, are summarised in **Table 2.1**.

Table 2.1: Preliminary Assessment Criteria

Criteria	Qualitative Assessment
Potential for interchange	This criterion considers the potential of each route option for interchange with heavy rail and Luas. Interchange with core bus corridors and BRT has also been considered.
Potential Trip Demand	<p>This criterion considers the likely trip demand of each route option based on the 24-hour trip demand data for all modes of transport extracted from the NTA's East Regional Model (extracted for the future year 2035).</p> <p>The potential trip demand per Metro Station Zone (as identified in Section 5) are summed together to give a high level trip demand estimate for the overall route under consideration.</p>
Key Trip Attractors	This criterion considers what key trip attractors are served by each route option, relative to proposed station locations.
Directness/Journey Time	This criterion considers the directness of route options using length as a proxy for directness. In assessing the directness of route options, consideration was also given to the demand generated by these routes and the availability of more suitable alternatives. Direct routes with high demand were preferred to routes which were not considered to be direct or did not offer any additional demand by routing away from the primary north-south direction of travel within the study area. Directness/length is also used as a proxy for cost at this stage of the assessment.

In considering the suitability of Feasible and Practical Options during the Preliminary Assessment the following process was applied:

- In addition to being assessed on their individual merits, in some instances, routes were also screened relative to each other allowing some routes to be ruled out if similar, more suitable alternatives existed;
- Consideration was also given to the interaction of routes between study area sections to ensure that all suitable connections between study areas were considered at the Stage 1 Multi-Criteria Assessment Stage; and
- While all criteria are considered in undertaking the assessment, a lower ranking on one criterion, for example, did not necessarily mean that the route was not suitable. A balanced view across all criteria was therefore taken when considering the suitability of feasible and practical route options.

The concept designs for Assessment Options identified as part of the Preliminary Assessment were developed further to include more detail in terms of alignment

and station locations. This allowed for a more detailed assessment to be undertaken at the Stage 1 Multi-Criteria Assessment Stage.

2.6 Stage 1 Multi-Criteria Assessment

2.6.1 Approach Overview

Following completion of the Preliminary Assessment, the Assessment Options which emerged were progressed to the Stage 1 Multi-Criteria Analysis process. This stage comprised a more detailed qualitative and quantitative assessment, using criteria established to compare route options in each study area.

The ‘Guidelines on a Common Appraisal Framework for Transport Projects and Programmes’ (CAF) published by the Department of Transport, Tourism and Sport (DTTAS), March 2016, requires schemes to undergo a ‘Multi-Criteria Analysis’ (MCA) under the following criteria;

- Economy;
- Integration;
- Accessibility and Social Inclusion;
- Environment;
- Safety; and
- Physical Activity.

An appreciation of constraints and opportunities within the study area as well as the defined project objectives, informed the establishment of project-specific route options assessment criteria. These were tailored to have commonality to the CAF guidelines where practical.

Table 2.2 presents a summary of the resulting assessment criteria and sub-criteria considered as part of the Stage 1 MCA detailed route options assessment process.

Table 2.2: Stage 1 MCA Assessment Criteria

Assessment Criteria	Assessment Sub-Criteria
1. Economy	1.a. Capital Cost
	1.b. Transport Reliability
	1.c. Journey Time
	1.d. Station Catchment Transport Demand
2. Integration	2.a. Land Use Policy Integration
	2.b. Public Transport Integration
	2.c. Integration with Other Modes
3. Accessibility & Social Inclusion	3.a. Key Trip Attractors
	3.b. Deprived Geographic Areas
	4.a. Biodiversity

Assessment Criteria	Assessment Sub-Criteria
4. Environment	4.b. Soils and Geology
	4.c. Landscape and Visual
	4.d. Archaeology, Architectural and Cultural Heritage

From the criteria listed in CAF, the following criteria were not considered to substantially differentiate between route options and were subsequently removed from the assessment process:

- Safety: All route options would be designed to be safe; and
- Physical Activity: All route options would generally have similar potential to improve physical activity of users.

A summary of the assessment criterion used in the assessment process is discussed in **Section 2.6.2**, with a more detailed description of each provided in **Chapter 7**.

In applying these criteria to the assessment process, for different sections of the study area, greater emphasis may need to be applied to some criterion over others in terms of their significance and influence on the route selection process.

2.6.2 Assessment Criteria

2.6.2.1 Economy (1)

Capital Cost (1.a.)

The Capital Cost criterion estimates the summation of the following costs, noting that this is used for comparative purposes only and does not represent an overall scheme cost:

Direct Costs which include the following:

- Indicative scheme infrastructure works cost;
- Land acquisition costs;
- Spoil removal costs; and
- Major utility diversion costs.

and Indirect Costs which include the following:

- Overhead costs; and
- Insurance costs.

It should be noted that these Direct and Indirect Costs represent high level feasibility working cost estimates, recognising that the level of engineering detail (concept design) for each assessment option at this stage is limited in terms of engineering design and as a consequence that all of the other costs are also high level estimates. An equivalent level of detail is prepared for each assessment option to ensure an equitable comparison of capital costs for assessment options.

Transport Reliability (1.b.)

The transport reliability criterion assesses the Assessment Options in terms of the degree to which transport service reliability is likely to be achieved on NMN (i.e. will the metro run according to a scheduled metro timetable). Transport reliability is linked to the level of segregation of the metro line. If the metro service is fully segregated, full transport reliability can be achieved. However, transport reliability is compromised if the metro service is not fully segregated from other modes (e.g. at-grade running through junctions would necessitate interaction with other road users and has the potential to impact on metro journey time)

Journey Time (1.c.)

This criterion estimates and compares the extent to which journey time savings, and therefore associated economic benefits can be achieved on and between Assessment Options.

Station Catchment Transport Demand (1.d.)

An assessment of transport demand associated with potential Metro Station Zones identified along Assessment Options was undertaken based on information extracted from the NTA's Eastern Regional Model. The transport demand of each Assessment Option is influenced by;

- (i) Station location;
- (ii) Station catchment (i.e. potential patronage at each station); and
- (iii) The number of stations provided on an Assessment Option.

This criterion further refines the catchment data presented in the Preliminary Assessment and considers the effect of overlapping catchments between adjacent stations. It therefore better reflects the potential demand of any particular route option.

2.6.2.2 Integration (2)

Land Use Policy Integration (2.a.)

The Land-use integration criterion identifies the extent to which an Assessment Option would encourage or support existing and established land uses, whilst also supporting planned development and providing for urban regeneration, urban consolidation, and housing, employment, economic and recreation opportunities.

This criterion also provides an assessment of the potential for travel demand and patronage on NMN from zoned lands subject to longer term development, as documented in **Section 1.2** (and **Appendix 1.1, Volume 2**).

Public Transport Integration (2.b.)

This criterion identifies the extent to which route options have the potential to contribute towards maximising wider public transport usage and reach in terms of facilitating efficient interchange between transport routes and modes.

Integration with Other Modes (2.c.)

This criterion identifies the extent to which route options would integrate with modes other than public transport, namely active modes (being pedestrians, cyclists) and private vehicles. Factors considered under this criterion include:

- Integration with pedestrian/cycle network;
- Reduction in road network capacity (e.g. resulting reduced traffic lanes or junction capacity); and/or
- Rerouting of traffic.

2.6.2.3 Accessibility and Social Inclusion (3)

Key Trip Attractors (3.a.)

This criterion assessed the proximity of potential station locations identified along Assessment Options to key trip attractors, as previously defined in **Section 2.4.3** as being:

- Education (universities);
- Commercial centres (shopping centres, town centres);
- Healthcare (hospitals);
- Leisure (sport stadiums, theatres, cinemas) etc.; and
- Employment (business parks, large office developments etc.).

Deprived Geographic Areas (3.b.)

The possible impact of the Assessment Options on deprived geographic areas including RAPID (Revitalising Areas by Planning, Investment and Development) areas and HP Deprivation Index are investigated.

RAPID is a focused Government initiative to target the most disadvantaged urban areas and provincial towns in the country and sought to improve the lives of the residents of its communities through among other things, improving the delivery of public services through integration and coordination.

The Pobal HP Deprivation Index is a method of measuring the relative affluence or disadvantage of a particular geographical area using various datasets from the 2016 census. For the purpose of this assessment, the HP Deprivation Index was examined by small area to determine which Assessment Options served deprived areas.

2.6.2.4 Environment (4)

The Environmental sub-criteria considered at Stage 1 Multi-Criteria Analysis was established by reviewing the Environmental Constraints Report (Volume 4) for each Environmental sub-criterion and determining whether or not there are significant differences across the study area in terms of differentiating routes

brought forward to MCA 1. A summary of the review process for each of the Environmental sub-criterion is provided below.

2.6.2.4.1 Biodiversity

Study Area A

Study Area A is characterised by the predominantly suburban areas to the south of the Grand Canal, with the central urban area of Dublin City on either side of the River Liffey leading to the northern city suburbs extending to the Royal Canal and Drumcondra.

There are locally important green areas such as St. Stephen's Green, Merrion Sq., Trinity College parkland, with relatively fewer green areas on the northern side of the River Liffey. The River Liffey is not designated as a European Site, i.e. Special Area of Conservation (SAC) or Special Protection Area (SPA), in this area but may be considered as hosting an Annex habitat, while the Grand and Royal Canals are both potential National Heritage Areas (pNHA), all having connectivity with Dublin Bay and downstream European sites.

Station locations have the potential to directly affect the River Liffey and indirectly affect downstream European sites in Dublin Bay. Additionally, station locations have the potential to directly affect areas of local biodiversity such as urban parkland.

Therefore, biodiversity is considered to be a differentiator and was considered at MCA stage.

Study Area B

Study Area B is characterised by the predominantly suburban environment from Drumcondra to the M50, after which the landcover becomes more open with more locally important green areas of parkland giving way to farmland to the north of the M50 to Dublin Airport. Important water courses which cross this study area include the Tolka River and Santry River having connectivity to Dublin Bay and downstream European sites and the River Mayne having connectivity to Baldoyle Bay and downstream European sites. The Santry River traverses the study area and passes through Santry Demesne which is a pNHA.

Emerging route options vary from underground to at-grade to elevated alignments – or a combination of these – and as such, potential interactions with water courses which are considered as ecological corridors and having connectivity to downstream European sites were considered.

Emerging routes and station locations have the potential to directly affect ecological corridors such as the Tolka, Santry and Mayne Rivers equally and to potentially indirectly affect downstream European sites. Additionally, emerging routes and station locations have the potential to directly affect areas of local biodiversity such as suburban parkland and farmland.

Therefore, biodiversity is considered to be a differentiator and was considered at MCA stage.

Study Area C

Study Area C is characterised by locally important green areas of farmland to the north of Dublin Airport giving way to the predominantly suburban environment of Swords. Important water courses which cross this study area include the Ward River and Broadmeadow River having connectivity to Malahide Estuary and its associated European sites.

Emerging route options vary from underground to at-grade – or a combination of these – and as such, potential interactions with water courses which are considered as ecological corridors and having connectivity to downstream European sites were considered.

Emerging routes and station locations have the potential to directly affect ecological corridors such as the Ward and Broadmeadow Rivers equally and to potentially indirectly affect downstream European sites. Additionally, emerging routes and station locations have the potential to directly affect areas of local biodiversity such as suburban parkland and farmland.

Therefore, biodiversity is considered to be a differentiator and was considered at MCA stage.

2.6.2.4.2 Soils and Geology

Study Area A

The environmental constraints related to soils and geology that have been considered in Area A are geomorphology, solid geology, soils and superficial geology, contaminated sites, economic geology, geological heritage and ground movement. The routes were assessed against these constraints and while there were some differences identified between the route options, the only constraint contributing to this differentiation is ground movement. A range of less than 15%, with some as low as 9%, of the route lengths were affected by the other constraints, a range which is not considered significant enough to differentiate between the routes. However, ground movement affected and varied across up to 65% of the route lengths and thus was considered as the sole constraint used when assessing soils and geology in Area A at MCA stage.

Study Area B

The environmental constraints related to soils and geology that have been considered in Area B are geomorphology, solid geology, soils and superficial geology, contaminated sites, economic geology, geological heritage and ground movement. As with Area A, the routes were assessed against these constraints and a range of 15 to 20% of the route lengths were affected by the other constraints, a range which is not considered significant enough to differentiate between the routes with ground movement affecting and varying by up to 79% of the route lengths. Thus ground movement was considered as the sole constraint used when assessing soils and geology in Area B at MCA stage.

Study Area C

The environmental constraints related to soils and geology that have been considered in Area C are geomorphology, solid geology, soils and superficial geology, contaminated sites, economic geology, geological heritage and ground movement. As with Area A, the routes were assessed against these constraints and a range of 15 to 20% of the route lengths were affected by the other constraints, a range which is not considered significant enough to differentiate between the routes with ground movement the area affecting and varying by up to 30% of the route lengths. Thus ground movement was considered as the sole constraint used when assessing soils and geology in Area C at MCA stage.

2.6.2.4.3 Waste

Waste is a critical environmental constraint for the route selection, however as the volumes and costs for disposal of all soil, rock and contaminated ground have been considered under the economic criteria for Stage 1 MCA, it is not considered as a separate criterion.

This is to avoid double counting of the waste volumes in the MCA process as it would unfairly bias the results in favour of routes with more overground lengths.

2.6.2.4.4 Hydrogeology

Study Area A

The hydrogeological constraints within Study Area A are the Locally Important Aquifer, the gravel filled Liffey Channel, a number of abstractions and vulnerability of the groundwater. All routes pass through the Locally Important Aquifer and the Liffey Channel. None of the abstractions close to the routes are used for potable supply and all are ranked with low importance. All routes pass through at least one abstraction hence this is not a differentiator. In addition, all routes in this area involve tunnelling hence the groundwater vulnerability will be equivalent to rock at surface for all routes. Consequently, there is no differentiator in relation to hydrogeology within Area A.

Study Area B

The hydrogeological constraints within Study Area B are the Locally Important Aquifer, a number of abstractions and the vulnerability of the groundwater. A Poor Aquifer is present in Area B but traverses the north of Area B hence it is not possible for a route to pass through Area B without and passing over or through the Locally Important Aquifer. One of the abstractions is close to the routes is reported to be used as a domestic supply but is not likely to supply 50 properties so is given a low importance in accordance with the NRA guidance. All routes pass through at least one abstraction. All routes pass over or through an area with groundwater vulnerability designation as extreme or rock at surface. Consequently, there is no differentiator in relation to hydrogeology within Area B.

Study Area C

The hydrogeological constraints within Study Area C are the Locally Important Aquifer, a number of abstractions and the vulnerability of the groundwater. A Poor Aquifer is present in Area C but only in the west of Area C and no routes pass through it. It is not possible for a route pass through Area C without and passing over or through the Locally Important Aquifer. None of the abstractions close to the routes are used for potable supply and all are ranked with low importance. All routes pass through at least one abstraction hence this is not a differentiator. Groundwater vulnerability is lower for some routes but based on the NRA guidance this is not a differentiator. Consequently, there is no differentiator in relation to hydrogeology within Area C.

2.6.2.4.5 Hydrology

Study Area A

The main hydrological constraints within study area A are associated with the River Liffey and its tributaries the Poddle and Camac and the River Tolka and the associated floodplains. Study area A also contains two artificial water bodies, the Grand Canal and the Royal Canal. As the potential routes and station locations will be sited generally on a north to south axis, it is likely that all routes will interact with the rivers and floodplains which generally flow from a west to east direction. As all of the rivers within the study area outfall to the Irish Sea on the eastern coast line, there is a potential hydrological pathway to the designated European sites. Therefore, there is potential for hydrological influence from an at-grade or elevated metro route option. However, for all routes, including tunnelled options, consideration will have to be given to the potential hydrological pathway from source to receptor for potential contaminants during the construction and operational phases for the disposal of ground and surface waters and the potential impact on water quality. This potential impact has been considered in the context of biodiversity and ecological impact. There is no major differentiator between routes in terms of hydrological impact and therefore hydrology has not been considered further at MCA stage.

Study Area B

The main hydrological constraints within study area B are associated with the River Tolka, the Santry River, the River Mayne and its tributary the Cuckoo Stream and the associated floodplains. As the potential routes and station locations will be sited generally on a north to south axis, it is likely that all routes will interact with the rivers and floodplains which generally flow from a west to east direction. As all of the rivers within the study area outfall to the Irish Sea on the eastern coast line, there is a potential hydrological pathway to the designated European sites. Therefore, there is potential for hydrological influence from an at-grade or elevated metro route option. However, for all routes, including tunnelled options, consideration will have to be given to the potential hydrological pathway from source to receptor for potential contaminants during the construction and operational phases for the disposal of ground and surface waters and the potential impact on water quality. This potential impact has been considered in the context of biodiversity and ecological impact. There is no major differentiator between

routes in terms of hydrological impact and therefore hydrology has not been considered further at MCA stage.

Study Area C

Study Area C has the highest density of rivers and watercourses of the three study areas. The main hydrological constraints within study area C are associated with the Sluice River, Gaybrook Stream, Broadmeadow River and its tributaries including the Ward River. There are substantial floodplains associated with the Gaybrook and Broadmeadow catchments in the vicinity of Swords. There is also a coastal flood risk along the eastern side of the study area boundary at the Malahide Estuary.

As all of the rivers within the study area outfall to the Irish Sea on the eastern coast line, there is a potential hydrological pathway to the designated European sites. Therefore, there is potential for hydrological influence from an at-grade or elevated metro route option. However, for all routes, including tunnelled options, consideration will have to be given to the potential hydrological pathway from source to receptor for potential contaminants during the construction and operational phases for the disposal of ground and surface waters and the potential impact on water quality. This potential impact has been considered in the context of biodiversity and ecological impact. There is no major differentiator between routes in terms of hydrological impact and therefore hydrology has not been considered further at MCA stage.

It should be also noted across the three study areas, design and mitigation measures will be incorporated into the identified station locations and routes to address any potential flood risk issues to both the route and third party lands, therefore flooding is not considered a key/significant differentiator for choosing an optimum route. A detailed site specific flood risk assessment shall be carried out on the Emerging Preferred Route at EIAR stage at the next phase of the project.

2.6.2.4.6 Landscape and Visual

Study Area A

The study area includes a range of urban character areas from the ‘South Georgian City’; ‘Grafton Street’; ‘The Old City’; ‘Temple Bar’; ‘Trinity College’; ‘South and North Docklands’; ‘North Georgian City’; ‘O’Connell Street’ and ‘Henry Street’, as well as the northern city suburbs extending to north of the North Circular Road and Royal Canal as far as North Strand, Drumcondra and Glasnevin.

While varying in character, these urban areas include a broad range of sensitive landscape/ townscape and visual receptors such as national monuments, protected structures and landscapes, urban landmarks and streetscapes, protected vistas, and residential, open space, commercial, community, institutional and retail land uses.

While all emerging route options are underground, landscape and visual considerations of proposed station locations offer potential for significant differentiation between route options. Station locations have the potential to

directly effect a range of landscape/townscape and visual receptors within the urban character areas of the City Centre. Therefore, landscape and visual is considered to be a differentiator and was considered at MCA stage.

Study Area B

The study area includes a typical range of suburban character areas dominated by the sensitive landscape/townscape and visual receptors of residential, open space and institutional land uses, interspersed with parks, small river corridors, amenity and recreational facilities, community and commercial uses, protected structures, mature trees and tree-lined avenues.

Emerging routes and station locations have the potential to directly effect a range of landscape/townscape and visual receptors within the northern suburbs of Drumcondra, Glasnevin, Griffith Avenue, Glasnevin Avenue/Collins Avenue, Ballymun, Santry, and Northwood. North of the M50 Corridor the study area is dominated by open undeveloped greenfield lands, and Dublin Airport with its extensive areas of associated parking.

Emerging route options also vary from underground to at-grade to elevated alignments – or a combination of these – and as such, landscape and visual considerations offer potential for significant differentiation between route options along their entire length. Therefore, landscape and visual is considered to be a differentiator and was considered at MCA stage.

Study Area C

The study area includes a typical range of suburban/town centre and open landscape character areas. The dominant sensitive landscape/townscape and visual receptors include residential, community, commercial and open space land uses, interspersed with parks, river corridors, amenity and recreational facilities, some protected structures, and mature trees.

Emerging routes and station locations have the potential to directly effect a range of landscape/ townscape and visual receptors primarily within the developed suburban/town centre of Swords.

Emerging route options also vary from underground to at-grade to elevated alignments – or a combination of these – and as such, landscape and visual considerations offer potential for significant differentiation between route options along their entire length. Therefore, landscape and visual is considered to be a differentiator and was considered at MCA stage.

2.6.2.4.7 Archaeology, Architectural and Cultural Heritage

Archaeological sites are considered to be a non-renewable resource and that are generally location sensitive. In this context, any change to their environment, such as construction activity and ground disturbance works, could adversely affect these sites and could result in irreversible damage or removal.

Architectural heritage is a unique and irreplaceable material asset which is given value by its design, setting, quality of workmanship and use of materials. In this context, any change to the architectural heritage fabric, structure and setting,

resulting from construction and operation activity, may adversely affect these sites.

Cultural heritage sites are often afforded protection either as a Recorded Monument or as Protected Structure or a structure within the National Inventory of Architectural Heritage. For the purpose of this study, the identification of sites of cultural heritage interest were considered in the context of statutory architectural and/or archaeological sites.

As such, all archaeological, architectural and cultural heritage sites are considered to have very high sensitivity in relation to development and changes in the immediate existing environment and as such archaeology, architectural heritage and cultural heritage is considered to be a differentiator and was considered at MCA stage.

Only archaeological, architectural and cultural heritage sites directly impacted by a proposed route and station option are considered in the MCA evaluation.

Study Area A

Study Area A extends from Ranelagh in the south to Drumcondra in the north. Dublin City developed on both sides of the River Liffey and was originally known as Áth Cliath, the ford of the hurdles. During the 9th century the area around Dubh Linn, the black pool, became a large trading centre and by 1170, Dublin was a walled city. Expansion in the 13th century saw the building of Dublin Castle and two cathedrals. After the suppression of the monasteries in 16th century, the lands from these religious houses were divided and Trinity College was founded and given the lands of the Priory of All Hallows. Dublin City rapidly expanded during the second half of the 17th century, during which time extensive reclamation works including the construction of revetment walls, the infilling of riverside mud-flats, the development of quays and bridges of the River Liffey took place.

The Wide Street Commission was set up in 1757 to alleviate the ever growing congestion within the city. It was fundamental in laying the foundations of the physical characteristics of the modern city. Some of its achievements were the development of Dame Street from the newly laid out Parliament House (Bank of Ireland at College Green) to Dublin Castle, the construction of Carlisle (now O'Connell) Bridge and the expansion of Sackville Street (now O'Connell Street) which led to the opening of the General Post Office (GPO) in 1818.

The city continued to grow in the 18th and 19th centuries with the development of residential suburbs and fashionable squares such as Merrion and Rutland (now Parnell) with Mountjoy Square and Fitzwilliam Square developed at a later date. New transport systems such as the tram lines in 1870 and the canals (Grand Canal 1755 and Royal Canal 1790) were developed to support the wider residential population and industry.

The zone of archaeological potential of the historic city of Dublin which is a Recorded Monument (RMP DU018-020) is located within this area. There are 12 National Monuments within the study area and these include the walled town defences of Medieval Dublin, Dublin Castle, St. Mary's Abbey, Christ Church Cathedral, St. Patrick's Cathedral, St Audoen's Church, all of which lie to the

west of the emerging route and station options. Monumental structures in the form of O'Connell, Parnell and O'Brien, St. Stephen's Green and Moore Street are National Monuments and have been assessed as part of the MCA stage of the project.

Consideration has also taken place of The Historic City of Dublin which is on the submitted tentative list for nomination as an UNESCO world heritage site.

The distinguishing qualities and universal outstanding value attributed to Dublin are that after London, Dublin was the second city with major development and expansion during the Georgian period (1714-1800). This has given the city, the institutional buildings, terraces, urban infrastructure, and city plan that substantially survives today.

The urban cityscape and the development of suburbs at Ranelagh and Drumcondra include a broad range of recorded sensitive receptors including national monuments, recorded monuments, protected structures, structures of architectural heritage interest, architectural conservation areas, historic Georgian and Victorian streetscapes, formal squares and parks.

As all route options are underground, the location of proposed stations has the potential to directly impact a range of archaeological, architectural and cultural heritage receptors. As such archaeology, architectural heritage and cultural heritage is considered to be a differentiator and was considered at MCA stage.

Study Area B

Study Area B extends from Drumcondra/ Glasnevin in the south to Dublin Airport in the north. Emerging routes and station locations have the potential to directly effect a range of archaeological, architectural and cultural heritage receptors within the northern suburbs of Drumcondra, Glasnevin, Griffith Avenue, Glasnevin Avenue/ Collins Avenue, Ballymun, Santry and Northwood. The study area contains residential Victorian and Edwardian housing along with modern development, institutional buildings and former demesne lands such as Santry Court and Hampstead House and amenity areas such as the Botanic Gardens.

During the Early Medieval period large ecclesiastical houses were established at both Santry and Drumcondra. The lands of Santry were granted by Hugh de Lacey, Lord of Meath, to his Baron Adam de Fiepo, who in the late 12th century erected a church and graveyard on the early ecclesiastical site of St. Pappin's; the only surviving element of which is a medieval stone font.

North of the M50, the study area is dominated by undeveloped green fields where there is the potential to reveal subsurface archaeological sites as demonstrated by the previous investigation works undertaken in Ballystruan and Ballymun townlands for the previous Metro North project.

Route options are varied and include underground, at grade, cut and cover and open portals, elevated and a combination of the afore mentioned options. Each option has the potential to affect an archaeological, architectural heritage and cultural heritage receptor in distinctive manner. As such archaeology, architectural heritage and cultural heritage is considered to be a differentiator and was considered at MCA stage.

Study Area C

Study Area C extends from Dublin Airport in the south to Lissenhall north of Swords. The study area includes undeveloped green fields, modern residential suburbs, a historic urban centre in the form of Swords town and former estate lands.

Evidence for archaeological activity in north county Dublin is recorded in the Record of Monuments and Places (RMP) and includes sites from the prehistoric period onwards. Prehistoric sites have been revealed through development led and research investigations and surveys and from stray finds.

In the early medieval period, the area formed part of the geographical region of Brega with a range of sites including ringforts, dispersed settlement site and Early Medieval ecclesiastical sites. A settlement at Swords existed from the 6th century when the monastic settlement dedicated to St Colmcille was founded. Swords is classified as a historic town (DU011-034).

In rural Fingal, there are relatively few surviving upstanding ringforts due to the intensive cultivation and agricultural activity, which levelled many earthwork sites. These sites tend to survive as cropmarks, as illustrated by the test excavation works undertaken for the previous Metro North project which revealed, amongst other sites, a number of enclosures and field systems.

After the arrival of the Anglo-Normans in the 12th century, social structures, agrarian development and settlement centres of religious and secular origin followed. Many existing ecclesiastical centres such as Swords flourished. Swords Castle, a National Monument, is the best remaining upstanding example of a medieval Episcopal Manor or Bishop's Palace in Ireland.

The architectural heritage has a dispersed settlement pattern apart from the town of Swords where a number of protected structures contribute to the historic streetscape of the town. The rural nature of the wider study area is predominantly reflected by 17th - 19th century former demesne houses and lands, for example at Lissenhall and Balheary, in addition to simple vernacular buildings such as thatched cottages and structures of industrial heritage, for example Lissenhall bridge, a protected structure, all of which influence the character, setting and layout of rural Fingal.

Route options (including design options of underground, at grade, elevated or a combination of these) and station options have the potential to directly impact a range of archaeological, architectural heritage and cultural heritage receptors. As such archaeology, architectural heritage and cultural heritage is considered to be a differentiator and was considered at MCA stage.

2.6.2.4.8 Material Assets

Material assets include both agricultural and non-agricultural assets. As the scheme study area is generally urban in nature, the vast majority of the assets within the area are non-agricultural assets such as property, utilities, industry and built infrastructure. Construction activities in such urban areas require the

diversion and relocation of utilities and reconfiguration of properties in instance where it is not possible to totally avoid such constraints.

Study Area A comprises the highly urbanised area of Dublin City Centre. Study Area B stretches from Drumcondra in the south to Dublin Airport in the north. The majority of Study Area B is also urbanised and mostly developed, with the exception of the rural land surrounding the airport boundary.

The rural land around the airport includes recreational facilities (such as golf courses, equestrian centres and football pitches) and agricultural land. Study Area C is generally more rural, with agricultural land to the south (in the vicinity of Dublin Airport) and becomes highly developed around Swords to the north.

Material Assets – Non-Agricultural:

Across Study Areas A, B and C, there are some significant utilities with associated major infrastructure namely:

- ESB and ESBI High Voltage Overhead and Underground Lines;
- Irish Water potable trunk mains and trunk sewers and Fingal County Council and Dublin City Council surface water sewers of greater than or equal to 300 mm diameter; and
- Gas Networks Ireland underground services.

As the potential routes and station locations will be generally on a north to south axis, it is likely that all routes will interact with the major utilities and the potential for impact on utilities is considered neutral to route options evaluation as it is solely a cost differential. Equally, all routes are likely to impact on private property and the built infrastructure as they pass through the study area.

Therefore, material assets as a whole is not considered a differentiator at MCA stage. However, it should be noted that an economic assessment of impacts on material assets is considered as part of the economy assessment at MCA stage:

- Costs associated with utility enabling, protection and diversion works; and
- Costs associated with acquisition of material assets such as private property and commercial properties.

Therefore, as the costs associated with management of utilities and the acquisition of material assets are considered under the economic criteria, the remaining elements of material assets (non-agricultural) is not considered a differentiator at MCA stage.

Material Assets – Agricultural:

Given the urban/suburban nature of the proposed scheme, the potential for impact on agriculture is not considered a differentiator at MCA stage as the extent of agricultural land within the study areas potentially impacted by the proposed routes is not significant.

2.6.2.4.9 Air Quality

The existing air quality is determined from air quality data recorded by the EPA in Zone A. Zone A is defined under the Air Quality Standards Regulations (S.I. No. 180 of 2011) as Agglomeration A — Dublin Conurbation. The three study areas are located within Zone A. Applicable air quality standards are compiled within the Dublin Conurbation.

The proposed NMN Project is expected to have a positive impact on air quality by encouraging a modal shift away from private car.

As there are no direct emissions from the NMN trains, there will be no impact on receptors in proximity to the route options during the operational phase. Therefore, air quality is not considered a differentiator for MCA stage.

2.6.2.4.10 Climate

The EPA report on greenhouse gas emissions on a national basis. Therefore, the three study areas are covered by the EPA data.

The proposed NMN Project is expected to have a positive impact on climate by encouraging a modal shift away from private car. Therefore, climate is not considered a differentiator at MCA stage.

2.6.2.4.11 Noise, Groundborne Noise and Vibration

A thorough analysis of the study area for NMN has shown that it is highly populated with properties deemed sensitive to Noise, Groundborne Noise and Vibration throughout. Therefore, there will be an impact from Noise, Groundborne Noise and Vibration on the receiving environment that the NMN route travels through. However, design measures will be incorporated into the design of NMN that will significantly reduce impacts during the operational phase.

During the Construction Stage, potential impacts are more difficult to mitigate and it is likely that there will be impacts on sensitive receptors such as hospitals, universities and residential areas and proactive stakeholder engagement during the design phase will seek to control these impacts. However, the objectives of the NMN project include catering for existing and future public transport travel demand along the defined corridor, contributing to a reduction in urban congestion and facilitating connection to key trip attractors. Therefore, NMN will be developed to provide a transport link in proximity to residential areas, areas of employment and locations where people may wish to visit. As all potential routes considered for NMN must serve project objectives, it is evitable that there will be Noise, Groundborne Noise and Vibration impacts during the construction phase associated with all routes considered. Therefore, Noise, Groundborne Noise and Vibration is not considered a differentiator across routes and for this reason will not be considered at MCA stage.

2.6.2.4.12 Population and Human Health

In terms of population, Volume 4 Environmental Constraints Report presented the existing population, population density and employment density for the entire study area at an electoral district level. This showed that population, population density and employment density varied across the study area. One of the primary goals of the scheme is to serve as many people as possible providing fast, efficient public transport system and improving access by public transport to and through the city. As such the project will have a positive impact on the population of the Study Area.

The extent to which the residential and employment population is served is considered under the sub-criteria of Station Catchment Transport Demand at Stage 1 MCA and Patronage at Stage 2 MCA. Similarly, the sub-criterion deprived geographic areas assessment under the main criteria Accessibility and Social Inclusion considers the level of deprivation that is served by route options at Stage 1 MCA. As such, population has already been considered.

In terms of Human Health, Volume 4 Environmental Constraints Report presented data from the 2016 census which evaluated the existing health of the population within the study area. This showed that 90% of the population within the study area are in 'very good' to 'fair' health. The extent to which route options would serve areas of poor health was not considered to be a differentiator.

In terms of potential impacts on Human Health, any route options considered will have overall positive impact on health in terms of the reduction in vehicular trips in the city. The extent to which this varies across route options is not considered to be a differentiator.

Other considerations which may have an impact on Human Health (Air Quality, Climate, Noise, Groundborne Noise and Vibration), are considered under individual criteria within the Environmental assessment.

Considering the findings of the Environmental Constraints Study, as well as the overlap with other assessment criteria, Population and Human Health is not considered to be an additional differentiator between route options and as such is not considered at MCA stage.

2.6.2.5 Summary of Environmental Criteria

The environmental constraints considered for assessment at Stage 1 MCA are outlined in the following sections.

Biodiversity (4.a.)

A broad assessment of the likely impacts of each of the Assessment Options (it's vertical alignment and station locations) on the key ecological receptors was undertaken, with an indication as to which, if any, of these were likely to be significant, and at what geographical level.

Sites considered in the assessment included the following:

- Sites of Local Importance e.g. Sites having semi-natural features such as grassland, hedgerows or parkland;
- Sites of County Importance e.g. Sites containing Important wildlife or having ecological corridors for example rivers or stream;
- Sites of National Importance e.g. National Heritage Area (NHA), proposed National Heritage Area (pNHA); and
- Site of Internationally Important Sites e.g. Special Area of Conservation (SAC), Special Protection Area (SPAs), Ramsar (wetland site).

Soils and Geology (4.b.)

The soils and geology - ground movement assessment took into account the expected methods of construction along the route and assessed their potential to cause ground movement within a certain distance of the route. The following construction elements were assessed:

- At-grade sections;
- Cut and cover sections;
- Bored tunnel sections; and
- Station box construction.

Landscape and Visual (4.c.)

The assessment comprised the compilation of a desktop understanding of each Assessment Option (its vertical alignment and station locations) within a 100m wide corridor and included the following:

- The landscape/townscape, its character and features;
- The visual environment, including the location of residential and other property;
- Views over the landscape/townscape; and
- Relationship with protected structures, conservation areas, national monuments etc.

Archaeological, Architecture and Cultural Heritage (4.d.)

For the purposes of this assessment heritage features of archaeological, architectural and cultural heritage significance within 100m wide corridor of each Assessment Option (its vertical alignment and station locations) were identified and mapped. Impacts associated with each assessment option were then compared and ranked in order of preference. Features considered included the following:

- Sites recorded on the Record of Monuments and Places (RMP sites);
- Sites recorded on the Record of Protected Structures (RPS);
- Sites recorded on the National Inventory of Architectural Heritage (NIAH);
- Site of Archaeological and Cultural Heritage Merit;

- Architectural Conservation Areas (ACAs) and other sites of Architectural Heritage Merit;
- Sites/areas of archaeological potential and recently identified archaeological sites;
- Conservation Areas; and
- Greenfield areas with unknown archaeological potential.

2.6.2.5.1 Risks of Major Accidents and/or Disasters

The Risk of Major Accidents and/or Disasters (for example, natural disasters/terrorist attacks etc.) could potentially (although unlikely to) occur across any part of the study area, therefore, for this reason, it is not considered at MCA stage. However, site specific risks will be identified at EIAR stage on the proposed Emerging Preferred Route.

The revised EIA Directive 2014/52/EU (new EIA Directive) entered into force on 16 May 2017 states the need to assess the expected significant adverse effects of a project “on the environment deriving from the vulnerability of the project to risks of major accidents and/or natural disasters which are relevant to the project concerned”. Based on the requirements of the new EIA Directive, a study shall be completed at EIAR stage which answers the following questions:

- What major accidents and/or natural disasters could the Proposed Project be vulnerable to?
- Could these major accidents and/or natural disasters result in likely significant adverse environmental effect(s) and if so what would these be?
- What measures are in place, or need to be in place, to prevent or mitigate the likely significant adverse effects of such events on the environment?

In order to carry out a study of the “Risk of Major Accidents and/or Disasters”, a Construction and Environmental Management Plan (CEMP) shall be completed for the EIA which will outline the site safety procedures that will be implemented during the construction phase. The effective implementation of the CEMP will help to reduce the risks associated with the construction phase of the proposed project.

A risk register shall also be developed which will contain all risks identified during the construction and operation of the proposed project. These risks shall be assessed and assigned a risk score in order to provide an indication of the critical nature of each risk for appropriate mitigation and management.

2.6.3 Route Options Summary Table






For each study area section, a route options summary table, has been prepared which collates and summarises the appraisal of route options under each of the assessment criterion.

The route options summary table for each study area section is contained within **Appendix 7.2, Volume 2**, with the emerging assessment summary table for each study area section presented in the main report.

For each individual assessment criterion considered, Assessment Options have been relatively compared against each other based on a five-point scale, ranging from having significant advantages to having significant disadvantages over other Assessment Options.

For illustrative purposes, this five-point scale is colour coded as presented in **Table 2.3**, with advantageous routes graded to ‘dark green’ and disadvantaged Assessment Options graded to ‘red’.

Table 2.3: Assessment Options Colour Coded Ranking Scale

Colour	Metric Definition
	Significant advantages over other options
	Some advantages over other options
	Comparable to other options
	Some disadvantages over other options
	Significant disadvantages over other options

The extent of reporting may vary between each study area, depending on the significance attached to a specific criterion in terms of route differentiation. For example, land-use policy is considered to be more relevant in Study Area C compared with Study Area A.

At the end of each study area Assessment Options assessment, an overall summary Stage 1 Multi Criterion Appraisal (MCA) table is provided, bringing together each of the individual sub-criterion assessments under the main assessment criterion as set out in **Table 2.2**.

A qualitative appraisal of, and conclusions from, the route options assessment is then provided, highlighting the key issues considered in determining recommended route options (‘preferred’ and in some instances, where applicable ‘next preferred’). It should be noted that a balanced approach is taken when assessing the preferred routes. All criteria are considered in undertaking the assessment and a lower ranking on one criterion, for example, will not necessarily mean that the route is not suitable.

The recommended route options from each study area section are then collated to provide ‘end-to-end’ scheme route options which are taken forward to Stage 2 MCA.

2.7 Stage 2 Multi-Criteria Assessment

2.7.1 Approach Overview

Following completion of the Stage 1 MCA assessment, the emerging route options from each study area section were collated to generate ‘end-to-end’ (whole) route options, and taken forward for Stage 2 MCA.

Each whole route option was subjected to further concept design development in order to provide an additional level of detail in terms of engineering feasibility, likely capital cost to deliver the scheme and to inform the assessment of potential environmental impact.

A key component of the Stage 2 MCA process is the transport demand and economic assessment of route alignment options.

This was undertaken by testing route alignment options using NTA’s Eastern Regional Model (ERM). The modelling and assessment undertaken is provided in **Appendix 8.1, Volume 2**.

By undertaking transport modelling and analysis of the results it was possible to assess the performance of alternative route alignment options using key modelling outputs including:

- Transport benefits as a result of travel time savings, travel cost savings and environmental benefits;
- Passenger boardings and alightings at stations;
- Level of interchange with other public transport services;
- Impact on achieving the key policy objective to reduce car mode share; and
- Volume of trips to key destinations that will be catered for by NMN.

The whole route options (or end-to-end options) and associated station locations were coded into the ERM, with the benefits accruing from each of the route options and key outputs then being assessed and inputted to the Stage 2 MCA process. Transport modelling was also used to undertake extensive testing on the Emerging Preferred Route (EPR) with the results informing the refinement/optimisation process and sensitivity analysis of the EPR.

2.7.2 Stage 2 Multi-Criteria Assessment Criteria

All criteria that were considered at Stage 1 MCA, as presented in **Section 2.7.2**, were similarly considered at Stage 2 MCA, but applied to each whole route assessed. As at Stage 2 MCA, the following criteria were not considered to be differentiators between whole route options:

- Transport Reliability – all route options considered at this stage are fully segregated from other modes and as such deliver a similar level of reliability;

- Integration with Other Modes – all route options considered at this stage are fully segregated from other modes and as such there will be no impact on pedestrians, cyclists or other traffic;
- Deprived Geographic Areas – the Stage 1 MCA determined that all routes assessed served these Deprived Geographic Areas equally;
- Biodiversity - the Stage 1 MCA determined that all routes which passed the Stage 1 MCA had a similar impact on Biodiversity;
- Safety: All route options considered would be designed to be safe; and
- Physical Activity: All route options considered would generally have similar potential to improve physical activity of users.

Table 2.4 presents a summary of the assessment criteria and sub-criteria used as part of the Stage 2 MCA detailed whole route options assessment.

Table 2.4: Stage 2 MCA Assessment Criteria

Assessment Criteria	Assessment Sub-Criteria
1. Economy	1.a. Benefit Cost Ratio
	1.b. Total Cost
	1.c. Patronage
	1.d. Journey Time
2. Integration	2.a. Land Use Policy Integration
	2.b. Public Transport Integration
3. Accessibility & Social Inclusion	3.a. Key Trip Attractors
4. Environment	4.a. Soils and Geology
	4.b. Landscape & Visual
	4.c. Archaeology, Architecture and Cultural Heritage

Again, as with the Stage 1 MCA process, in applying these criteria to the assessment process, greater emphasis may need to be applied to some criterion over others in terms of their significance and influence to select the EPR.

A summary of the assessment criterion used in the Stage 2 MCA process is discussed below.

2.7.3 Assessment Criteria

2.7.3.1 Economy (1)

Benefit Cost Ratio (1.a.)

The Benefit Cost Ratio (BCR) criterion assesses the whole route options in terms of the extent to which the economic benefits of the metro are greater than the economic costs of providing the metro. The economic benefits of the metro are likely to include travel time savings, vehicle operation costs, monetised benefits

of reductions in pollutant emissions and monetised benefits of improved safety for the travelling public. The economic cost of the metro includes construction costs (including land acquisition) and operational and maintenance costs. All costs and benefits are discounted to net present values to reflect the profile of costs and benefits over time. A BCR of greater than 1:1 is an indicator that the benefits exceed the costs. Higher BCR values signify a better economic return on the investment in metro.

The BCR ratios are used to compare combined options against one another and are not a scheme BCR. The costs on which the BCRs are based are indicative as noted below, and are subject to further assessment once the Concept Engineering Design has been developed.

Total Cost (I.b.)

The total cost of the proposed metro is considered under this criterion and represents more detailed cost estimates from what was considered in the Stage 1 MCA. 'Total Cost' is a measure of the money required to construct the metro, together with costs to operate and maintain over a specified period of time, and is assessed as a criterion to give a measure of the actual expenditure required to realise the potential monetised benefits.

Ultimately, there has to be adequate funding for the capital cost initially before the project can commence construction, as a scheme that is too expensive for the public exchequer will be difficult to progress. The cost assessed therefore includes both the construction cost and the subsequent cost of operating and maintaining the metro.

The total cost criteria is made up of the following elements:

Direct Costs:

- Indicative scheme infrastructure works cost;
- Land acquisition costs;
- Spoil removal costs; and
- Major utility diversion costs.

Indirect Costs:

- Overhead costs;
- Insurance costs; and
- Operation and Maintenance Costs (30 years).

These Direct and Indirect Costs are used for comparative purposes only, again recognising that the level of engineering detail (concept design) for each option at this stage is limited in terms of engineering design. An equivalent level of detail is prepared for each option to ensure an equitable comparison of costs. However, these costs are not representative of the total scheme cost and are subject to further assessment once the Concept Engineering Design has been developed.

Patronage (1.c.)

The Public Transport Usage criterion assesses the whole route options in terms of how many passengers they will attract, i.e. what level of public transport usage will be served by the metro. There are many factors that influence public transport usage on the metro, mainly station location, competition or integration with other modes and other public transport services, connectivity to desired destinations and journey time. The NTA's East Regional Model (ERM), which takes all the major influencing factors into account, is used to provide passenger boarding forecasts for each whole route option.

Journey Time (1.d.)

The 'Journey Time' criterion remains as that set out for Stage 1 MCA, as presented in **Section 2.6.2.1**, but applied to each whole route option.

2.7.3.2 Integration (2)

Land Use Policy Integration (2.a.)

This criterion remains as that set out for Stage 1 MCA, as presented in **Section 2.6.2.2**, but applied to each whole route.

Public Transport Integration (2.b.)

This criterion remains as that set out for Stage 1 MCA, as presented in **Section 2.6.2.2**, but applied to each whole route.

2.7.3.3 Accessibility and Social Inclusion (3)

Key Trip Attractors (3.a)

This criterion remains as that set out for Stage 1 MCA, as presented in **Section 2.6.2.3**, but applied to each whole route.

2.7.3.4 Environment (4)

Similar to the Stage 1 MCA in terms of the 'Environment' criterion within the Stage 2 MCA, only the following sub-criterion were considered to be of significance in terms of differentiating between whole route options:

Soils and Geology (4.a.)

This criterion remains as that set out for Stage 1 MCA, as presented in **Section 2.6.2.5**, but applied to each whole route.

Landscape and Visual (4.b.)

This criterion remains as that set out for Stage 1 MCA, as presented in **Section 2.6.2.5**, but applied to each whole route.

Archaeology, Architecture and Cultural Heritage (4.c.)

This criterion remains as that set out for Stage 1 MCA, as presented in **Section 2.6.2.5**, but applied to each whole route.

2.7.4 Route Options Summary Table

As with the Stage 1 MCA, for each end-to-end route option considered at Stage 2 MCA, a route options summary table has been prepared which collates and summaries the appraisal of route options under each of the assessment criterion.

The Stage 2 MCA summary table is contained within **Appendix 8.3, Volume 2**, with the emerging assessment summary table presented in the main report.

As with the Stage 1 MCA, end-to-end route options have been relatively compared against each other based on the five-point scale presented in **Table 2.2**.

An overall Stage 2 MCA table is then provided, bringing together each of the individual sub-criterion assessments under the main assessment criterion as set out in **Table 2.4**.

A qualitative appraisal of, and conclusions from, the route options assessment is then provided, highlighting the key issues considered in determining a recommended Emerging Preferred Route (EPR).

The output of the Stage 2 Multi-Criteria Assessment is the Emerging Preferred Route for New Metro North.

3 System Objectives

3.1 Background

The Fingal/North Dublin Transport Study concluded that a high quality public transport service, in addition to the existing bus network, could generate southbound passenger demands, sufficient to justify provision of a metro/light rail infrastructure – however, this is contingent on the metro providing a high frequency and high capacity service that is independent of other public transport network constraints.

This study concluded that the metro should be designed to operate a maximum peak service frequency running at two-minute headways (i.e. 30 trams per hour in each direction) and be free of constraints imposed by other transport modes.

Subsequent to the Fingal/North Dublin Transport Study, the National Transport Authority set out the following requirements for the New Metro North scheme, at the starting point for this NMN Options Assessment process:

- NMN should be fully segregated from other transport modes between Dublin Airport and the City Centre;
- NMN should have an initial capacity of 10,000 passengers per hour per direction, with passive provision being made for an ultimate capacity of at least 15,000 passengers per hour per direction;
- NMN should be capable of operating at a minimum headway of 2 minutes between the Green Line tie-in and the Airport stop, and a headway of 4 minutes north of the Airport;
- NMN should consist of 2.4m or 2.65m wide, single saloon, articulated, bi-directional light rail vehicles, of a minimum length of 60m, and capable of being extended to up to at least 90m in length;
- NMN station platforms should initially be of a minimum length of 60m and capable of being extended up to at least 90m in length;
- Intermediate emergency access and ventilation shafts will be required at an approximate spacing of 1km along the NMN route; and
- NMN should be a LRT system similar to systems operating in Europe.

A review of the above system objectives, shows that some of these requirements impose constraints on the alignment options available to deliver the NMN scheme and could influence the choice of options. The main influencing factors are the level of segregation and the size of the metro platforms.

Key to delivering the high level of benefits achievable from a mass rapid transit systems such as NMN is the ability to guarantee and secure the operational efficiency.

The attractiveness of NMN as a viable alternative mode of transport to access employment is linked to the frequency of trains and the reliability of the service.

It must also be capable of meeting capacity demands. Equally, the ability to ensure that operational efficiency continues into the future is linked to the ability to expand as demand increases, plus the ability of the NMN to adapt as technologies advance over the lifetime service – all of which stem from the system that is installed at the outset. Therefore, the type of metro, form of metro and design of metro (i.e. the metro characteristics) are all key considerations in planning a metro system.

This chapter describes the anticipated NMN system objectives and design principles adopted for the study, in so far as they informed and influenced the options assessment process.

3.2 Alignment Characteristics

A metro system's ability to deliver a reliable service and a high capacity service is affected by the degree to which it can operate within its own dedicated alignment corridor, without physical interaction with other transport modes and pedestrians. The highest level of segregation is known as fully segregated systems. Metro systems worldwide vary with some providing full segregation and others, which due to a combination of factors including the physical environment, operate with a reduced level of segregation and a consequential reduced service level performance.

Broadly speaking, the extent to which a metro system operates on a dedicated right of way is described in terms of 'full segregation', 'partial segregation' or 'at-grade running'.

3.2.1 Full Segregation

Full segregation is normally achieved by placing the metro infrastructure in tunnels, deep cut or on elevated structures thereby ensuring the route alignment is fully isolated from other transport modes and pedestrians, ensuring that metro vehicles can operate at reliable frequencies and speeds, unimpeded by the need to stop at pedestrian and traffic junctions. As passengers are unable to gain access to the metro infrastructure at locations other than stations, the metro service can operate with a high degree of reliability without possibility of encountering unauthorised persons on the live rail line.

Fully segregated metro systems can be driver operated; however, the deployment of Automatic Train Operation (ATO) systems, which can facilitate autonomous metro services is becoming more prevalent in the industry, for both new and existing lines (through conversions). Autonomous metro services can further enhance the reliability, speed and capacity of fully segregated metro systems.

Images of fully segregated systems such as a typical metro tunnel, deep cut and elevated structure are shown in **Figure 3.1**, **Figure 3.2** and **Figure 3.3** respectively.

Figure 3.1: Metro running in tunnel



Figure 3.2: Metro in cut section



Figure 3.3: Elevated Metro

3.2.2 Partial Segregation

It is sometimes the case that achieving full segregation is not required or achievable due to the physical environment and/or available funding. In such a scenario, the metro system is designed as a partially segregated system. In a partially segregated system, the rail alignment is fully isolated from other vehicles by conveying the rail infrastructure under or over critical traffic junctions within an underpass or overpass structure or through the junction on a dedicated signal cycle. Between each junction, the alignment is partially segregated from pedestrian access through the installation of line side fencing with a break to allow access for pedestrians at metro stations.

As the route alignment is fully isolated from other vehicular movements and partially segregated from pedestrians, metro vehicles can operate at reliable frequencies and speeds, unimpeded by the need to stop at traffic junctions. Unauthorised persons can however access the live rail line over the line side fencing. This however greatly inhibits the ability to introduce autonomous metro services and as a consequence partially segregated systems are generally required to be driver controlled with drivers using light of sight operations to ensure the vehicles stops in a controlled fashion and a safe distance in advance of personnel or obstruction on the live rail.

An illustration of a section of partially segregated metro is provided in **Figure 3.4**.

Figure 3.4: Metro running with partial segregation – Minnesota, USA



3.2.3 At-grade Running

It is sometimes the case that achieving even partial segregation is not desirable or achievable due to the physical environment, passenger demand requirements or available funding. In such a scenario, the metro system is designed with a heavy emphasis on the use of at-grade running.

The rail alignment travels at road/path level and passes through critical traffic junctions with the metro service receiving a high level of priority over other traffic modes at each traffic junction. Between each traffic junction the alignment is partially segregated from pedestrian access through the installation of line side fencing. The requirement to stop and/or slow down at traffic junctions does impact negatively on the frequency and reliability of service levels.

As with partially segregated system, unauthorised persons can access the live rail line over the line side fencing which greatly inhibits the ability to introduce autonomous metro services. Non-segregated systems are generally required to be driver controlled with drivers using light of sight operations to ensure the vehicles stops in a controlled fashion and a safe distance in advance of personnel or obstruction on the live rail.

An illustration of a typical section of an at-grade metro is provided in **Figure 3.5**.

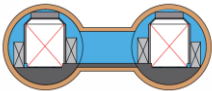


Figure 3.5: Metro running At-Grade - Line B Los Angeles

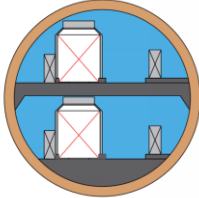
3.3 Metro Tunnel and Station Characteristics

3.3.1 Tunnel Configuration

The options available for tunnelling on New Metro North are illustrated in Table 3.1 and described thereafter. The selection of the route options is initially not influenced by the tunnel configurations. However, the cost varies for each configuration, a recommendation on the optimum configuration is made based on a cost and technical analysis.

Table 3.1: Tunnel Configurations for NMN

Tunnel Configuration	Track configuration	Internal Diameter (m)	Depth to rail at stations
Twin Bore Single Track		5.9	Ultra-shallow, shallow, deep
Single Bore Twin Track (Side by Side) – with no wall		9.3	Shallow, deep
Single Bore Twin Track (Side by Side) – with dividing wall		11.6	Shallow, deep

Tunnel Configuration	Track configuration	Internal Diameter (m)	Depth to rail at stations
Monotube		12.5	Deep

Twin Bore Single Track

Twin Bore Single Track configuration consists of two separate tunnel bores, each with a single track. The tunnels are commonly connected by cross passages, which are typically spaced at 250m centres. This configuration has the smallest diameter and hence can be constructed at the shallowest depth.

Single Bore Twin Track (Side-by-Side)

Single Bore Twin Track (Side-by-Side) configuration consists of a single tunnel with both tracks contained within it. Depending on the proposed fire strategy, the tunnel may or may not include a dividing wall. The option with the dividing wall would increase the diameter of the tunnel due to additional walkways required either side of the wall. As the option without the dividing wall can be provided safely, this option was recommended.

Monotube

The monotube is a variation on the single bore twin track (stacked) configuration, which consists of a single tunnel with both tracks contained within the tunnel bore with the tracks stacked one above the other. The variation from the typical single bore stacked option is that the tunnel has been enlarged to allow the provision of station platforms within the tunnel bore.

This configuration generally leads to deeper stations as there needs to be a minimum of two levels in the station to service both platforms.

Intervention Shafts

Intervention shafts are required to allow passengers egress from the tunnels in the event of an emergency when the spacing of the stations exceeds a certain limit. For twin bore tunnels, access points can be spaced up to 1.5km apart. For single bore tunnels it is assumed that exits to the surface (which would also be available for intervention) are required at approximately 1km intervals. If underground stations on NMN are less than 1km apart, then it is expected that there would be no requirement for intervention shafts.

Optimum Tunnel Configuration

Initial options for the metro alignment routes are developed without a bias towards any tunnel configuration, thus ensuring that the route selection is independent of the ultimate tunnel configuration.

Concept design of the initial options is capable of adapting to whichever tunnel configuration is selected. The twin bore configuration has been assumed initially in the Options Assessment process in order to develop Assessment Options and to provide a cost estimation for the purposes of comparative assessments of the route options.

The Assessment Options are taken through a multi-criteria assessment before narrowing the selection to a number of end-to-end routes. End-to-end options are analysed to establish the optimum tunnel configuration.

3.3.2 Station Types

It is a requirement that NMN station platforms shall be of a minimum length of 60m and capable of being extended up to at least 90m in length. This length imposes constraints on the alignment due to the requirement to minimise the gradient over the extent of the station, to limit the gradient on the approach to and from the station, and to limit the horizontal radius on approach to the station. There are various platform configurations (side and island) which are to be considered.

Side Platform

This arrangement consists of two platforms that sit either side of two central tracks so that each direction is served by a single platform.

It is more difficult to transfer and way finding is slightly more difficult as decisions by passengers accessing the station have to be made at ground or concourse level. The side platform sits naturally with single bore twin track as the tracks are together as the tunnel enters the station, meaning no transition box is required. It can potentially work with the twin bore single track configuration however, it would require a transition on approach to the station to combine the tracks.

Figure 3.6: Typical Underground Station Side Platform Layout

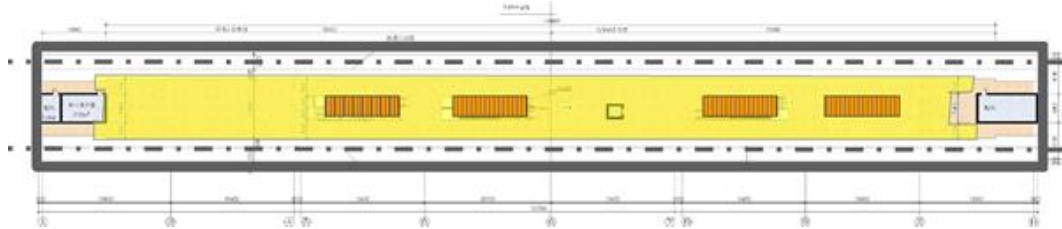


Island Platform

This arrangement consists of a single platform that sits between two tracks so that both directions are served by a single platform. It has benefits for transfers and passenger experience as it simplifies the way finding in the station.

The island platform sits naturally with twin bore single track as the two tunnels can be spaced to enter the station at the required separation, meaning no transition in an additional excavation is required. It can potentially work with the single bore twin track (side-by-side) configuration, however, it would require a transition on approach to the station, to separate the tracks.

Figure 3.7: Typical Underground Station Island Platform Layout



Stacked Platform

This arrangement consists of two single platforms that sit above and below each other so that each direction is served by a single level. It is more difficult to transfer and way finding is slightly more difficult as decisions by passengers accessing the station have to be made at concourse level. The stacked platform sits naturally with monotube as the tracks are stacked within the tunnel meaning no transition box is required.

4 Receiving Environment

4.1 Introduction

This chapter describes the receiving environment within the NMN Study Area. For each study area, detail of the baseline data collected is presented which in turn informed the identification of constraints and opportunities for the identification of potential route options for NMN.

4.2 Study Area A – City Centre

4.2.1 Overview

The extent of Study Area A is presented in **Figure 4.1**.

The map displays the central part of Dublin, Ireland, with the River Liffey as a prominent feature. The city is divided into several districts, each labeled in large, bold, blue capital letters: SMITHFIELD, PORTOBELLO, RATHMINES, RANELAGH, DUBLIN CITY CENTRE, DOCKLANDS, and EAST WALL. The map shows a dense network of streets, with major roads like the R1, R2, and R4 clearly marked. Public transport routes are indicated by colored lines: a red line for the Dublin Bus route, a blue line for the DART (Dublin Area Rapid Transit) route, and a green line for the Luas (Dublin Light Rail) route. Key landmarks and stations are marked with icons and labels, including the Buses Bus Station, Connolly Station, and St. Stephen's Green. The map is framed by an orange border, and the overall color scheme is a mix of light blues, greens, and greys, typical of a modern digital map.

This study area extends from Ranelagh in the south to Drumcondra in the north. It extends eastwards to encompass Tara and Connolly Stations and westwards as far as the Phibsborough Road.

The study area encompasses almost the entire ‘core’ City Centre area. This includes the historic core of the city traversing some of the main thoroughfares and encompassing many of the most significant architectural features in the state. Existing land-use varies considerably and includes pockets of residential, together with retail, office and other commercial and educational/institutional uses.

4.2.2 Constraints

4.2.2.1 Tie-in Locations

Luas Green Line Tie-in

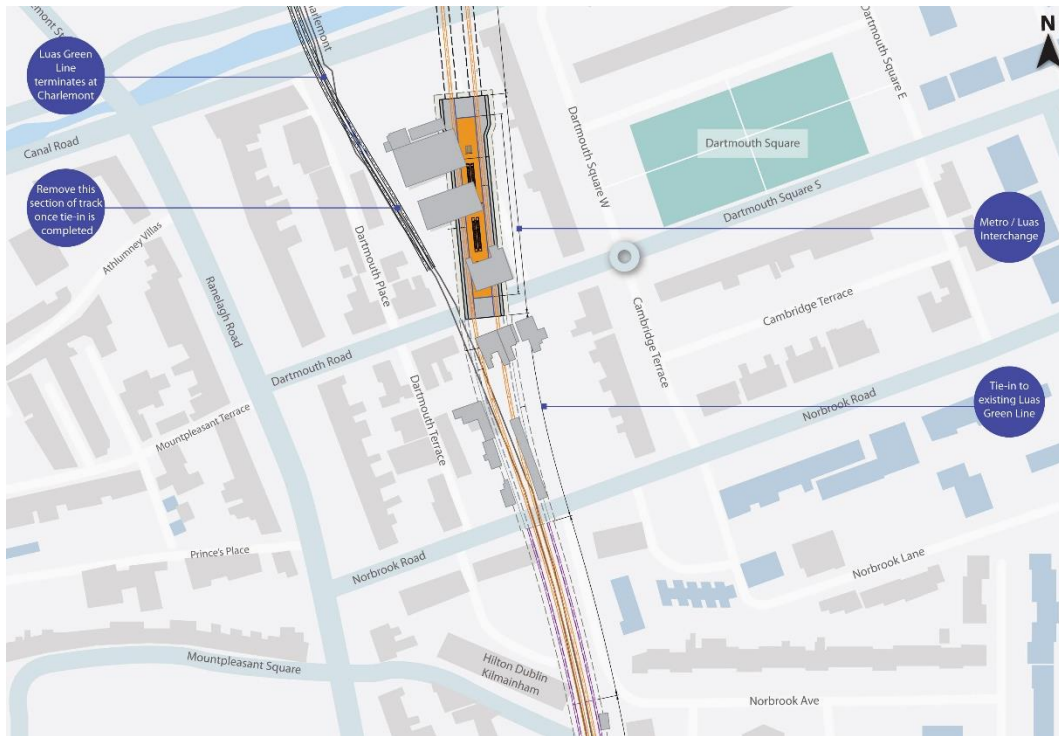
As set out in Chapter 1, the GDA Transport Strategy identifies the need to upgrade the Luas Green Line to metro standard to facilitate Metro South. To provide integration between Metro North and Metro South, it is planned to extend the NMN southwards, via a tunnel, to join the Green Line in Ranelagh, thereby allowing metro services to run from Swords to Brides Glen.

To this end, TII and NTA carried out a study¹ to identify the optimum tie-in location between NMN and the Luas Green Line. This study included an assessment of all reasonable tie-in points and undertook a multi-criteria assessment of the options available. Effects on the environment was one of the criterion within this multi-criteria assessment. The findings of this study identified Charlemont Luas stop as the optimum location for this tie-in.

In the context of this Options Study, this tie-in location is identified as a fixed location and as a result, all feasible and practicable route options for NMN within Study Area A are required to tie into this point and include for an interchange between NMN and the Green Line Luas at this location.

Furthermore, the NMN track south of the proposed Charlemont station/stop is intended to follow an alignment to connect in-line directly to the existing Luas Green Line alignment when it reaches the existing Ranelagh stop to the south as shown in **Figure 4.2**.

¹ New Metro North Green Line Tie-In Stage 1 Report

Figure 4.2: NMN Luas Green Line Tie-in at Charlemont

Following the tie in of NMN with the Luas Green Line via a station at Charlemont there will no longer be a physical track connection between the Luas Green Line north of the tie-in and the track to the south which will become Metro only.

4.2.2.2 Environmental Constraints

The environmental constraints identified in Study Area A are presented in **Figure 4.3**, **Figure 4.4** and **Figure 4.5** and described in the following sections.

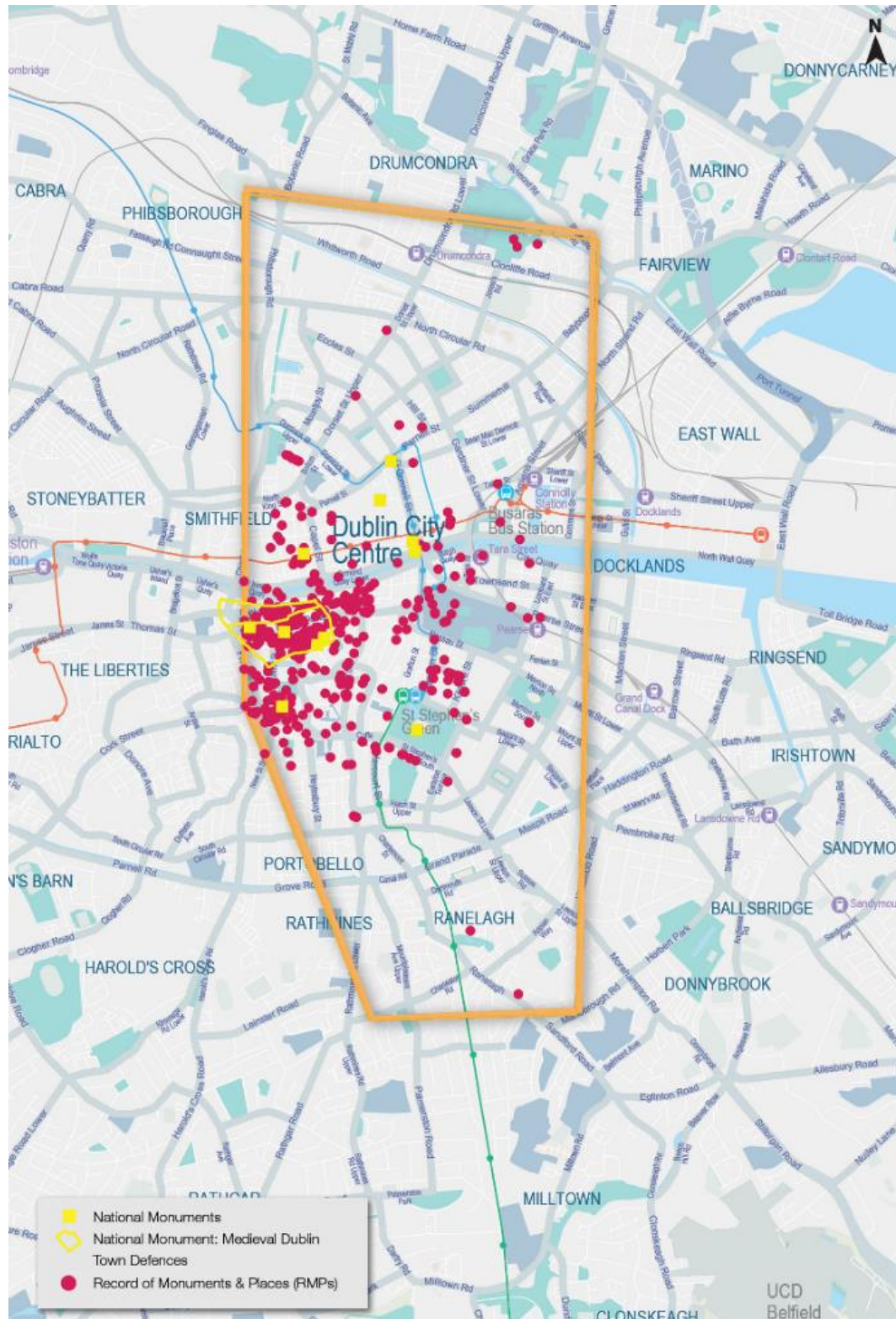
Figure 4.3: Study Area A – Archaeology and Cultural Heritage Constraints

Figure 4.4: Study Area A – Architectural Heritage and Cultural Heritage Constraints

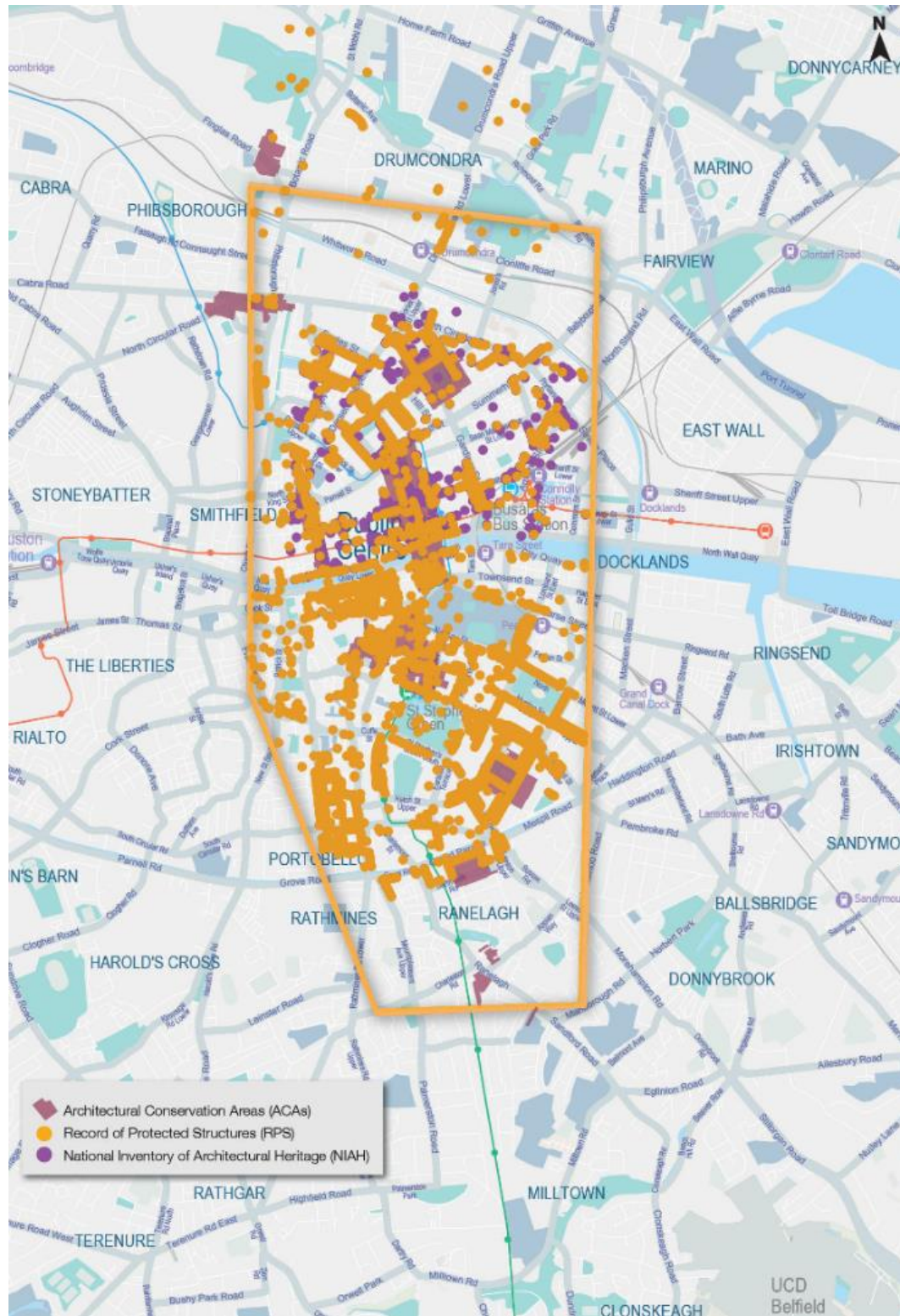
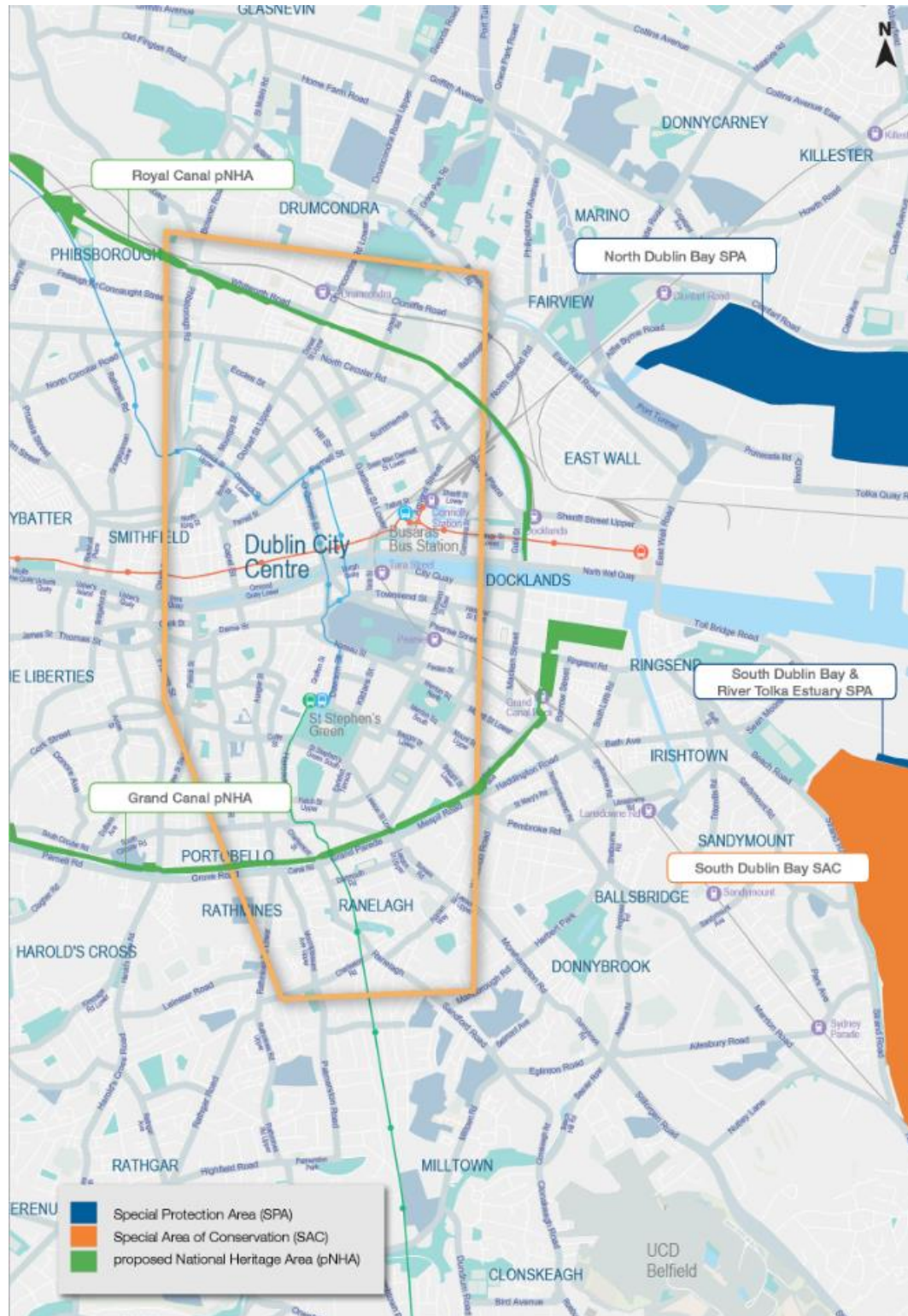


Figure 4.5: Study Area A - Biodiversity Constraints

Archaeology, Architecture and Cultural Heritage

Archaeological sites are considered to be non-renewable resource. The National Monuments legislation legally protects access and the visual amenity associated with National Monuments and requires consent from the Minister for invasive works within their vicinity.

The primary source of information for archaeology is the Record of Monuments and Places (RMP) maintained by the Department of Culture, Heritage and the Gaeltacht (DCHG). National Monuments, monuments with a preservation order and the Record of Monuments and Places (RMP) have been considered for this study. The results of archaeological investigations conducted for the Metro North project have also been considered in the assessment.

For the purpose of this study, only areas of archaeological potential with statutory protection and archaeological constraints identified through the assessment of Metro North have been considered.

Architectural heritage is a unique and irreplaceable material asset which is given value by its design, setting quality of workmanship and use of materials. The Record of Protected Structures (RPS), sites of architectural heritage interest (NIAH) and Architectural Conservation Areas (ACAs) have been considered in this assessment.

A number of NIAH structures are also listed as protected structures, this means that an individual structure or building may have two entries and have been considered as an NIAH and a RPS (leading to double counting). As these are two separate datasets, it was decided to present all information for consideration as part of the reporting process.

Cultural heritage sites and sites of industrial heritage are often afforded protection either as a Recorded Monument or as Protected Structure or a structure within the National Inventory of Architectural Heritage. For the purpose of this study, the identification of sites of cultural heritage interest were considered in the context of statutory architectural and/or archaeological sites.

Archaeology and Cultural Heritage

The Historic City of Dublin (RMP DU018-020) is a designated recorded monument and reflects the continuous intense occupation of a relatively confined area from the Mesolithic period onwards to modern times. Upstanding monuments survive in the form of the city walls, several castles, churches, graveyards, historic parks and the quay walls.

There are 12 National Monuments within the constraints study area and these include the walled town defences of Medieval Dublin, Dublin Castle, St Mary's Abbey, Christ Church Cathedral, St Patrick's Cathedral, St Audeon's Church and monumental structures in the form of O'Connell, Parnell and O'Brien sculptures, St Stephen's Green and 14-17 Moore Street.

The city also has deeply buried archaeological deposits which provide a rich and complex record of human activity and while not readily legible in the street scape today, have been revealed through archaeological investigation and excavation.

In summary, within Study Area A there are:

- 12 National Monuments and 3 monuments with preservation orders;
- 635 Record of Monuments and Places (RMP) sites; and
- Below ground archaeological potential in the form of stratified archaeological deposits, finds and features.

The location of National monuments and RMP sites in Study Area A are presented in **Figure 4.3**. Full detail is available in **Volume 4, Environmental Constraints Report**.

Architectural Heritage and Cultural Heritage

Study Area A covers a large part of Dublin City Centre which has a rich and varied cultural landscape of historic buildings and structures.

These structures range from nationally important parks and designed landscapes such as Stephens Green to the typical Georgian and Victorian terraces that form part of the modern day streetscape. These historic buildings remain mostly in use and support a mixture of residential and commercial uses.

The 18th century (Georgian Dublin) was a period of rapid expansion and growth for the city to the extent that it became the second city of the British Empire and one of the largest and most prestigious capitals in Europe. This Georgian legacy of formal squares and gardens, newly laid out street plans as well as individual buildings, structures, bridges and street surfaces (stone sets and cobblestones etc) is recognised by the state in its nomination of the *Historic City of Dublin* on the tentative list as an UNESCO world heritage site.

The modern street plan incorporates elements of the curving organic medieval city along with the formal classical symmetry of Georgian Dublin. Architectural features, historic street furniture and sculptures add to the cultural identity of the city. Dublin city has long enjoyed an association with writers and poets such as Swift, Goldsmith Yeats, Joyce and Shaw, and institutions such as the Abbey and the Gate.

Extensive surveys carried out by the RPA for the Luas Cross City Project led to the identification and recording of subterranean structures, therefore, there is the potential to reveal cellars/ basements that extend out beneath of the road surface as part of NMN.

The form of buildings and spaces, civic, institutional and educational buildings within set pieces of urban design, the unique Georgian squares and streets, together with the larger areas of Victorian and Edwardian architecture north and south of the canals and the industrial buildings and smaller mews and worker's housing all contribute to the city's character, diversity and identity.

In summary, within Study Area A, there are:

- 3,226 Record of Protected Structures (RPS) sites;
- 1,343 National Inventory of Architectural Heritage (NIAH) structures; and

- 13 Architectural Conservation Areas (ACAs) including The O’Connell Street area, The Grafton Street area and the South City Retail Quarter.

The location of RPS sites, NIAH structures and ACAs within Study Area A are presented in **Figure 4.4**. Full detail is available in **Volume 4, Environmental Constraints Report**.

Biodiversity

Natura 2000 sites

There are four ‘Natura 2000’ sites located within a potential zone of influence of the project:

- South Dublin Bay SAC;
- South Dublin Bay and River Tolka Estuary SPA;
- North Bull Island SPA; and
- North Dublin Bay SAC.

Proposed Natural Heritage Areas (pNHA’s)

Nationally designated proposed Natural Heritage Areas (pNHAs) include the Royal Canal pNHA and Grand Canal pNHA which intersect Study Area A. These sites have limited hydrological connectivity to Dublin Bay and the European sites located in outer Dublin Bay.

The River Liffey is not designated as a conservation area but considered as an ‘Annexed habitat: Estuaries from Dublin Bay up to Chapelizod Weir’.

The location of Natura 2000 sites and pNHAs are presented in **Figure 4.5**. Full detail is available in **Volume 4, Environmental Constraints Report**.

Landscape and Streetscape

In terms of landscape, Dublin City Centre comprises some of the most significant and sensitive urban landmarks, spaces and streetscapes in Ireland. These include the Nationally and internationally recognisable urban set pieces of St Stephen’s Green and surrounding streets; examples being the Shelbourne Hotel, the Georgian streetscapes of the South City Centre; Merrion Square and surroundings streets; Government Buildings (Leinster House), the National Gallery, the National Museum, the Mansion House; Grafton Street and surrounding streets; Trinity College, College Green, Bank of Ireland; Dame Street, Central Bank; Dublin Castle, St Patrick’s Cathedral and Christchurch; Temple Bar; the Liffey Quays, Custom House, City Bridges; O’Connell Bridge, O’Connell Street, G.P.O., the Spire; Parnell Square, the Rotunda; and Mountjoy Square and the Georgian streetscapes of the North City Centre.

Study Area A also includes part of Dublin’s North City Centre, including the Western Docklands, Connelly Station and North Strand; Dorset Street; and the village areas of Phibsborough and Drumcondra. The quality of the existing urban streetscape and general residential amenity are key landscape and visual constraints within this northern section of Study Area A. The area also includes

notable urban landscape and visual features, including Croke Park, the Royal Canal Corridor; and Blessington Street Basin and the Royal Canal Bank Park.

Further information on the key views and prospects within Study Area A are detailed in section 1.8 of **Volume 4, Environmental Constraints Report**.

4.2.3 Opportunities

4.2.3.1 Key Trip Attractors

Key trip attractors which could potentially be served by the metro in Study Area A are illustrated in **Figure 4.6** and summarised in **Table 4.1**.

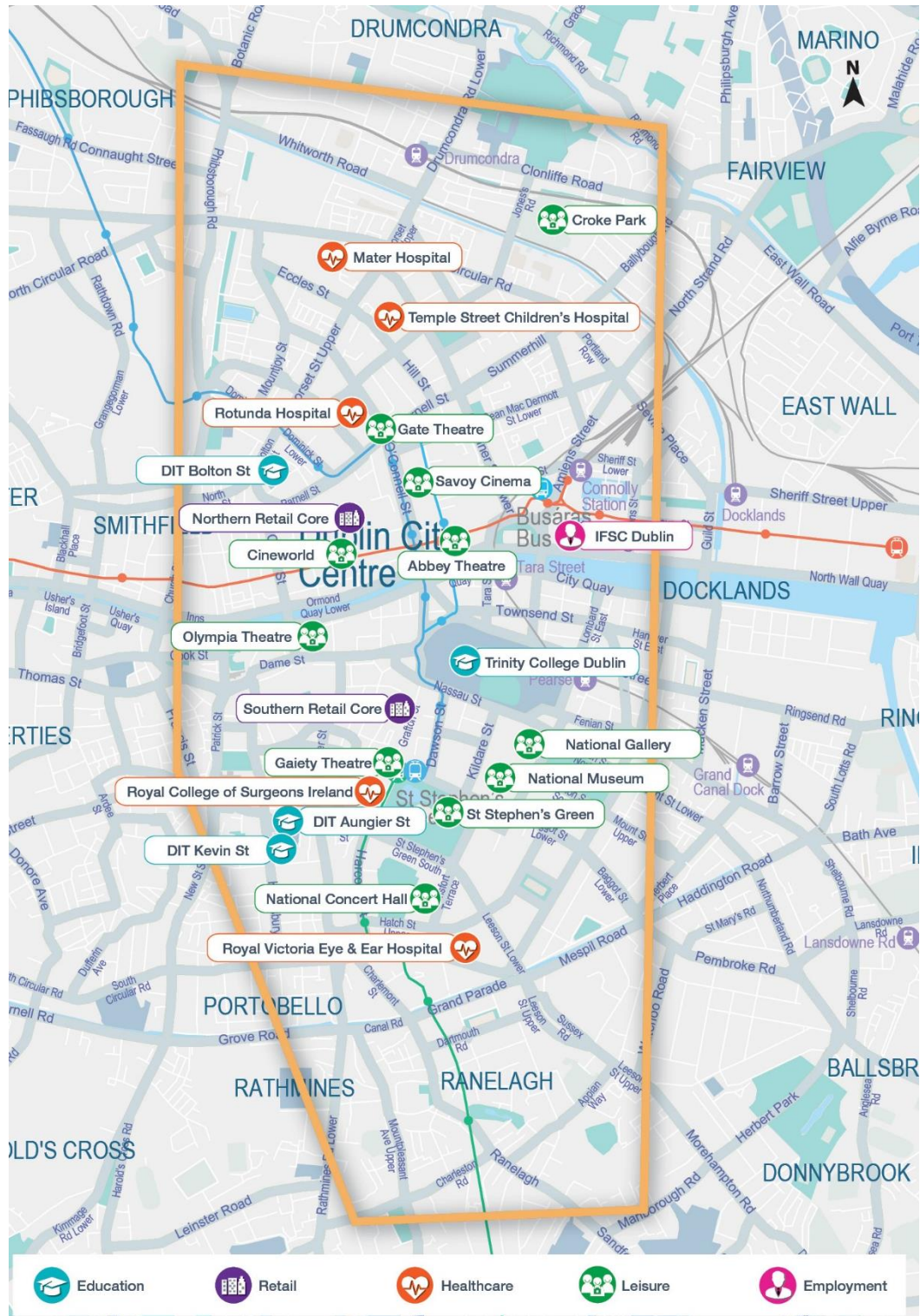
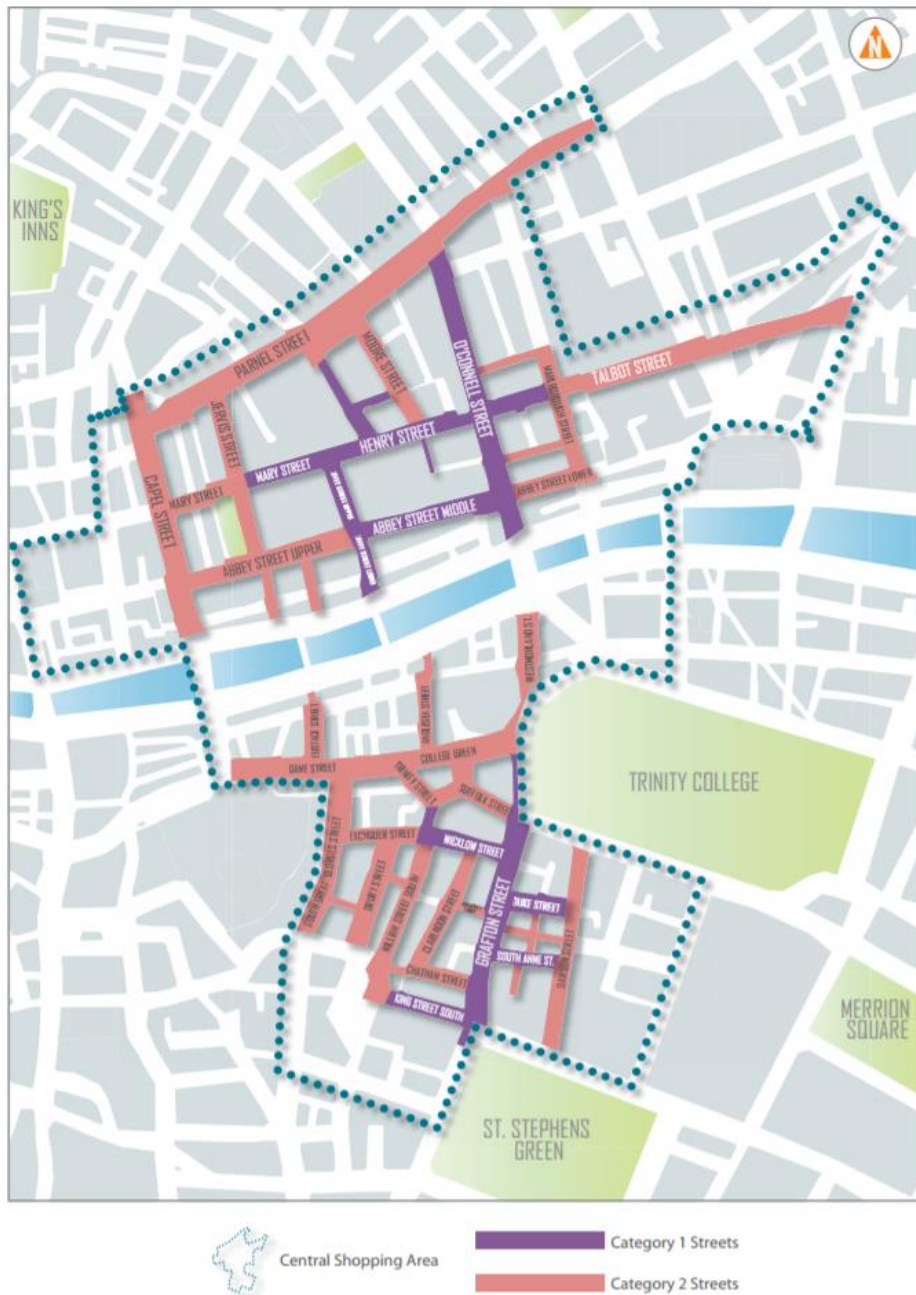
Figure 4.6: Study Area A Key Trip Attractors

Table 4.1: Study Area A - Summary of Key Trip Attractors

Key Trip Attractors
<p>Education</p> <ul style="list-style-type: none"> • Trinity College Dublin • National College of Ireland • Dublin Institute of Technology (DIT) Aungier Street • Dublin Institute of Technology (DIT) Bolton Street
<p>Commercial Centres</p> <ul style="list-style-type: none"> • City Centre Retail Core – North • City Centre Retail Core – South • Ranelagh Village • Phibsborough Village
<p>Healthcare</p> <ul style="list-style-type: none"> • Rotunda Hospital • Temple Street Children’s Hospital • Mater Hospital (Public and Private) • Royal College of Surgeons Ireland (RCSI) • Royal Victoria Eye and Ear Hospital • St. Vincent’s Psychiatric Hospital Fairview
<p>Leisure</p> <ul style="list-style-type: none"> • National Concert Hall • National Gallery of Ireland • National Museum of Ireland • Abbey Theatre • Gaiety Theatre • The Gate Theatre • Olympia Theatre • Savoy Cinema • Cineworld • St. Stephen’s Green • Croke Park
<p>Employment</p> <ul style="list-style-type: none"> • Irish Financial Services Centre (IFSC)

Of particular significance in terms of trip attraction Study Area A is the City Centre Retail Core, as defined in the Dublin City Development Plan, and shown in **Figure 4.7**.

Figure 4.7: Dublin City Centre Retail Core – Principal Shopping Streets

The retail core is split into two areas, north and south of the River Liffey:

- City Centre Retail Core – North: O'Connell Street, Henry Street, Middle Abbey Street, Henry Street and Liffey Street Upper; and
- City Centre Retail Core – South: Grafton Street, King Street South, South Anne Street, Duke Street, Wicklow Street and St. Andrew's Street (between Wicklow Street and Trinity Street).

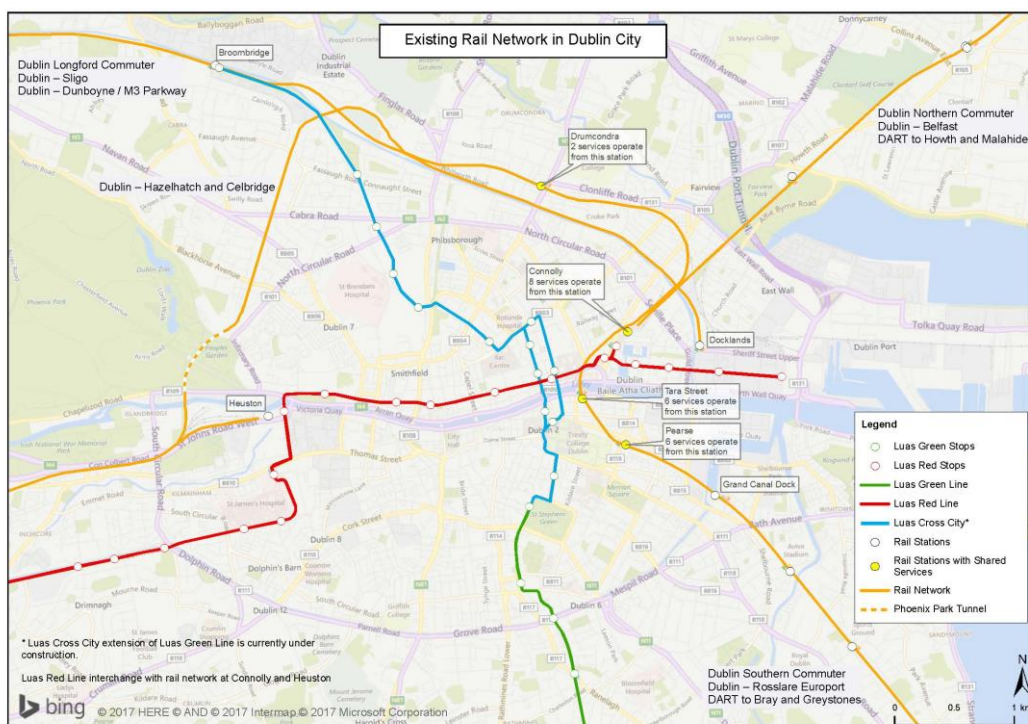
4.2.3.2 Transport Network Integration Opportunities

The overall integrated GDA Transport Strategy places emphasis on, and provision of, facilities to support interchange between transport services in order to provide overall benefits in terms of capacity, accessibility (ideally with most public transport trips between origin and destination being made with one or less service interchanges), and network efficiency. Within the city centre area, it is therefore an objective of the GDA Transport Strategy to provide high quality interchange points, which facilitate efficient transfer between public transport services.

This is directly applicable to NMN in terms of maximising the benefits of the scheme and significantly contributing to the overall accessibility of the city centre and beyond, through potential interchange opportunities with all public transport services.

A review of the existing public transport services was undertaken to establish the potential for the metro to facilitate integration / interchange with other public transport modes. The existing rail network is shown in **Figure 4.8**.

Figure 4.8: Study Area A Existing Rail Network

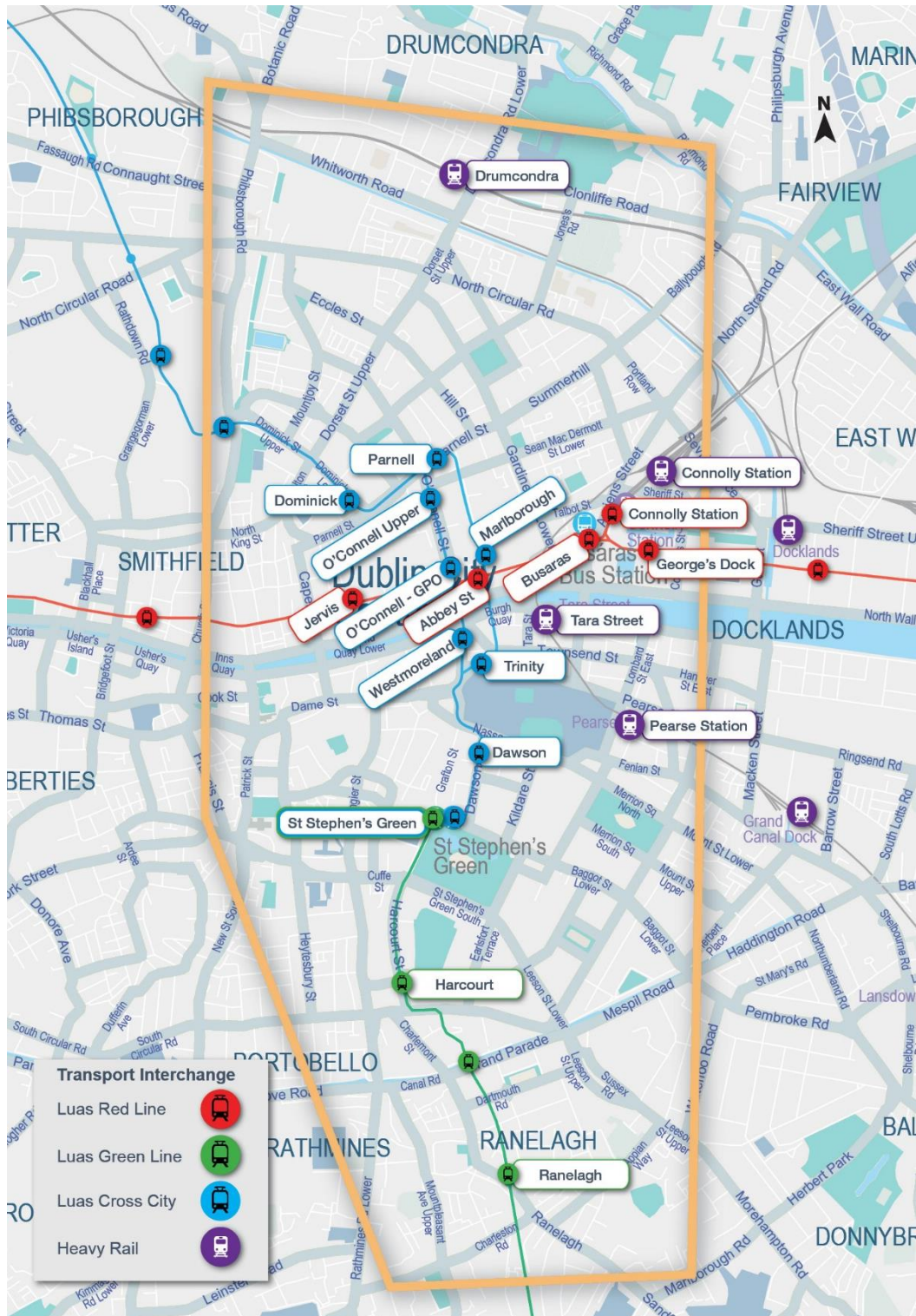


In terms of the existing network:

- Drumcondra Railway Station provides interchange with the heavy rail services on the Maynooth Line. (Western Commuter to Maynooth/Longford & Phoenix Park Tunnel, Commuter to (Hazelhatch/Celbridge and Sligo Intercity). NMN will intersect with the Maynooth Line as it passes south to north through the study area. This could be at Drumcondra Railway Station or at an alternative point on the Maynooth Railway Line to the east or west of Drumcondra Station;

- Connolly Railway Station provides interchange with heavy rail services Intercity (Rosslare Europort, Wexford, Belfast, and Sligo), Northern Commuter (Dundalk), Western Commuter (Maynooth/Longford), South Eastern Commuter (Gorey), Phoenix Park Tunnel Commuter (Hazelhatch & Celbridge), and DART. There is also interchange with the LUAS network at this point;
- Pearse and Tara Street Stations provide interchange opportunities with Intercity (Rosslare, Europort & Wexford), Northern Commuter (Dundalk), Western Commuter (Maynooth/Longford), South Eastern Commuter (Gorey), Phoenix Park Tunnel Commuter (Hazelhatch & Celbridge Rosslare Europort Intercity, Wexford Intercity, Northern Commuter (Dundalk), Western Commuter (Maynooth/Longford), South Eastern Commuter (Gorey), Phoenix Park Tunnel Commuter (Hazelhatch & Celbridge) and DART;
- Luas Line interchange opportunities exist at Charlemont, St. Stephen's Green, Abbey Street, Connolly Station and Parnell Square;
- Bus Áras provides an interchange opportunity with a large number of bus services; while
- There are a large number of bus routes operating along the north and south quays, O'Connell Street, Dame Street, Georges Street, Nassau Street, Camden Street.

Locations which could potentially provide high quality passenger interchange points and facilitate convenient transfer between metro and existing Luas, bus and heavy rail while serving key trip attractors are presented in **Figure 4.9**.

Figure 4.9: Study Area A Interchange Opportunity Locations

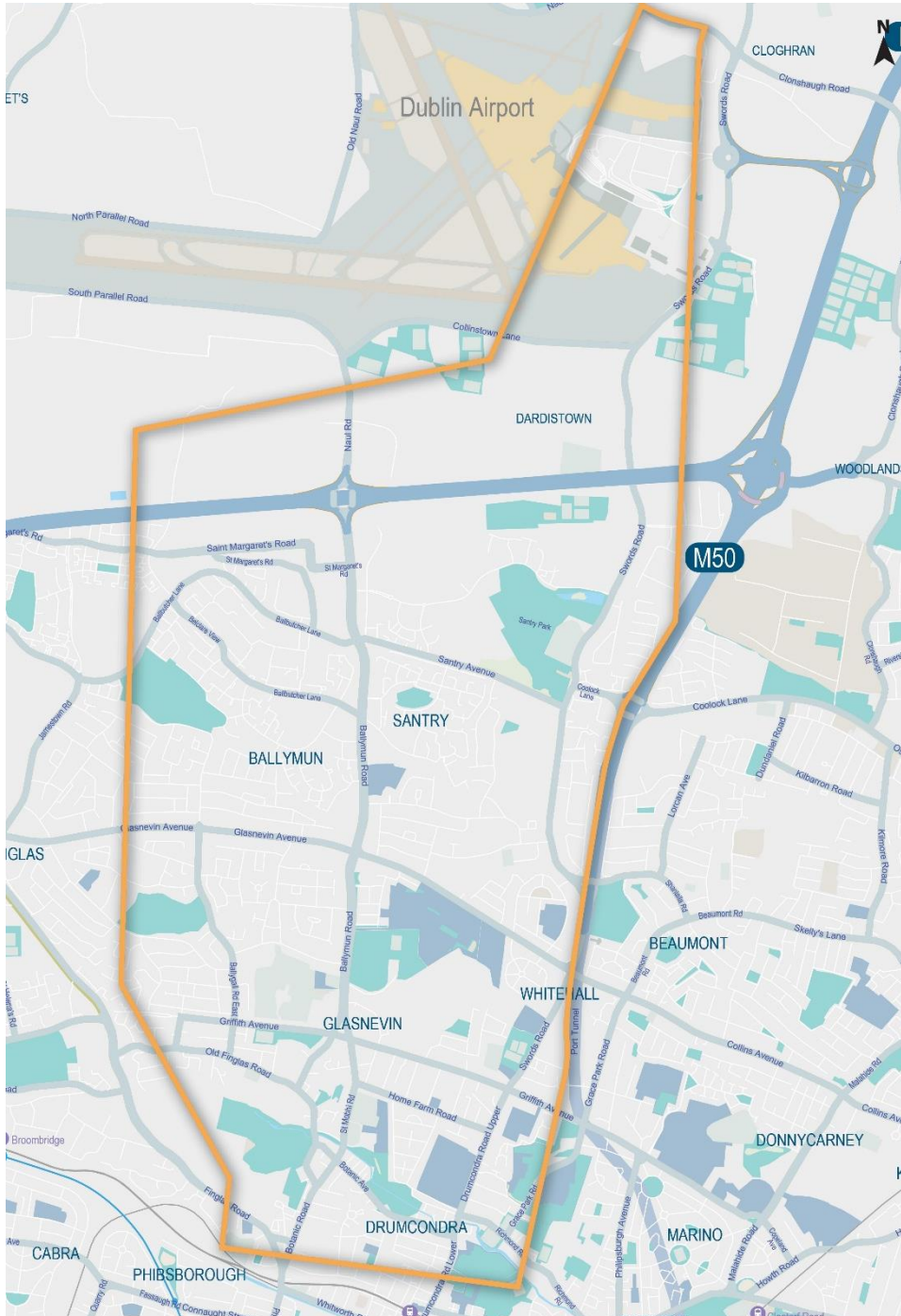
In addition to potential for integration with the rail network, Study Area A also includes a dense network of bus routes serving all parts of the city. Any route option through Study Area A will provide opportunity for interchange with the core bus network.

4.3 Study Area B

4.3.1 Overview

The extent of Study Area B is presented in **Figure 4.10**.

Figure 4.10: Study Area B - Ballymun/Airport



This study area extends from Drumcondra in the south to Dublin Airport in the north. It extends eastwards to take in the M1/M50 Motorway and to the west as far as Finglas Village.

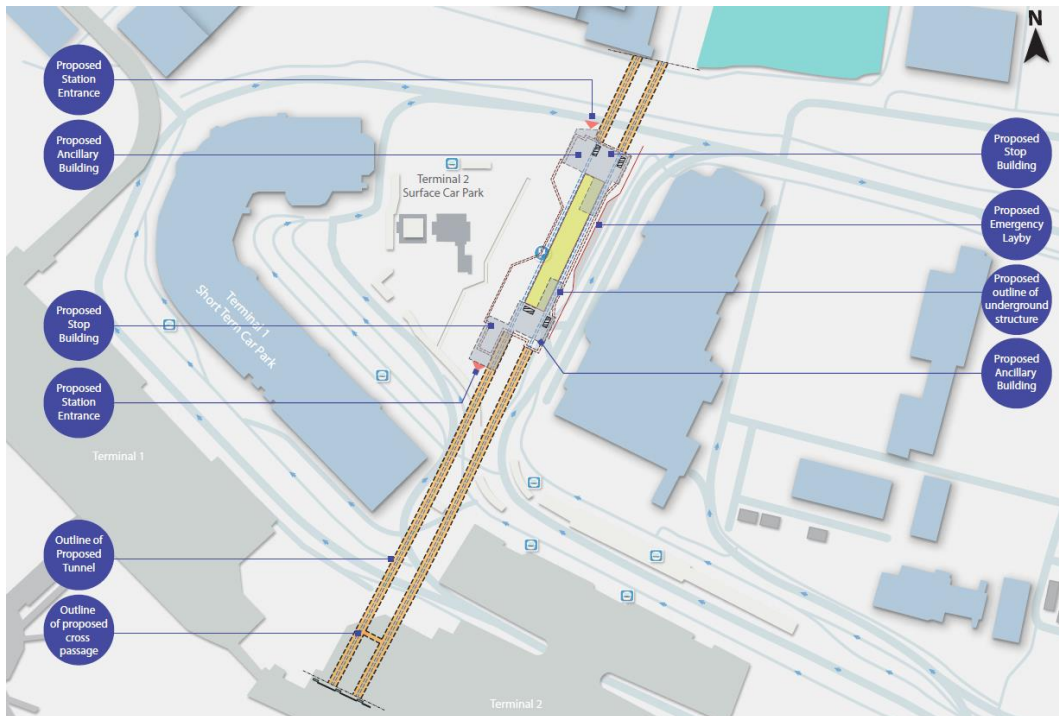
The current land uses within this study area section vary considerably. From the airport, moving south, the land-use along the eastern side of the study area is predominantly mixed-use general enterprise/employment along with residential. The primary centres of commercial and retail activity within the study area are, Santry Village, Ballymun Town Centre, Glasnevin and Drumcondra Village. Outside of these centres, the majority of the study area can be defined as being residential in character, with large areas of recreational/open space also present, such as Santry Park. Outside of the commercial centres, there are other key areas of existing and planned future commercial and retail development which generate travel demand, notably Ikea, to the north of Ballymun (immediately south of the M50 and west of the R108) and the Northwood Retail and Business Park areas (immediately south of the M50 and east of the R108).

North of the M50, the study area includes the Dardistown LAP development lands within the Fingal Metro Economic Corridor, as set out in Section 1.2.

4.3.2 Constraints

4.3.2.1 Tie-in Locations

NMN will run underground at Dublin Airport with tunnel portals located outside of the airport's perimeter. The alignment of the tunnel as it passes through the airport is fixed to tie into the proposed Ground Transportation Centre as shown in **Figure 4.11**. All route options in Study Area B will be required to tie into this point. As this particular location is already fully developed to receive the metro, the environmental impacts of tying into this location are minimal, and to attempt to tie in at an alternate location will have significantly more environmental effects.

Figure 4.11: Alignment through Dublin Airport²

4.3.2.2 Environmental constraints

The environmental constraints identified in Study Area B are presented in **Figure 4.12**, **Figure 4.13** and **Figure 4.14** and described in the following sections.

² Old Metro North Railway Works Line MN Alignment Details Airport – Rail Order

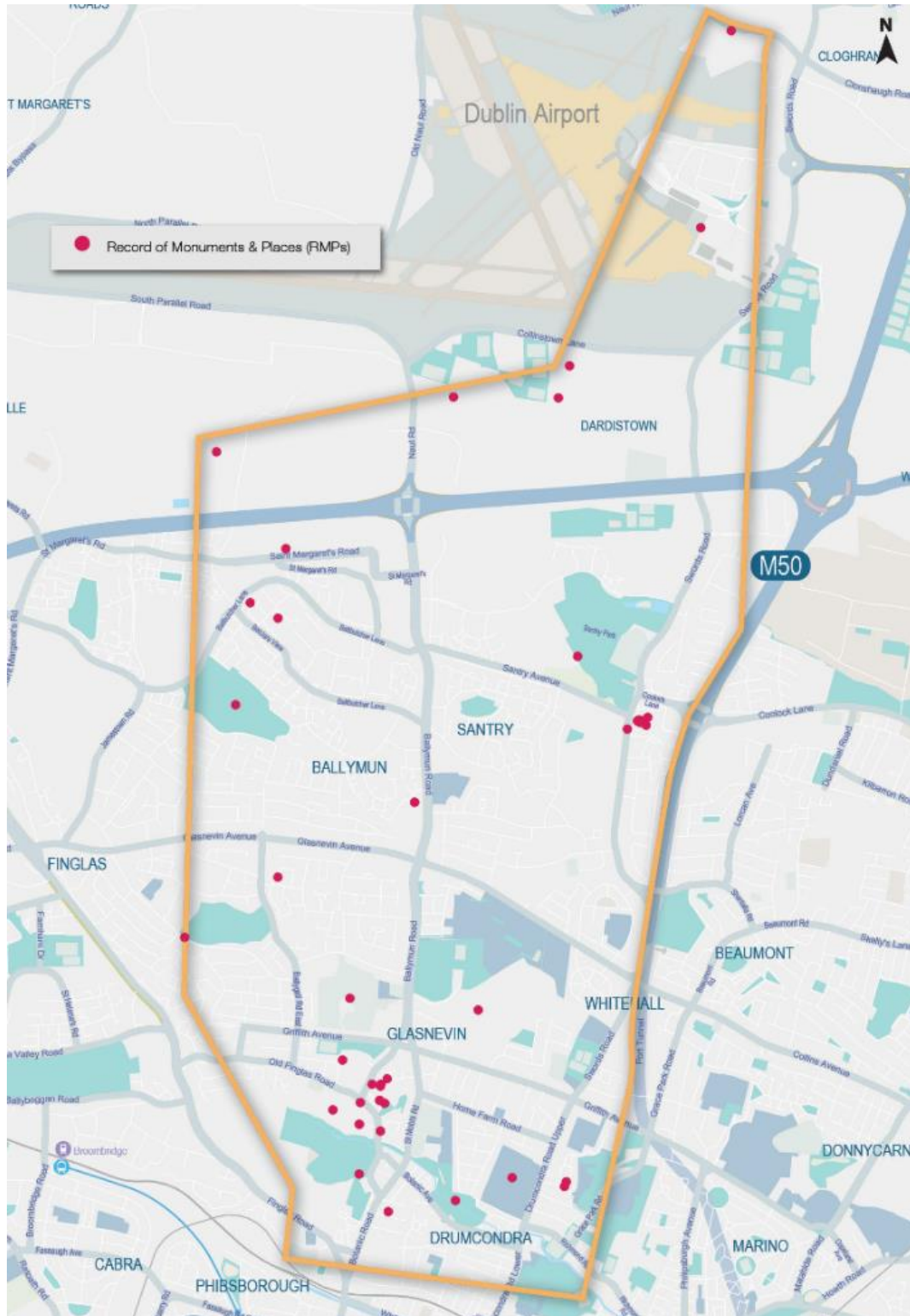
Figure 4.12: Study Area B – Archaeology and Cultural Heritage Constraints

Figure 4.13: Study Area B – Architectural Heritage and Cultural Heritage Constraints

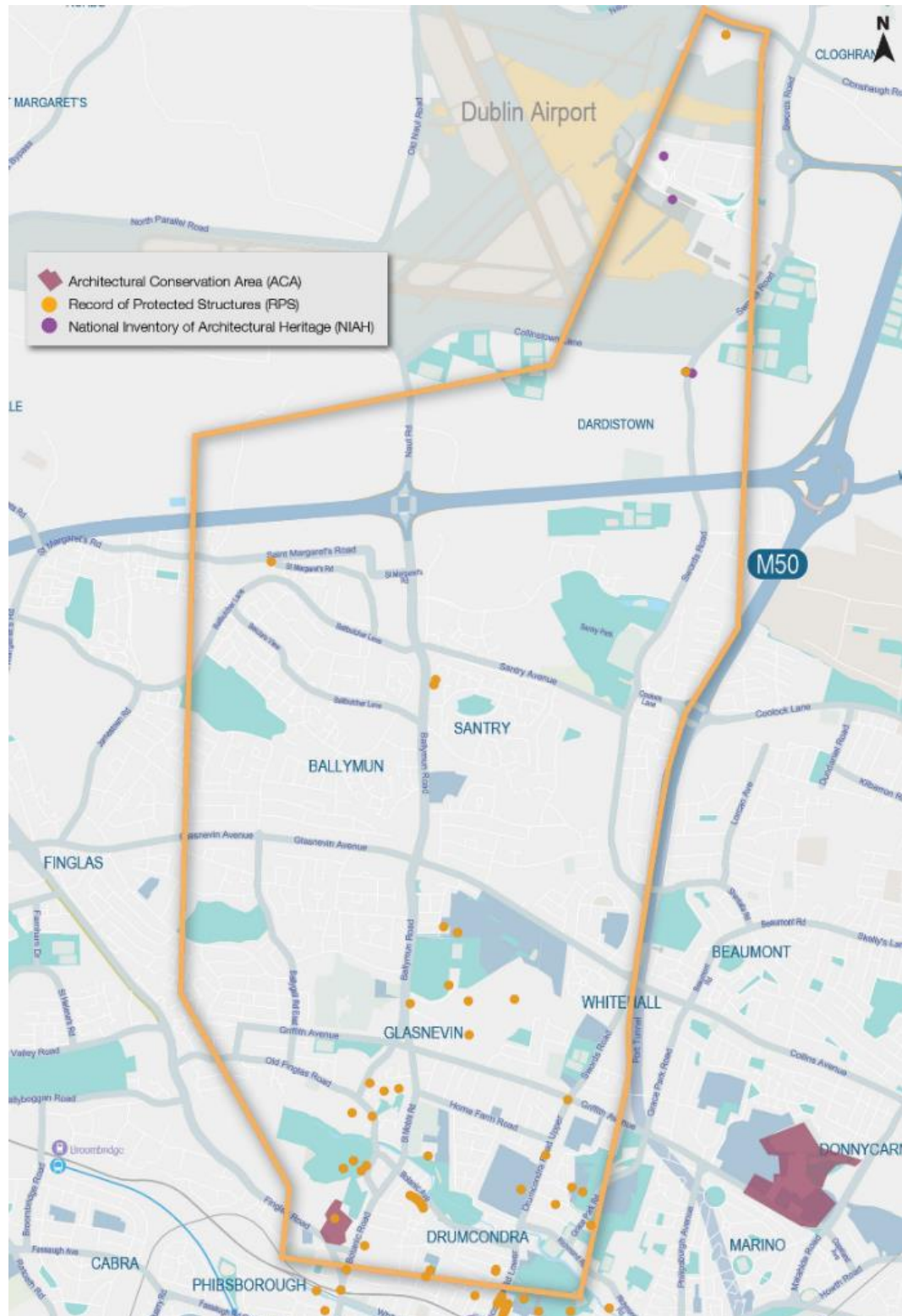
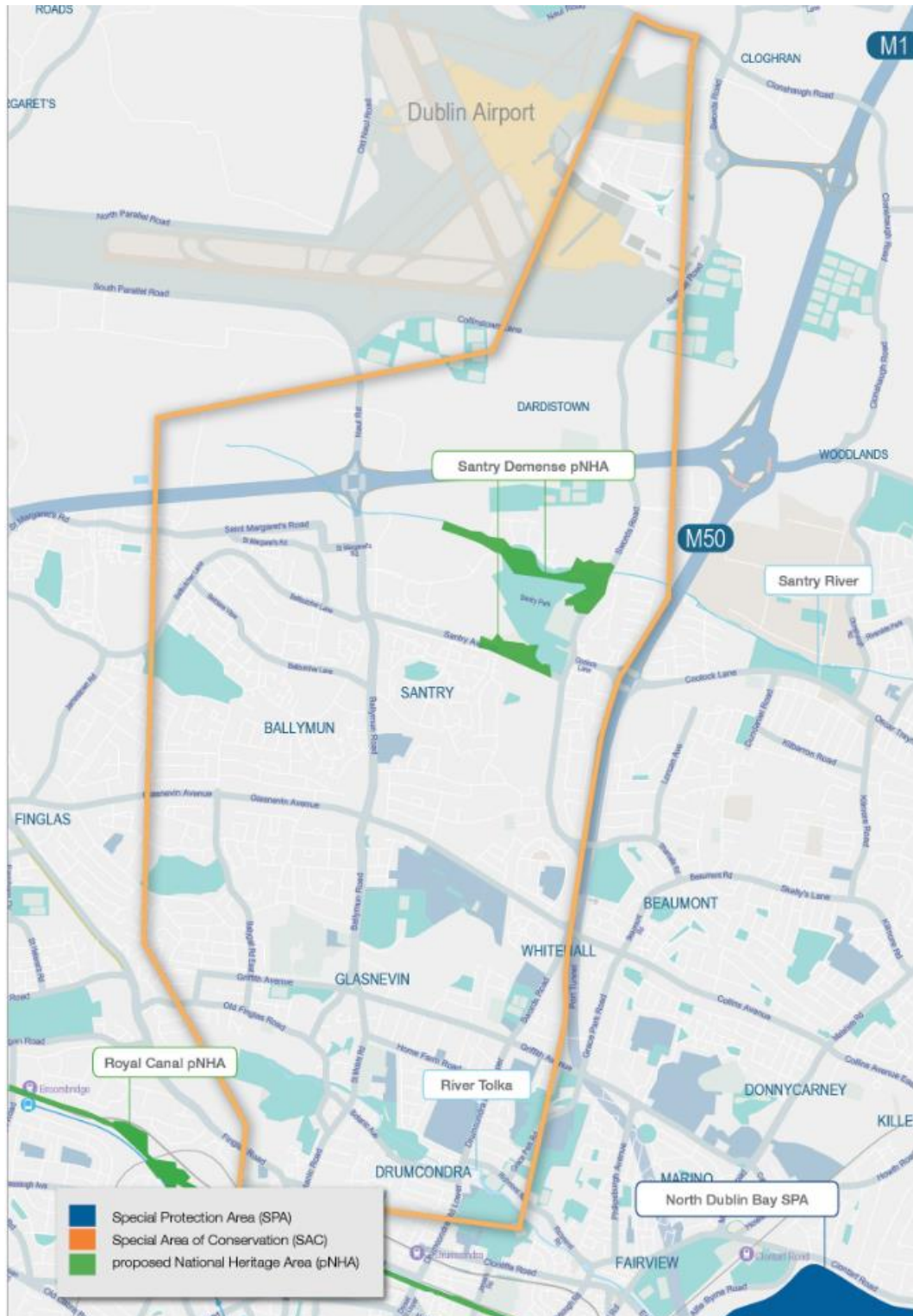


Figure 4.14: Study Area B - Biodiversity Constraints



Archaeology and Cultural Heritage

There is a high potential to uncover subsurface archaeological finds and/ or stratigraphy within undeveloped green fields or agricultural land. For example, the Metro North archaeological investigations at Dardistown (Ballystruan and Ballymun townlands) previously revealed a burnt mound, an isolated pit, cremation pits, a rectangular enclosure, a curvilinear ditch and a fire pit (Licence Refs. 10E410, 09E0479, 11E039, 09E0480 and 09E0478). Features associated with these newly revealed archaeological sites could extend into the line of proposed routes and stations for NMN.

In summary, within Study Area B, there are:

- No National Monuments;
- No monuments with preservation orders;
- 43 RMP sites; and
- Undeveloped green fields within institutional and educational grounds (schools and colleges) and agricultural land which has the potential to reveal buried archaeological deposits, finds and sites.

The location of RMP sites within Study Area B are presented in **Figure 4.12**. Full detail is available in **Volume 4, Environmental Constraints Report**.

Architectural Heritage and Cultural Heritage

The study area contains residential Georgian, Victorian and Edwardian housing along with modern residential and commercial development, for example along the R108, structures such as the Botanic House (a licenced premises) (RPS BH416), the former player's factory (RPS BH417) and features such as the railings and gates associated with the former St Vincent's orphanage (RPS BH4606) add to the architectural heritage diversity and interest of the area.

Institutional buildings in the form of Dublin City University and former demesne lands such as Santry Court and Hampstead House and amenity and educational areas such as the Botanic Gardens are also present within the study area.

In summary, within Study Area B, there are:

- 47 RPS sites;
- 4 NIAH structures; and
- 1 ACA, Prospect-DeCourcy Square and Environs ACA, a residential enclave located east of Glasnevin Cemetery. The majority of the buildings are late Victorian and Edwardian houses with red and yellow brick facades.

The location of RPS sites, NIAH structures and the ACA within Study Area B are presented in **Figure 4.13**. Full detail is available in **Volume 4, Environmental Constraints Report**.

Biodiversity

Natura 2000 sites

There are four Natura 2000 sites located within a potential zone of influence of the project:

- North Dublin Bay SAC with River Tolka connectivity
- South Dublin Bay SAC with River Tolka connectivity
- North Bull Island SPA with River Tolka connectivity
- South Dublin Bay and River Tolka Estuary SPA with River Tolka connectivity

Proposed Natural Heritage Area

- Santry Demesne is a proposed Natural Heritage Area (pNHA), located north of old Santry village within Study Area B.

The location of Natura 2000 sites and pNHA are presented in **Figure 4.14**. Full detail is available in **Volume 4, Environmental Constraints Report**.

Landscape and Streetscape

Study Area B includes part of Dublin's North City Suburbs and Dublin Airport, including the village areas and surrounds of Drumcondra, Glasnevin, Whitehall, Santry, and Ballymun. The area also includes the major north-south road arteries of the N1 Drumcondra – Whitehall Road and the R108 St. Mobi – Ballymun Road as well as the tree-lined east-west avenues of the R102 Griffith Avenue, R103 Collins Avenue, and R104 Santry Avenue.

Key landscape/urban landscape and visual constraints include:

- The core village areas of Drumcondra, Glasnevin and Santry;
- Residential land uses throughout, including some residential conservation areas;
- Tolka River Valley and associated parks, including Griffith Park and Tolka Park Sports Ground;
- Botanic Gardens;
- Glasnevin Cemetery and Dardistown Cemetery;
- Dublin City University and Sports Grounds;
- Santry Demesne, which includes an extensive Tree Preservation Order, Santry River Valley and Morton Stadium/Sports Grounds;
- Regional, District and Local Parks, including Hampstead Park; Balcurris Park, Poppintree Park;
- Institutional lands with open space, sports facilities, mature tree planting, including Holy Cross College, All Hallows College, St. Joseph's, St. Patrick's College, Colaiste Caoimhin, St. Clare's, and various school grounds etc.;
- Sillogue Park Golf Course, ALSAA Sports Grounds, Tolka Rovers Sports Grounds; and

- Tree-line avenues of Griffith Avenue, Collins Avenue, and St. Mobi Road.

4.3.3 Opportunities

4.3.3.1 Key Trip Attractors

Key trip attractors which could potentially be served by the metro in Study Area B are illustrated in **Figure 4.15** and summarised in **Table 4.2**.

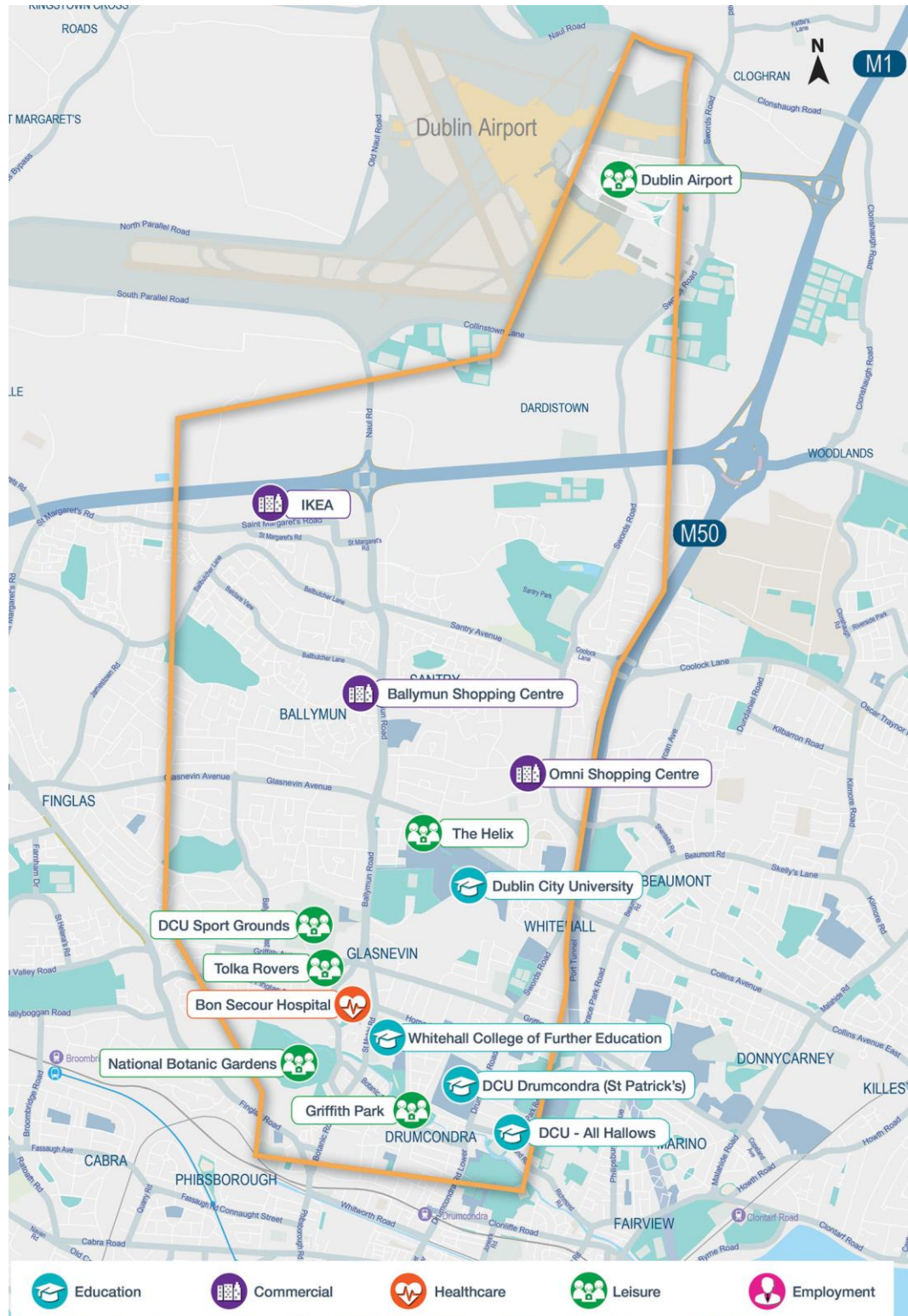
Figure 4.15: Study Area B Key Trip Attractors

Table 4.2: Summary of Key Trip Attractors

Key Trip Attractors
Education <ul style="list-style-type: none"> • DCU All Hallows • DCU Glasnevin • DCU Sports Grounds • DCU St. Patricks College
Commercial Centres <ul style="list-style-type: none"> • Glasnevin Village • Santry Village • Ballymun Shopping Centre • Omni Shopping Centre
Healthcare <ul style="list-style-type: none"> • Bon Secours Hospital Dublin • Whitehall College of Further Education
Leisure <ul style="list-style-type: none"> • Griffith Park • National Botanic Gardens • The Helix • Tolka Rovers • Santry Park • Santry Sports Stadium • Griffith Park
Employment <ul style="list-style-type: none"> • Dublin Airport • Ikea • Northwood Estate • Gulliver's Retail Park

4.3.3.2 Transport Network Integration Opportunities

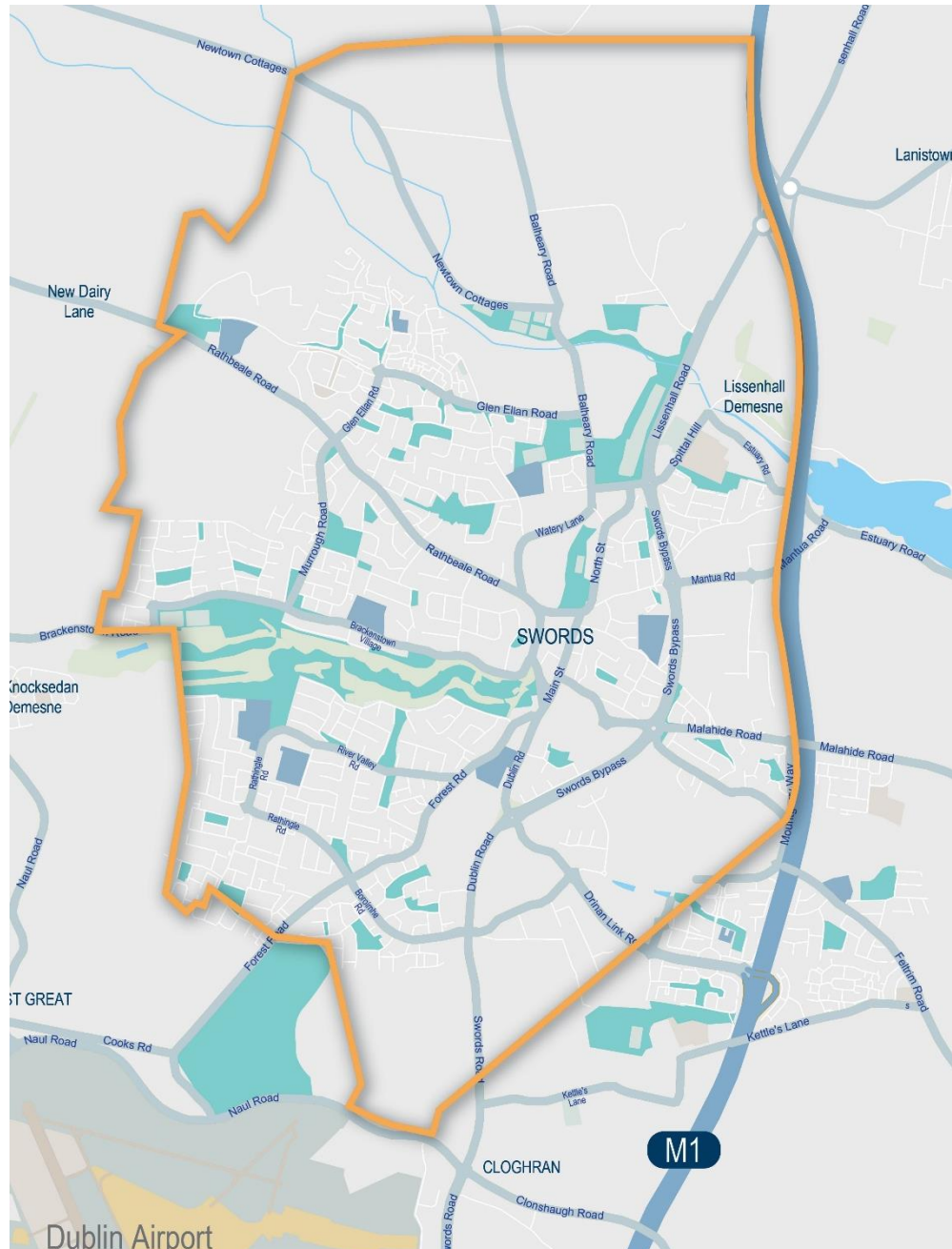
There are no interchange opportunities with heavy rail or Luas in Study Area B. However, Study Area B includes the Ballymun to Phibsborough and Swords to Drumcondra radial Core Bus Corridors (CBCs). In addition, the Blanchardstown to Kilbarrack and Ranelagh to Drumcondra orbital CBCs pass through Study Area B.

4.4 Study Area C

4.4.1 Overview

The extent of Study Area C is presented in **Figure 4.16**.

Figure 4.16: Study Area C - Swords



This study area stretches from Dublin Airport in the south to Lissenhall north of Swords Village. It extends eastwards as far as the M1 Motorway and westwards to encompass existing and developing residential areas including Boromimhe, Ridgewood, River Valley, Thornleigh, Applewood and Ashton Brock.

Current land uses within the study area section corridor predominantly comprise of low density sub-urban residential areas centred around Swords Village. Swords acts as the commercial and retail centre of the area. There are also a number of significant employment uses within the study area section, including Balheary Industrial Park, the Bristol-Myers Squibb facility located off Watery Lane and the Swords Business Park to the east of the R132.

As set out in Section 1.23, although a considerable section of the Metro Economic Corridor identified by Fingal County Council is centred on land banks along the R132, lands along the regional road route remain relatively undeveloped, comprising a mix of greenbelt and low density general enterprise/employment business parks. This includes the Airfield Retail Park at the southern end of the study area section. The area between Airside and Dublin Airport is generally greenbelt with some pockets of residential development.

4.4.2 Constraints

4.4.2.1 Tie-in Locations

Northern Terminus

The National Transport Authority commissioned a study to examine the role of Park and Ride in the Greater Dublin Area (GDA) as part of the preparation of the GDA Transport Strategy up to the year 2035. The purpose of this study was to recommend Park and Ride options in the GDA based on a review of policies and best practices locally and internationally. Park and Ride is considered a key component of the GDA Transport Strategy and is viewed as a means of increasing the accessibility of the public transport network to a population that might not otherwise access it. With increased accessibility, Park and Ride can strengthen the public transport system and support a more robust public transport network if implemented without compromising access for other modes of travel.

This study identified suitable areas for new Park and Ride facilities and/or the expansion of existing facilities within the GDA, and included engagement with Local Authorities and Transport Operators to collect planning and policy information relating to future Park and Ride locations. A recommendation for Park and Ride Policy was established for the Greater Dublin Area upon completion of this study.

It was found that Park and Ride in the GDA must be divided into two facility categories, rail based and bus based. These are then divided further by usage category, strategic or local. Strategic facilities generally refer to those located on the outskirts of urban areas before congestion commences.

Local sites are located closer to the origin of the trip, intercepting cars at the beginning of their journeys. It was established that rail is usually the most practical mode for strategic sites whereas local sites could be supported through a combination of modes.³

³ Draft Transport Strategy for the Greater Dublin Area – Executive Summary

A Park and Ride facility on NMN is considered a strategic site. Such sites are generally located on the outskirts of the contiguous built-up area, or prior to the start of where significant congestion levels occur on the strategic road network. These sites are also located on the main orbital route to the city and close to strategic radial routes prior to congestion commencing. The primary function of such sites is to intercept car trips from the adjacent radial route, attracting trips from a number of origins whilst minimising abstraction from existing public transport services. Equally, the facilities must improve public transport accessibility without unduly worsening road congestion, or increasing the total distance travelled by car within the GDA. This means that Park and Ride should be located in areas where the road network has the capacity to absorb the impact of car traffic.

The following criteria were utilised to assess suitable locations for strategic rail based park and ride facilities as are considered the main influencing factors on delivering a successful Park and Ride programme for such facilities:

- Intercept trips before they enter congested urban area;
- Easy access to/from radial routes without impacting on congestion on local road networks;
- Compliance with existing local area objectives; and
- Have adequate capacity to accommodate the additional demand without displacing other public transport users accessing the station by other modes of travel.

A strategic location was identified at the northern terminus of NMN which would attract demand from the M1. This Park and Ride site has the potential to offer a competitive journey time into the city centre and allows users to bypass congestions on the M1/N1 and the R132. This is a strategic site and would be designed to attract trips from the adjacent radial routes.

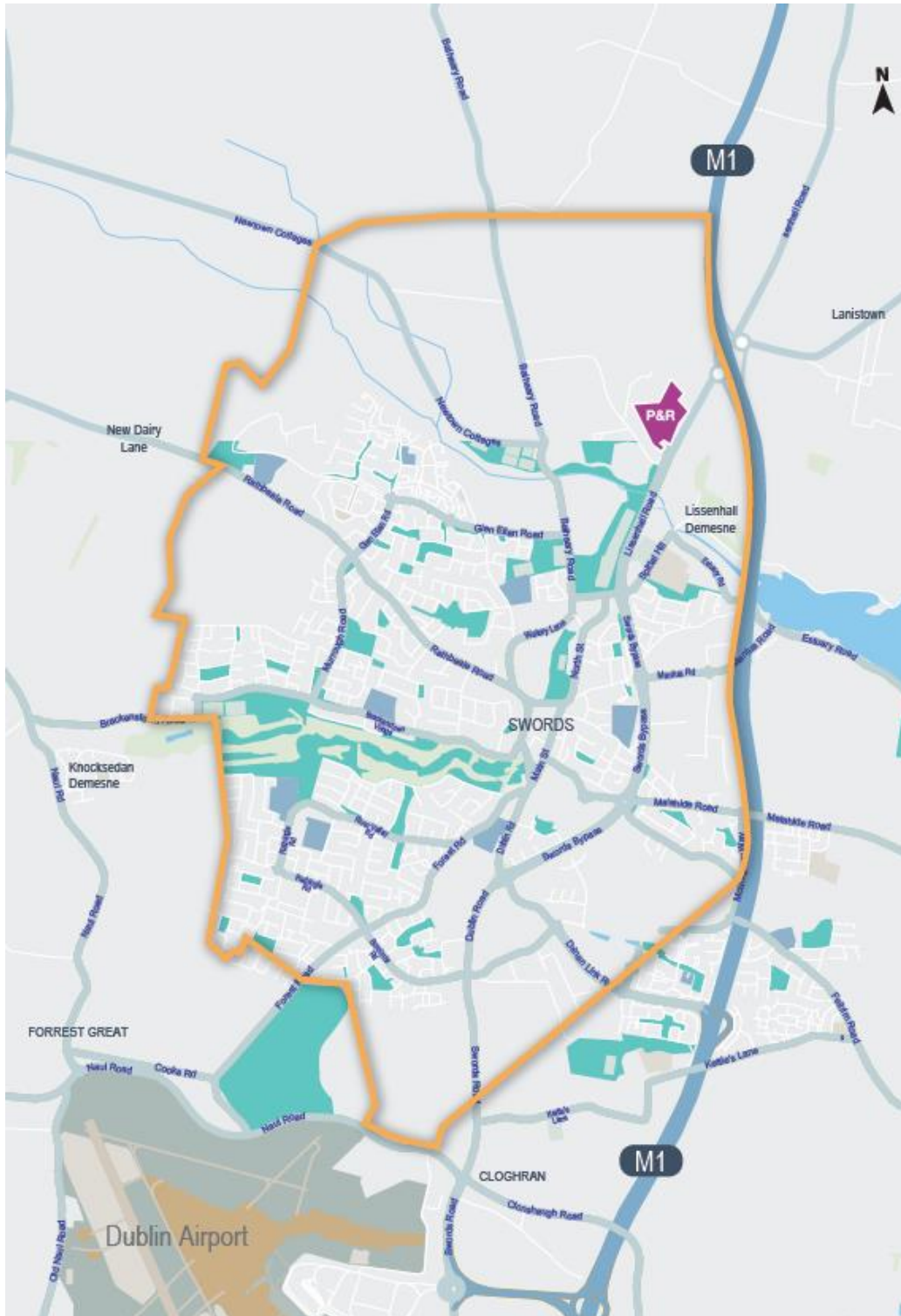
The location of the Park and Ride site to the north of Swords and to the south of the M1 influences the location of the terminus of NMN. The initial NTA study recommended a site on the east of the Estuary Roundabout adjacent to the R132 at the north edge of Swords, on the grounds of a public park as it has good links to the strategic network via the R132 which joins the M1. However, this area is identified to be at risk of flooding as part of the Fingal East Meath Flood Risk Assessment and Management Study. The areas of flood risk extend along its banks right through the urbanised centre of Swords to its confluence with the Broadmeadow River. In addition, this site is immediately adjacent to the urban area.

A location 400m further to the north of the Broadmeadow River as shown on **Figure 4.17** was assessed against the criteria above as performing better at intercepting the traffic before entering the congested urban areas.

It provides good access from the high capacity M1 junction and is located at sufficient distance from the M1 junction to enable construction of a right turn lane in the median of the R132 to allow access to the site.

It is located outside the floodplain and aligns with planning policy within the Fingal County Development Plan.

Figure 4.17: Northern Terminus – Proposed Park and Ride Location



4.4.2.2 Environmental constraints

The environmental constraints identified in Study Area C are presented in **Figure 4.18**, **Figure 4.19** and **Figure 4.20** and described in the following sections.

Figure 4.18: Study Area C – Archaeology and Cultural Heritage Constraints

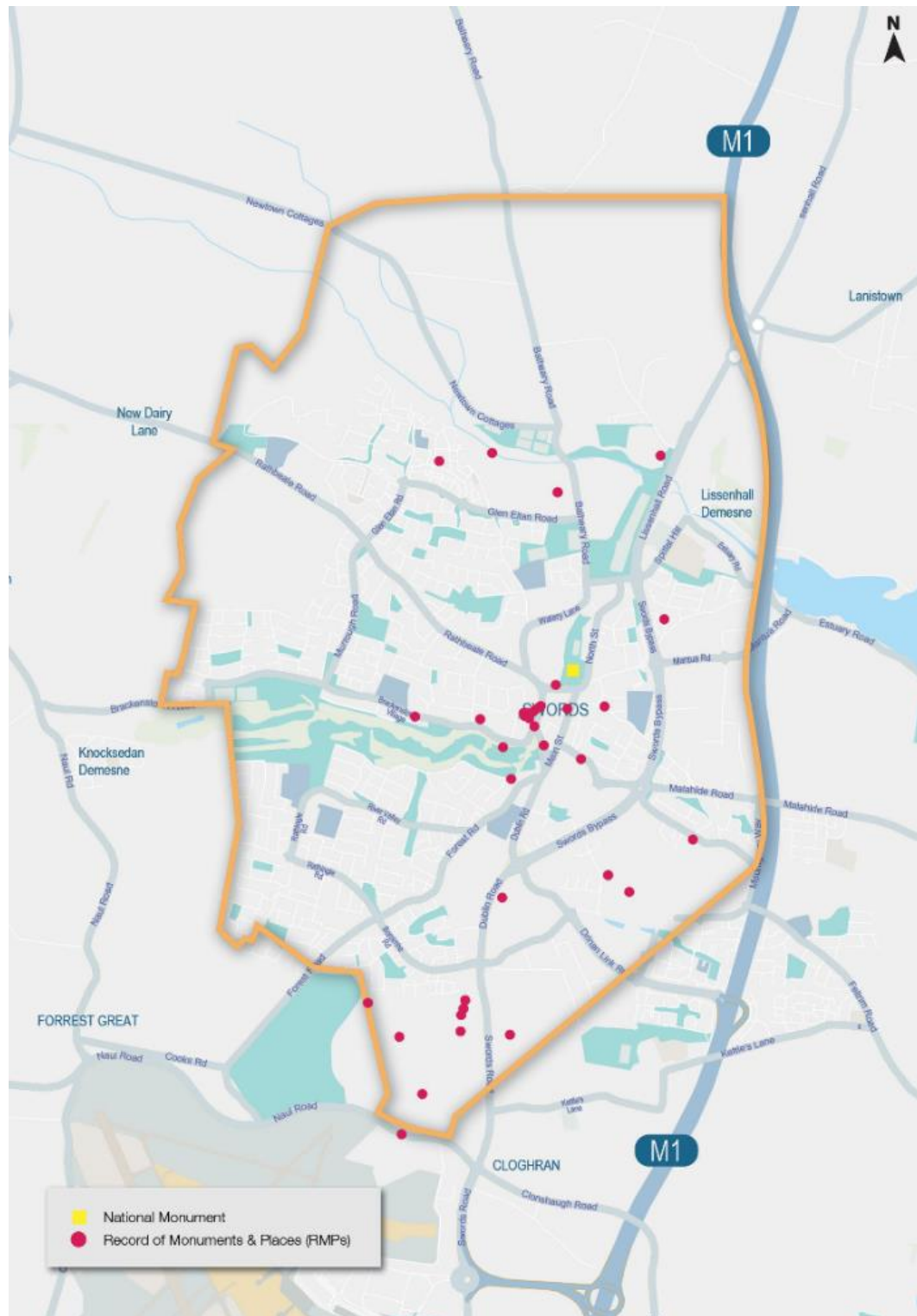


Figure 4.19: Study Area C - Architectural Heritage and Cultural Heritage Constraints

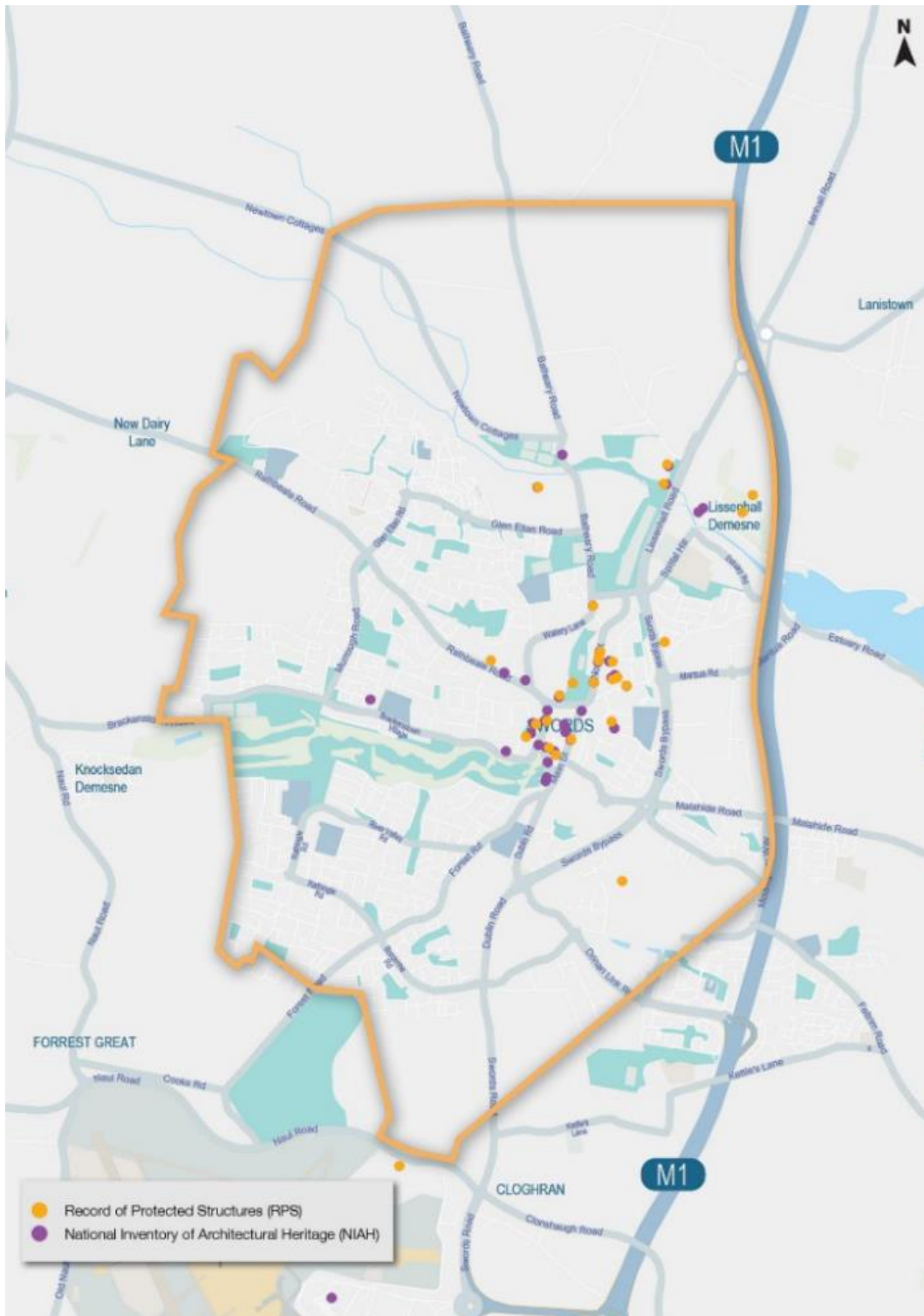
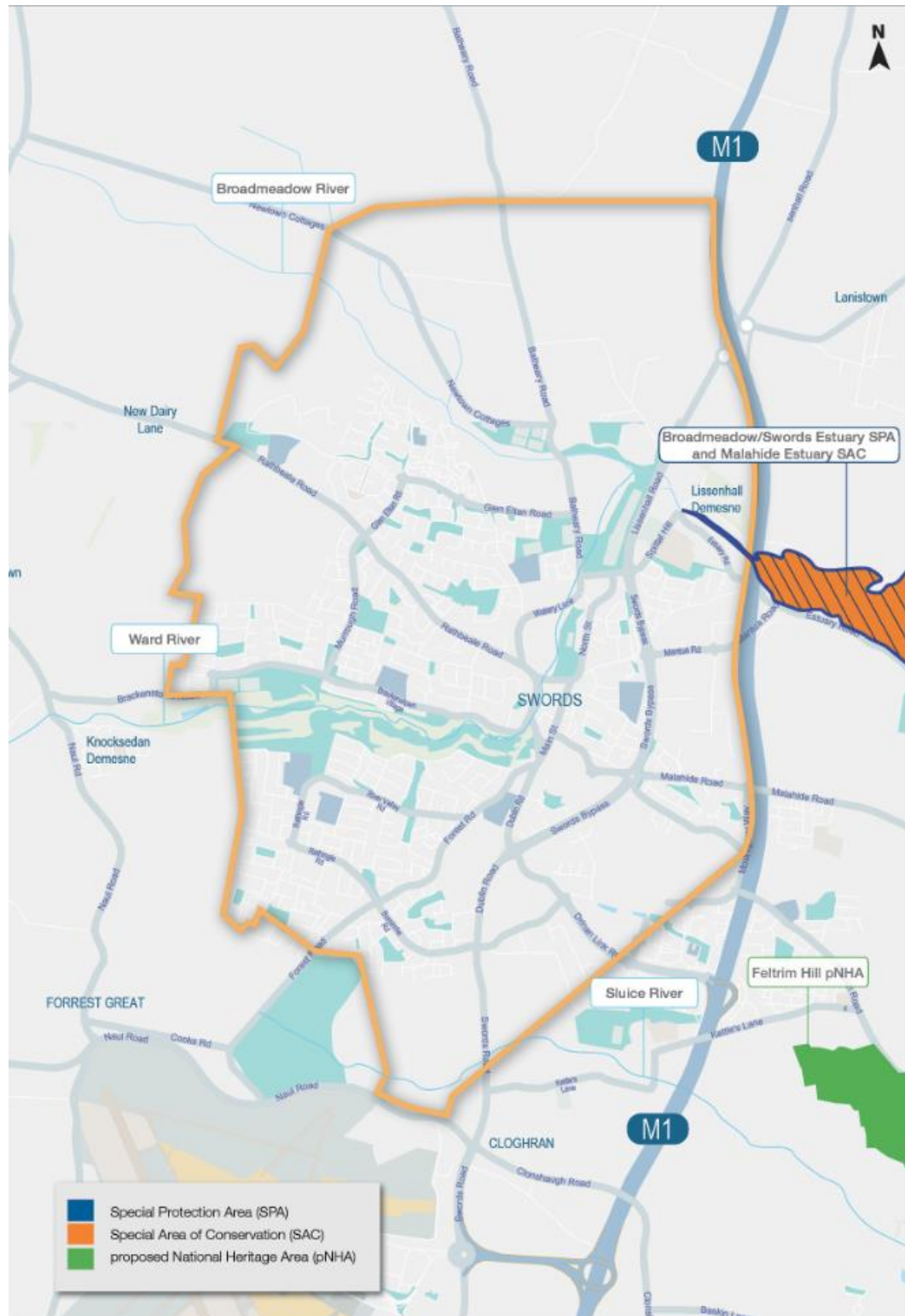


Figure 4.20: Study Area C - Biodiversity Constraints

Archaeology and Cultural Heritage

Archaeological activity in Study Area C has been noted from the prehistoric period onwards, where development led investigation and/ or research have previously revealed buried archaeological sites in the form of early Neolithic habitation sites, Bronze Age ring ditches and barrow sites while excavation and field walking has revealed a number of artefacts such as prehistoric flints and Bronze Age axeheads.

A settlement at Swords has existed from the 6th century when the monastic settlement dedicated to St Colmcille was founded. The site was established on a ridge of high ground overlooking the Ward River. The ecclesiastical site at Swords flourished and the round tower, is the only surviving portion of the original monastic establishment, the medieval church, belongs to a structure which was erected in the later Middle Ages.

Prior to the Anglo-Norman invasion of 1169, the monastery at Swords and its possessions had been transferred to the Archbishop of Dublin (Laurence O'Toole) and Swords subsequently became one of the main archiepiscopal manors. The ruins of the archbishop's palace (Swords Castle, a National Monument) (AH208) (Harbison, 1992) are situated at the north end of the town. The building of the castle is thought to have commenced c. 1200 and is more manorial in character than defensive, though it is walled on all sides (Leask, 1973).

The borough of Swords was one of the largest and most enduring boroughs established by the archbishops of Dublin. There are many references which show that it functioned continuously into the 16th century and it is classified as a historic town (DU011-034).

Within the undeveloped green fields there is a significant potential to reveal previously unrecorded archaeological sites. A number of enclosure sites have been identified in the Fingal area by aerial photography and three enclosures were identified as a result of archaeological investigations (Licence Ref. 09E0464, 09E463) undertaken for the Metro North project in Fostertown South (DU011-115/ 116 and 118, AH567, AH565 and AH562) in agricultural fields.

As part of the investigation works for Metro North, additional subsurface sites were revealed at Miltonfields, Balheary Demesne and Lissenhall Little townlands. Sites included a ring ditch, cremation pit, burnt mound and possible pits and these lands are considered to have a subsurface archaeological potential.

In summary within Study Area C, there is/are:

- 1 National Monument – Swords Castle;
- No monuments with preservation orders;
- 44 RMP sites; and
- Undeveloped agricultural land which has the potential to reveal buried archaeological deposits, finds and sites.

The location of the national monument and RMP sites within Study Area C is presented on **Figure 4.18**. Full detail is available in **Volume 4, Environmental Constraints Report**.

Architectural Heritage and Cultural Heritage

The architectural heritage of Study Area C has a dispersed settlement pattern apart from the town of Swords where a number of protected structures contribute to the historic streetscape of the town.

The rural nature of the wider area is predominantly reflected in the architectural heritage resources by 17th – 19th Century demesne houses, designated historic gardens and designated landscapes, in addition to simple vernacular buildings such as thatched cottages and structures of industrial heritage.

In summary within Area C, there are:

- 26 RPS sites;
- 36 NIAH structures; and
- 0 Architectural Conservation Areas (ACAs).

The location of RPS sites and NIAH structures within Study Area C are presented in **Figure 4.19**. Full detail is available in **Volume 4, Environmental Constraints Report**.

Biodiversity

Natura 2000 Sites

There are four Natura 2000 sites located within a potential zone of influence of the project:

- Malahide Estuary SAC with Ward River connectivity;
- Broadmeadow/Swords Estuary SPA with Ward River connectivity;
- Baldoyle Bay SPA with Sluice River connectivity; and
- Baldoyle Bay SAC with Sluice River connectivity.

Proposed Natural Heritage Area

There are no pNHAs located within Study Area C.

The location of the Natura 2000 sites are presented in **Figure 4.20**.

Full detail is available in **Volume 4, Environmental Constraints Report**.

Landscape and Streetscape

Study Area C extends from the Naul Road to the north of Swords, and includes greenbelt, undeveloped and agricultural lands between the Naul Road and Swords as well as the core town centre of Swords and suburban estates. The area also includes the major south to north road artery of the R132 Swords Road.

Key landscape/urban landscape and visual constraints include:

- The core village/town centre and main street of Swords, including Swords Castle;
- Residential land uses to the south, west and north of Swords;
- The Ward River Valley;
- Open space and sports grounds;
- Forrest Little Golf Course;
- Greenbelt and agricultural lands; and
- The existing tree-line character of R132.

4.4.3 Opportunities

4.4.3.1 Key Trip Attractors

Key trip attractors which could potentially be served by the metro in Study Area C are illustrated in **Figure 4.21** and summarised in **Table 4.3**.

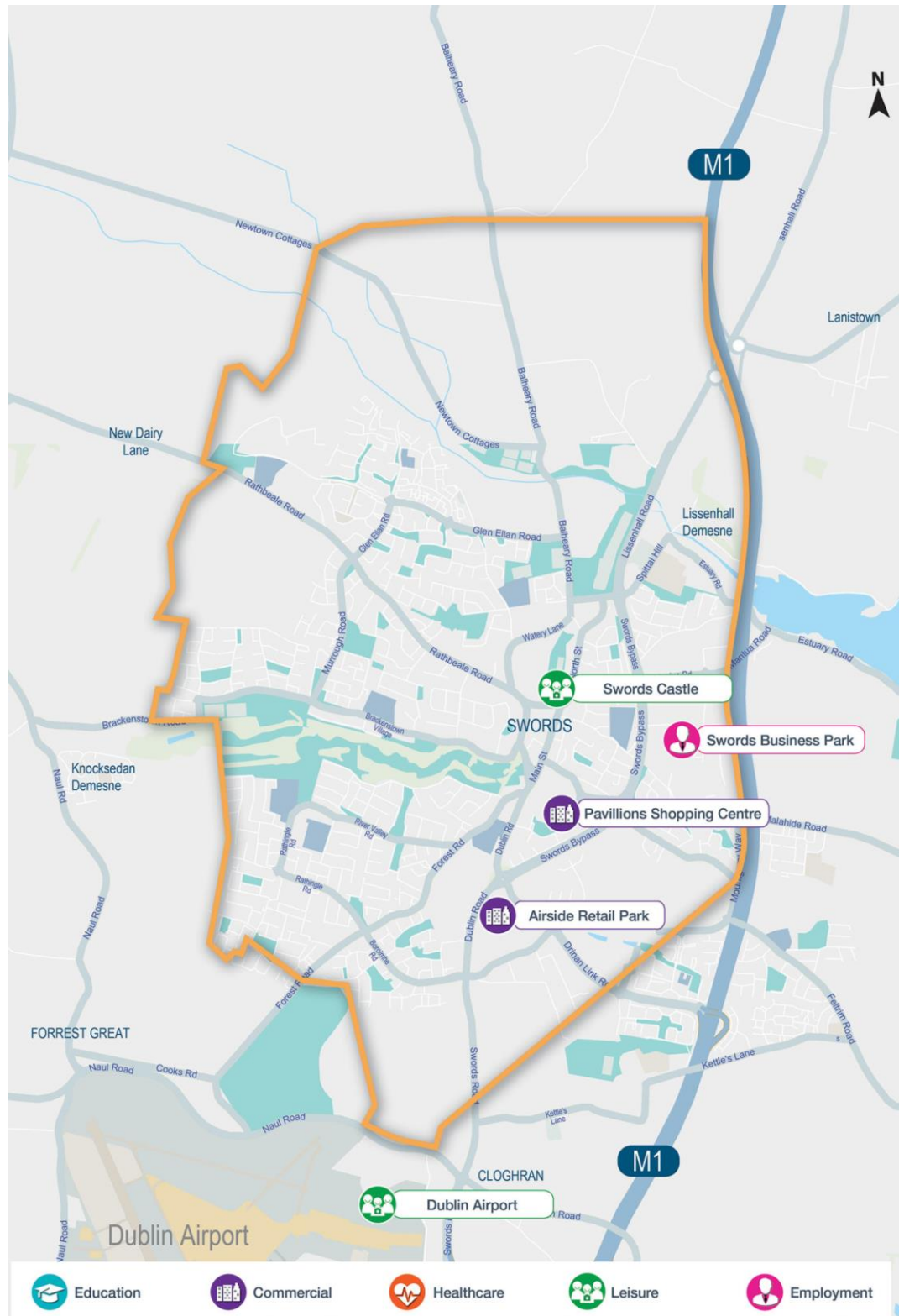
Figure 4.21: Study Area C Key Trip Attractors

Table 4.3: Summary of Key Trip Attractors

Key Trip Attractors
Education <ul style="list-style-type: none"> • N/A
Commercial Centres <ul style="list-style-type: none"> • Pavilions Shopping Centre • Swords Village
Healthcare <ul style="list-style-type: none"> • N/A
Leisure <ul style="list-style-type: none"> • Swords Castle
Employment <ul style="list-style-type: none"> • Airside Retail Park • Swords Business Park

4.4.3.2 Transport Network Integration Opportunities

There are no interchange opportunities with heavy rail or Luas in Study Area C. However, Study Area C includes the Swords to Drumcondra radial Core Bus Corridors (CBC).

In addition to public transport, there is potential to provide a strategic park and ride to integrate with the strategic road network close to the M1.

5 Options Identification

5.1 Introduction

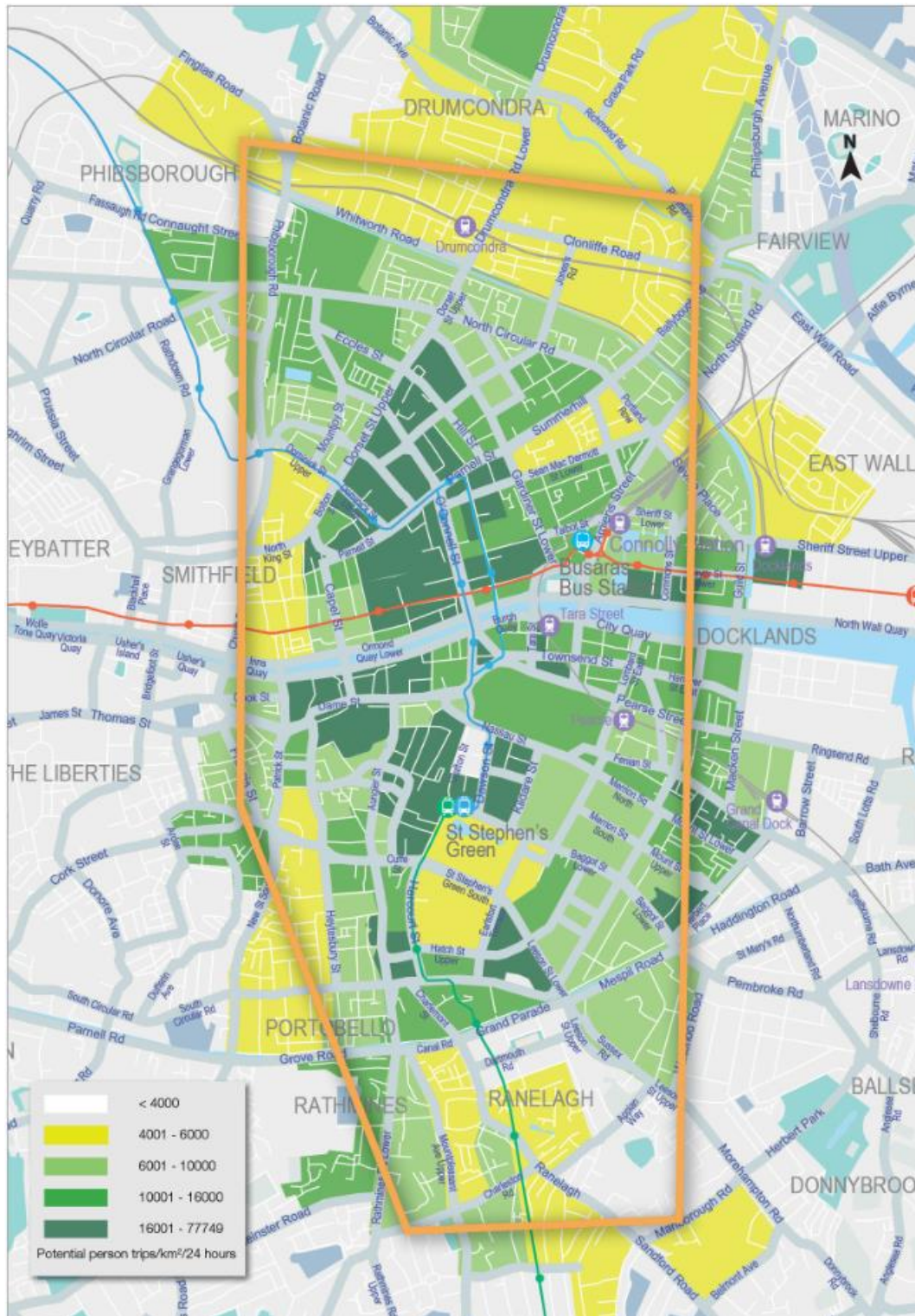
This chapter presents the output of the process undertaken to identify ‘feasible and practical’ route options for NMN within the study area by considering potential station locations and alignments that had the potential to meet the scheme objectives.

5.2 Route Options Identification

5.2.1 Study Area A

5.2.1.1 Transport Demand Assessment

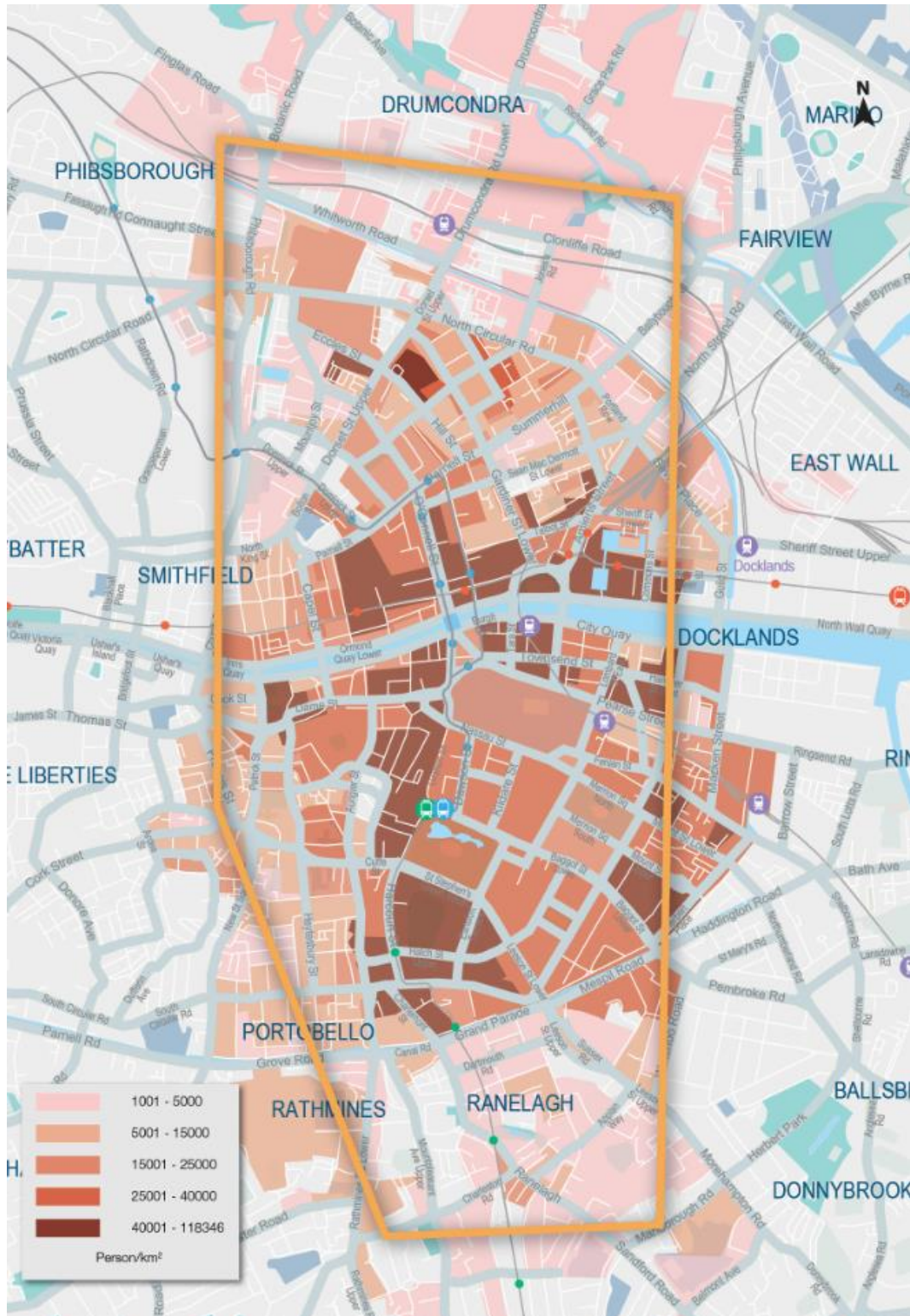
Figure 5.1 presents the variance in 2035 forecast transport demand from the ERM at cell level across Study Area A (presented as potential person trip demand per square kilometre over a 24-hour period).

Figure 5.1: Study Area A - Transport Demand

As can be seen in **Figure 5.1**, there is generally a high forecast transport demand in the ERM in 2035 throughout Study Area A. This is particularly the case in the central and western side of the study area. Forecast transport demand is lower at the northern and southern extremities of the study area compared to central areas.

Figure 5.2 presents forecast 2035 variance in employment from the ERM at cell level (similarly reported in persons per square kilometre) across Study Area A.

Figure 5.2: Study Area A - Employment Opportunity

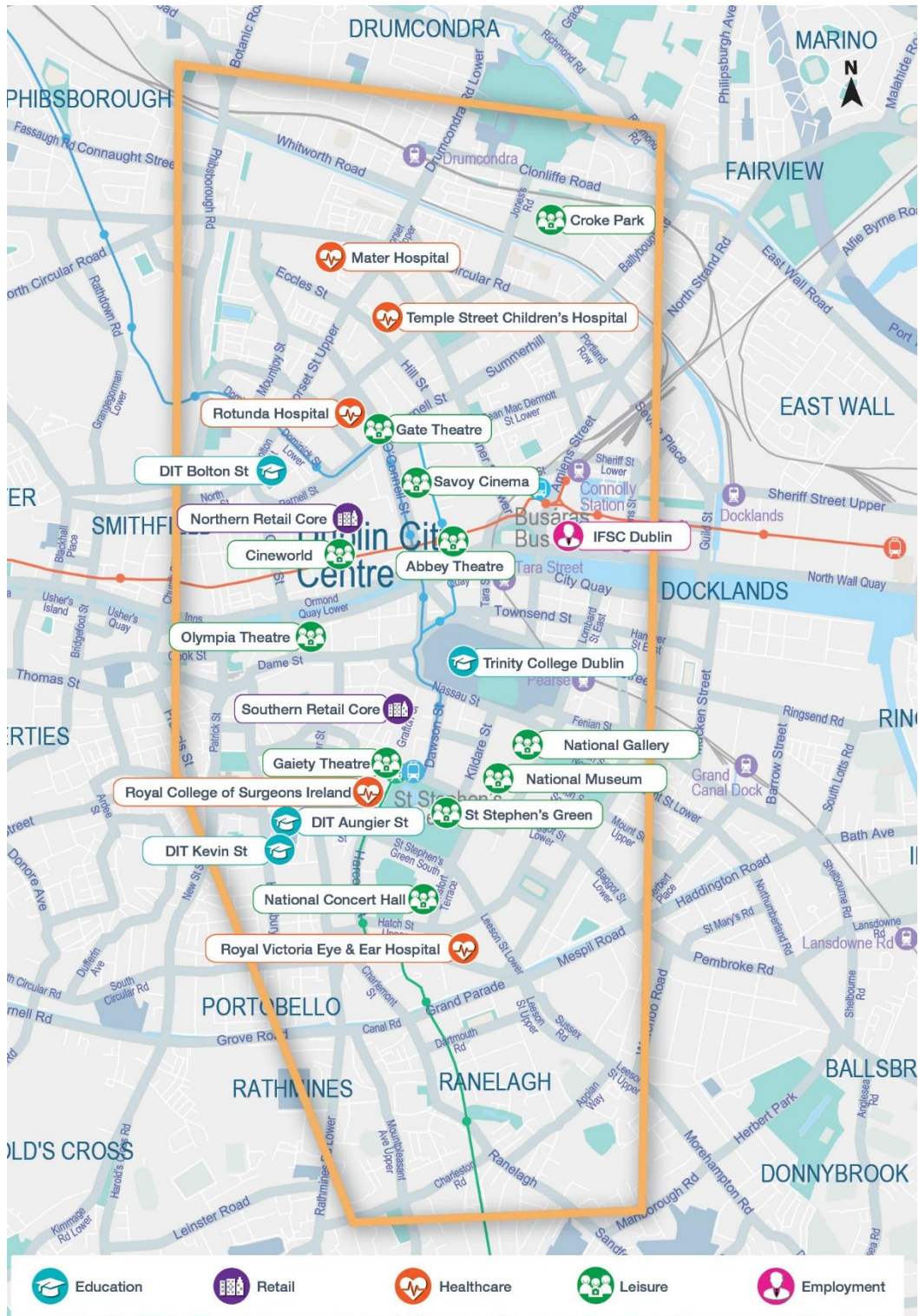


Employment opportunity is generally forecast to be quite high within Study Area A, and is particularly concentrated around the city centre area, mirroring for the most part, forecast transport demand.

At the northern end of the study area, there is a higher density of employment opportunities towards the western side of the study area relative to the eastern side. Similar to the potential transport demand forecast, employment density at the northern and southern extremities of Study Area A are lower than the central portion of the study area.

5.2.1.2 Key Trip Attractors

Key trip attractors which could potentially be served by the metro in Study Area A are illustrated in **Figure 5.3**.

Figure 5.3: Study Area A - Key Trip Attractors

5.2.1.3 Initial Metro Station Zones Locations

The initial potential MSZs which were identified within Study Area A are presented in **Figure 5.4** and summarised in **Table 5.1**.

Figure 5.4: Study Area A - Initial Potential Metro Station Zones

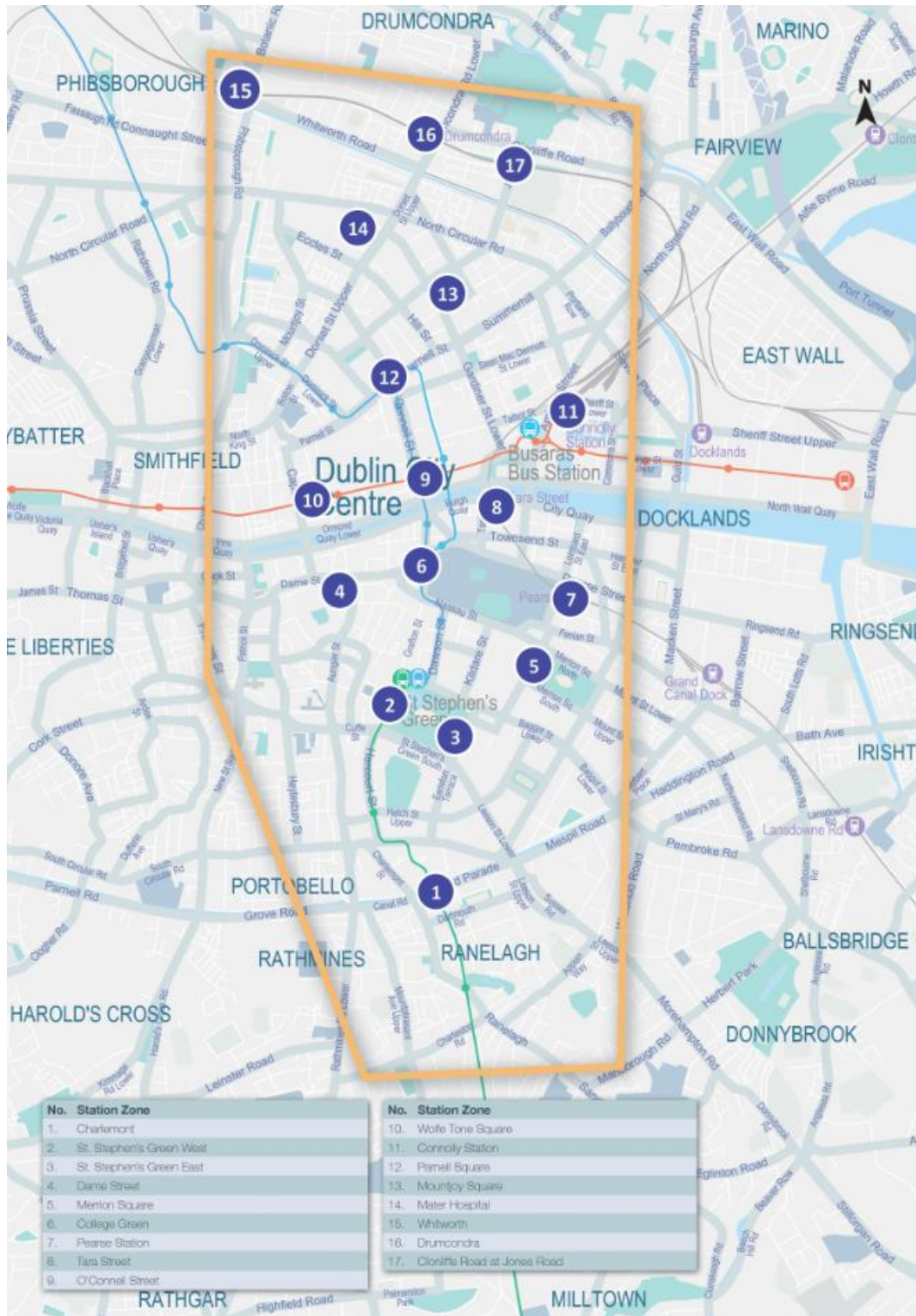


Table 5.1: Study Area A, Potential Metro Station Zones

No.	Potential Metro Station Zone	Potential Metro Station Zone Description	Potential Trip Demand (trips/24 hours) within 500m ²	Transport Interchange Opportunities Within Immediate Vicinity of Station Zone (100m)	Key Trip Attractors Within 500m Station Zone
1	Charlemont	Refer to Luas Green Line Tie-In Study which specifies this location in vicinity of the existing elevated Charlemont Luas stop	5,250	Luas Green Line	National Concert Hall Royal Victoria Eye and Ear hospital Ranelagh Village South City Centre Employment Areas
2	St. Stephen's Green West	Broad area covering St. Stephen's Green West between Grafton Street Lower and Cuffe Street. Station possible within public land.	13,000	Luas Green Line Luas Cross City	St. Stephen's Green City Centre Retail Core – South ¹ South City Centre Employment Trinity College Dublin Royal College of Surgeons Ireland National Museum of Ireland National Gallery of Ireland Gaiety Theatre
3	St. Stephen's Green East	Broad area covering St. Stephen's Green East between Leeson Street Lower and Baggot Street Lower. Station possible within public land.	9,200	Blanchardstown to UCD BRT	St. Stephen's Green City Centre Retail Core – South South City Centre Employment Trinity College Dublin Royal College of Surgeons Ireland National Museum of Ireland National Gallery of Ireland Gaiety Theatre

¹ Dublin City Development Plan 2016 - 2022 Written Statement - Volume 1 Fig. 7 City Centre Retail Core – Principal

No.	Potential Metro Station Zone	Potential Metro Station Zone Description	Potential Trip Demand (trips/24 hours) within 500m ²	Transport Interchange Opportunities Within Immediate Vicinity of Station Zone (100m)	Key Trip Attractors Within 500m Station Zone
4	Dame Street	Broad area covering Dame Street in the vicinity of Georges Street. Space is limited in this area and station may therefore likely require private land acquisition.	15,250	Blanchardstown to UCD BRT	City Centre Retail Core – South City Centre Retail Core – North ² Trinity College Dublin Dublin Castle Temple Bar Gaiety Theatre Olympia Theatre
5	Merrion Square	Broad area covering Merrion Square West between Merrion Square North and Merrion Square South.	7,750	Swords/Airport to City Centre BRT	City Centre Retail Core – South St. Stephen's Green National Museum of Ireland National Gallery of Ireland Trinity College
6	College Green	Broad area covering College Green in front of Trinity College.	18,750	Luas Cross City	City Centre Retail Core – South City Centre Retail Core – North Trinity College Dublin Gaiety Theatre Dublin Castle Temple Bar Olympia Theatre
7	Pearse Station	Broad area covering Pearse Station, Pearse Street in the vicinity of the station and Westland Row.	7,750	Pearse Station	Trinity College Dublin National Gallery of Ireland
8	Tara Station	Broad area covering Tara Street Station, and Tara Street and Georges Quay in the vicinity of the station.	12,250	Tara Street Station	City Centre Retail Core – North Trinity College Dublin Abbey Theatre

No.	Potential Metro Station Zone	Potential Metro Station Zone Description	Potential Trip Demand (trips/24 hours) within 500m ²	Transport Interchange Opportunities Within Immediate Vicinity of Station Zone (100m)	Key Trip Attractors Within 500m Station Zone
9	Luas Red Line Interchange at Earl Place	<p>Broad area covering O'Connell Street, Eden Quay, Earl Place and Bachelors Walk in the vicinity of O'Connell Street.</p> <p>This zone also includes Abbey Street Lower and Middle Abbey Street in the vicinity of O'Connell Street.</p> <p>Note: MSZ 9 also represents the O'Connell Street Station on Original Metro North (OMN) and has been included to allow comparison of Old Metro North with other route options being considered as part of this study. However, the construction of this MSZ at the OMN location would require significant works, disruption and associated cost and is not considered appropriate for NMN. As such, this MSZ is not used to form routes other than OMN.</p>	17,500	Luas Red Line	<p>City Centre Retail Core – North</p> <p>City Centre Retail Core – South</p> <p>Abbey Theatre</p> <p>Rotunda Hospital</p> <p>Savoy Cinema</p>
10	Wolfe Tone Square	Broad Area covering, Mary Street, Wolfe Tone Street, Jervis Street, Upper Abbey Street and Capel Street in the vicinity of Wolfe Tone Square.	17,250	Luas Red Line	<p>City Centre Retail Core – North</p> <p>City Centre Retail Core – South</p> <p>Olympia Theatre</p> <p>Cineworld</p> <p>DIT Bolton Street</p>
11	Connolly Station	Broad area covering Connolly Station, Amiens Street, Mayor Street Lower, Harbourmaster Place and Sheriff Street Lower in the vicinity of the station and Westland Row.	8,000	<p>Connolly Station</p> <p>Luas Red Line</p> <p>Clongriffin to Tallaght BRT</p>	<p>National College of Ireland</p> <p>IFSC</p>

No.	Potential Metro Station Zone	Potential Metro Station Zone Description	Potential Trip Demand (trips/24 hours) within 500m ²	Transport Interchange Opportunities Within Immediate Vicinity of Station Zone (100m)	Key Trip Attractors Within 500m Station Zone
12	Parnell Square	Broad area covering Parnell Street, O'Connell Street, Parnell Square East.	17,500	Luas Cross City	City Centre Retail Core – North Rotunda Hospital Temple Street Children's Hospital The Gate Theatre Savoy Cinema Cineworld DIT Bolton Street
13	Mountjoy Square	Broad area covering Mountjoy Square and adjacent roads i.e. Mountjoy Square North, South, East and West.	9,250	Swords/Airport to City Centre BRT	Rotunda Hospital Temple Street Children's Hospital The Gate Theatre Savoy Cinema
14	Mater Hospital	Broad area covering Mater Hospital, Eccles Street, and Dorset Street Upper and North Circular Road in the vicinity of the Mater.	7,750	N/A	Mater Hospital (Public and Private)
15	Whitworth	Broad area covering Lindsay Road and Whitworth Road in the vicinity of the rail line. This is identified as a potential alternative location to Drumcondra to interchange with the Maynooth line and services arriving from the Phoenix Park Tunnel. A new heavy rail station would therefore be required at this location.	4,000	N/A	Phibsborough Village
16	Drumcondra	Broad area covering Drumcondra Station and Clonliffe Road, Drumcondra Road Lower and Whitworth Road in the vicinity of Drumcondra Station.	3,750	Drumcondra Station Swords/Airport to City Centre BRT	Croke Park

No.	Potential Metro Station Zone	Potential Metro Station Zone Description	Potential Trip Demand (trips/24 hours) within 500m ²	Transport Interchange Opportunities Within Immediate Vicinity of Station Zone (100m)	Key Trip Attractors Within 500m Station Zone
17	Clonliffe Road at Jones Road	Broad area covering Jones Road and Clonliffe Road in the vicinity of the rail line. This is identified as a potential alternative location to Drumcondra to interchange with the Maynooth line. A new heavy rail station would therefore be required at this location.	4,000	N/A	Croke Park

5.2.1.4 Initial Metro Station Zones Sift

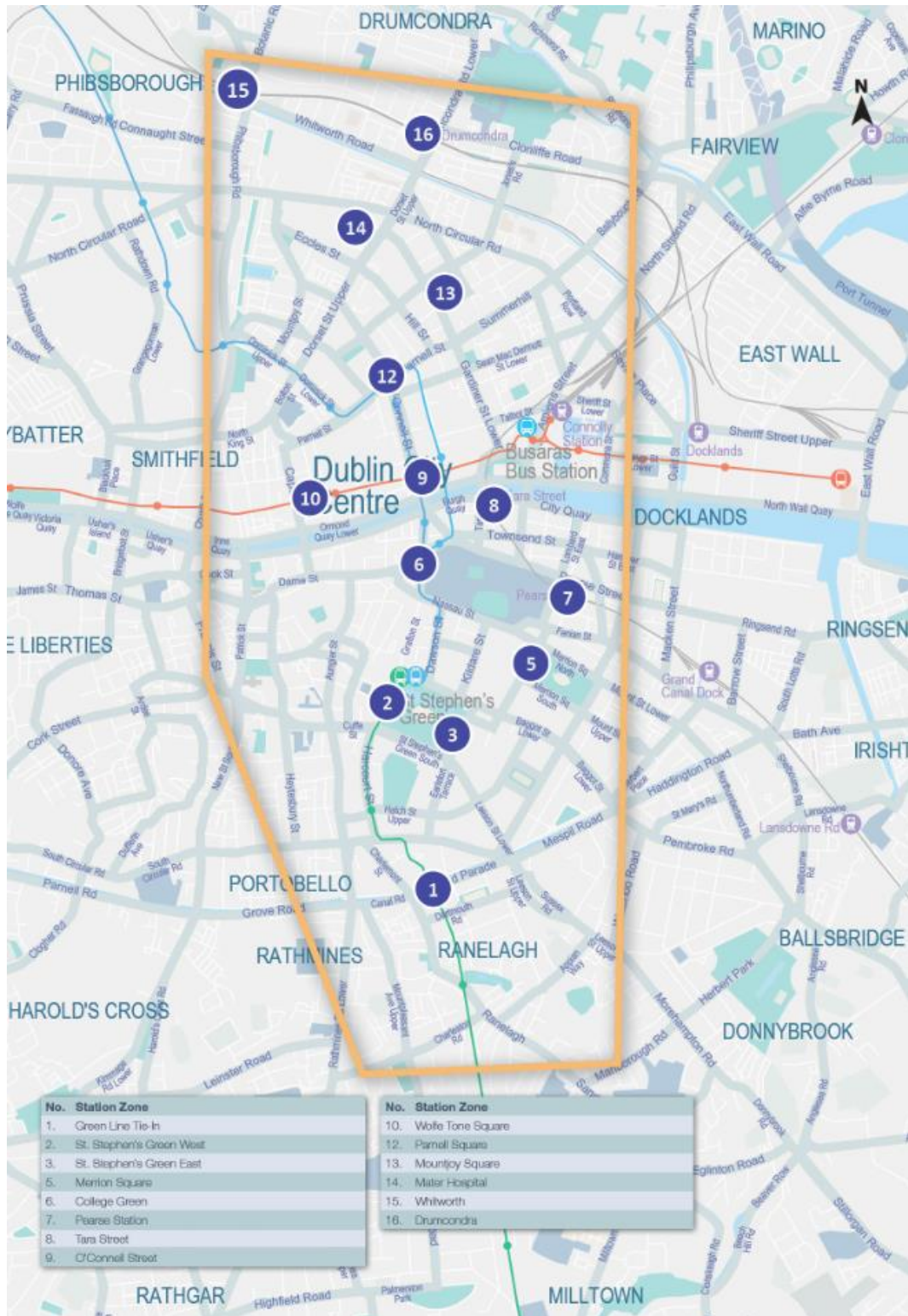
The initial MSZs identified were assessed at a high level to rule out those zones which could not be used to form routes which would meet the project objectives. In particular, consideration was given to station demand, the directness of routes which would pass through each zone and the potential for interchange with other modes.

Based on the high-level assessment, the following were not progressed as a feasible MSZs:

- Dame Street (MSZ 4): An MSZ was considered in the Dame Street area as this is an attractive central location for a metro station. However, after a more detailed assessment of the area, it was determined that there is no suitable location in the area to facilitate a metro station without significant property acquisition. For this reason, the Dame Street Metro Station Zone was not considered any further.
- Clonliffe Road at Jones Road (MSZ 17): Three potential interchange points with the heavy rail line are identified at the northern end of Study Area A. Each of these stations would attract a similar local potential trip demand of approximately 4,000 trips/24 hours within a 500m walk. However, each would interchange with the heavy rail line to varying degrees. While the Clonliffe Road at Jones Road MSZ would provide good interchange with the Maynooth line via a new station, interchange with the Kildare Line to the south of this would require lengthy walks and reduce the passenger experience. This interchange is better facilitated at the Drumcondra or Whitworth MSZs where walk distances between rail lines would be shorter and thus encourage greater levels of interchange. Furthermore, any route serving MSZ 17 would connect to Study Area B at the eastern side of the study area and would ultimately need to move back further west to tie into feasible MSZs in Study Area B. For these reasons MSZ 17 was not considered any further.
- Connolly Station (MSZ 11): This MSZ is one of the easternmost MSZs considered in Study Area A and would attract one of the lower potential trip demands in this part of Study Area A (compared to MSZ 8, 9 and 10). Additionally, any route serving this MSZ would need to return from the eastern side of the study area to Drumcondra MSZ thus adding length without any increase in patronage. For this reason, MSZ 11 has not been considered any further.

5.2.1.5 Feasible Metro Station Zones

Following the Metro Station Zone sift, a total of 14 feasible MSZs were identified. These are presented in **Figure 5.5**.

Figure 5.5: Study Area A – Feasible Metro Station Zones

5.2.2 Feasible and Practical Route Option Identification

Having identified feasible MSZs within Study Area A, geometrically feasible route options which connected these were generated.

The initial geometrically feasible route options identified were then assessed at a high level to rule out routes which would clearly not meet the project objectives. In particular, consideration was given to station demand and the directness of routes. In some cases, route options were ruled out owing to the presence of more suitable alternatives.

In addition to tunnelled route alignments, within Study Area A, at-grade and elevated alignments were also considered in terms of feasibility of achieving the scheme segregation objective as set out in Section 1.3.

At-grade options

Based on consideration of the significant architectural, landscape and streetscape constraints in Study Area A, it was not deemed feasible to run a fully segregated metro on an at-grade alignment over any practical length through Study Area A. This is due to the limited available street space and competition for road space with other users. To accommodate the needs of all road users there would be potential for significant impacts on structures of national and international significance. Furthermore, at-grade options would result in comprehensive and significant changes to the setting and character of the streetscape within the city centre.

Elevated options

Similar to at-grade options, upon consideration of the significant architectural, landscape and streetscape constraints in Study Area A, it was not considered feasible to run a fully segregated metro on an elevated alignment over any practical length through Study Area A north of the Luas Green Line Tie In location.

Underground options

Given the impracticality of at-grade or elevated route options, only underground options were considered feasible and practical within Study Area A.

Route sections between MSZs identified as being geometrically feasible were combined to form individual end-to-end route options within Study Area A. The resulting feasible and practical routes identified are illustrated in **Figure 5.6** and in greater detail in Chapter 6. **Table 5.2** summarises the route options and MSZs served.

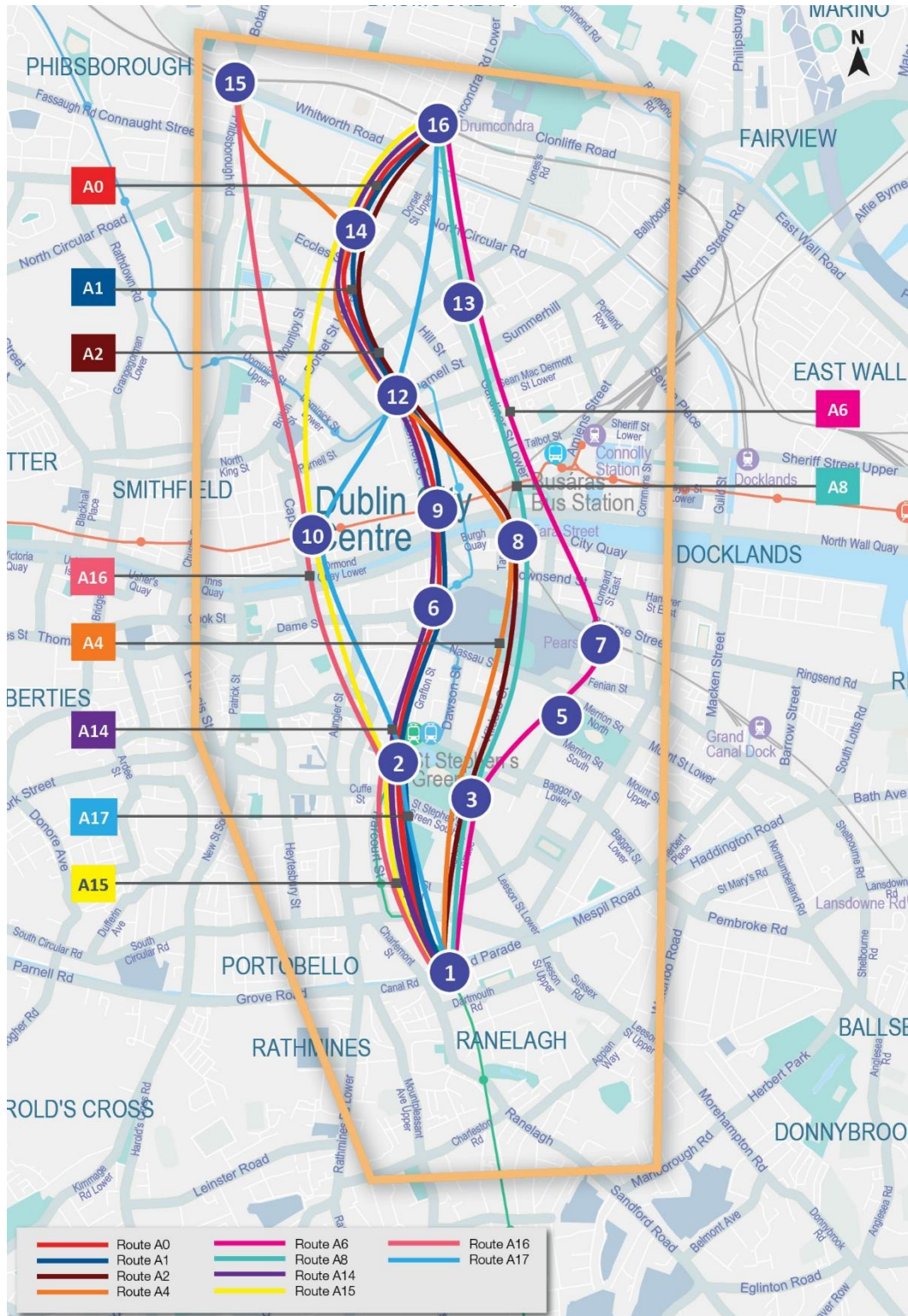
Figure 5.6: Study Area A - Feasible and Practical Route Options

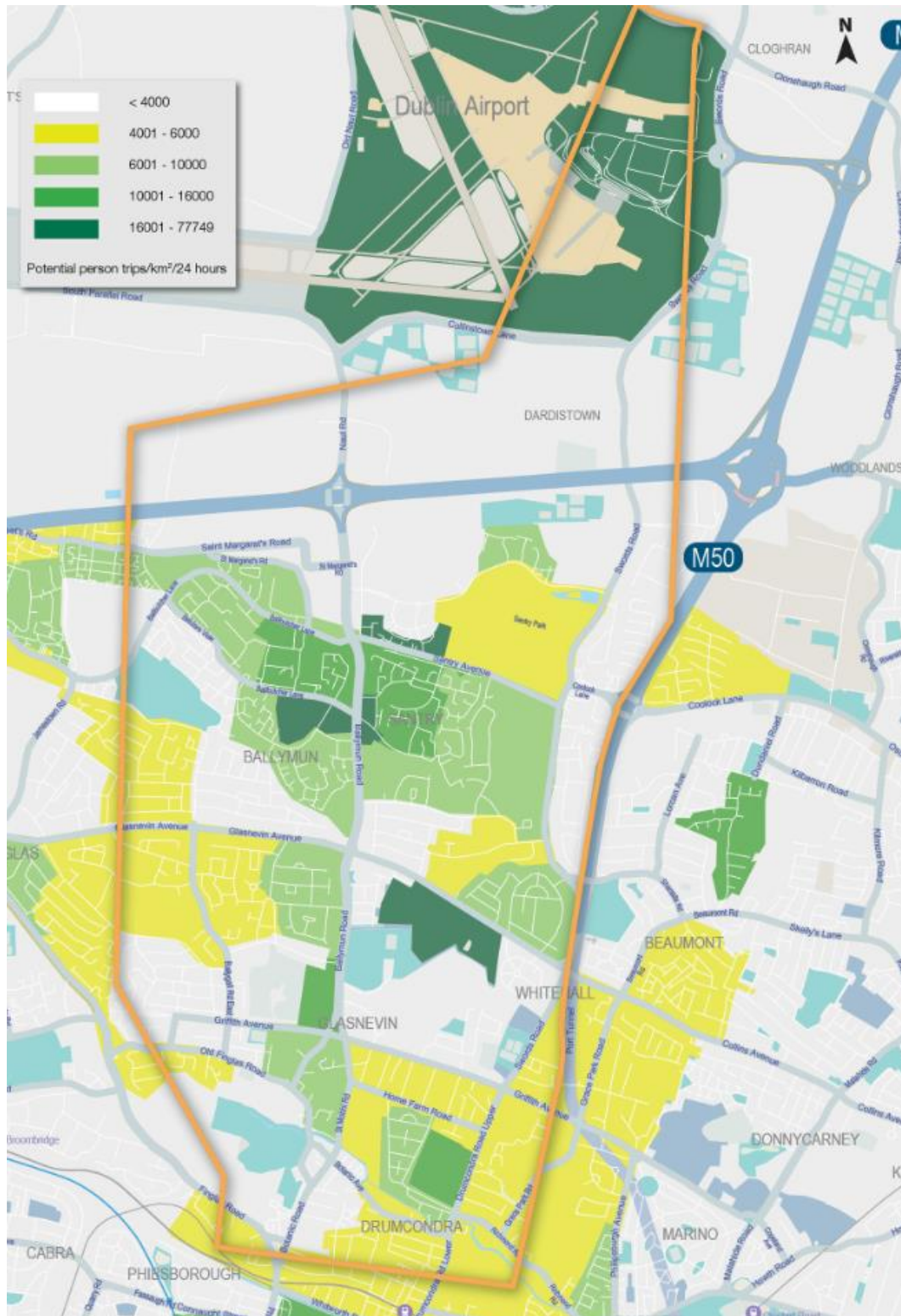
Table 5.2: Feasible and Practical Route Options Summary

Route Option	Potential Metro Station Zones Served
A0	Charlemont – St. Stephen’s Green West – O’Connell Bridge – Parnell Square – Mater Hospital – Drumcondra (MSZs 1-2-9-12-14-16)
A1	Charlemont – College Green – Parnell Square – Mater Hospital - Drumcondra (MSZs 1-6-12-14-16)
A2	Charlemont – St. Stephen’s Green East – Tara Street - Parnell Square – Mater Hospital - Drumcondra (MSZs 1-3-8-12-14-16)
A4	Charlemont – St. Stephen’s Green East – Tara Street – Parnell Square – Mater Hospital – Whitworth (MSZs 1-3-8-12-14-15)
A6	Charlemont – St. Stephen’s Green East (inside railings) – Pearse Station – Mountjoy Square - Drumcondra (MSZs 1-3-7-13-16)
A8	Charlemont – St. Stephen’s Green East – Tara Street – Mountjoy Square – Drumcondra (MSZs 1-3-8-13-16)
A14	Charlemont – St. Stephen’s Green West – O’Connell Street – Mater Hospital – Drumcondra (MSZs 1-2-9-14-16)
A15	Charlemont – St. Stephen’s Green West – Wolfe Tone Square – Mater Hospital – Drumcondra (MSZs 1-2-10-14-16)
A16	Charlemont – St. Stephen’s Green West – Wolfe Tone Square – Whitworth (MSZ 1-2-10-15)
A17	Charlemont – St. Stephen’s Green West – Wolfe Tone Square – Parnell Square - Drumcondra (MSZ 1-2-10-12-16)

5.2.3 Study Area B

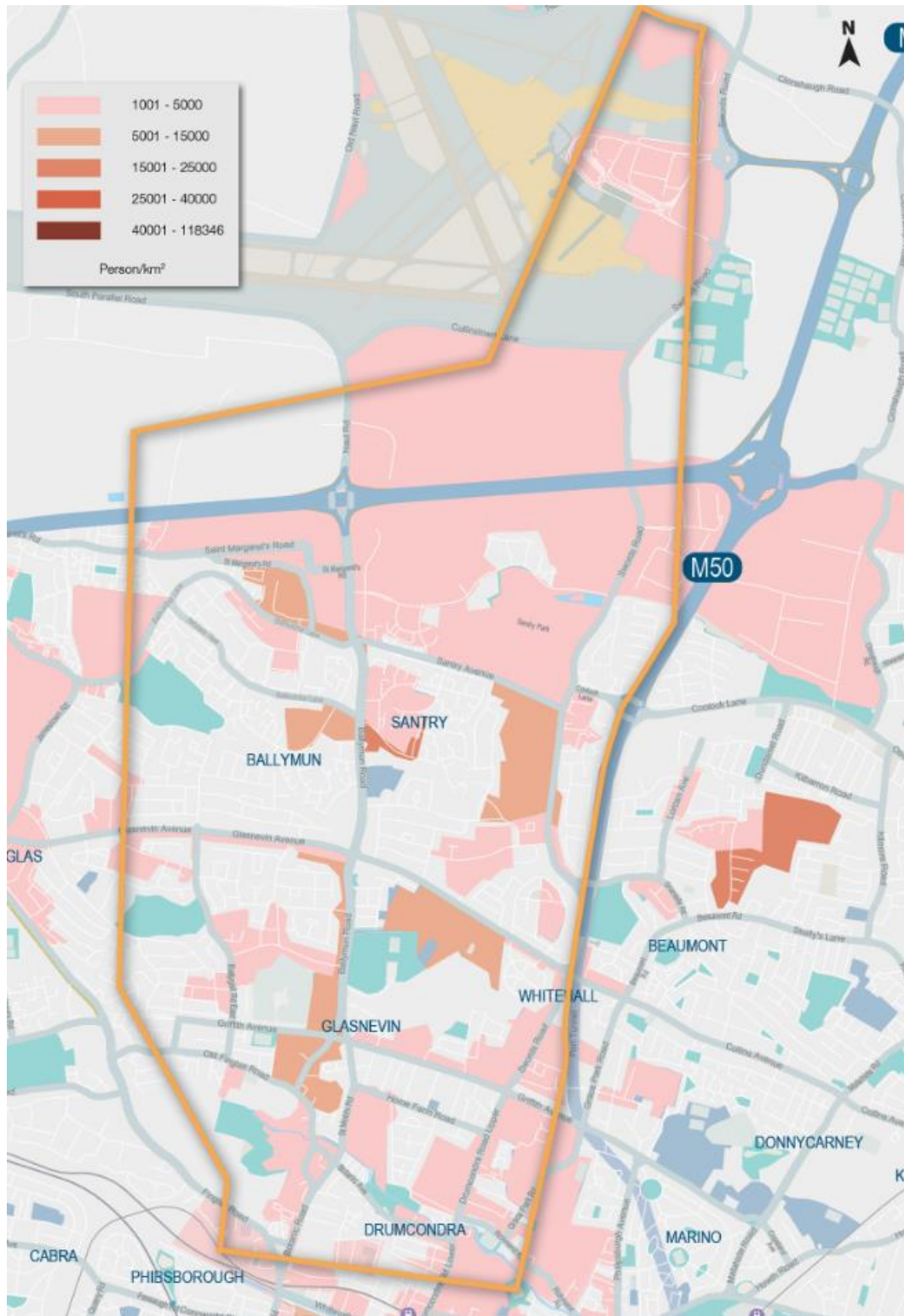
5.2.3.1 Transport Demand Assessment

Figure 5.7 presents the variance in forecast transport demand from the ERM at cell level across Study Area B (presented as potential person trip demand per square kilometre over a 24-hour period).

Figure 5.7: Study Area B - Transport Demand

As can be seen in **Figure 5.7**, there is generally a high forecast transport demand through the centre of Study Area B in 2035 with lower transport demand at both the western and eastern edges.

Figure 5.8 presents the variance in employment across Study Area B.

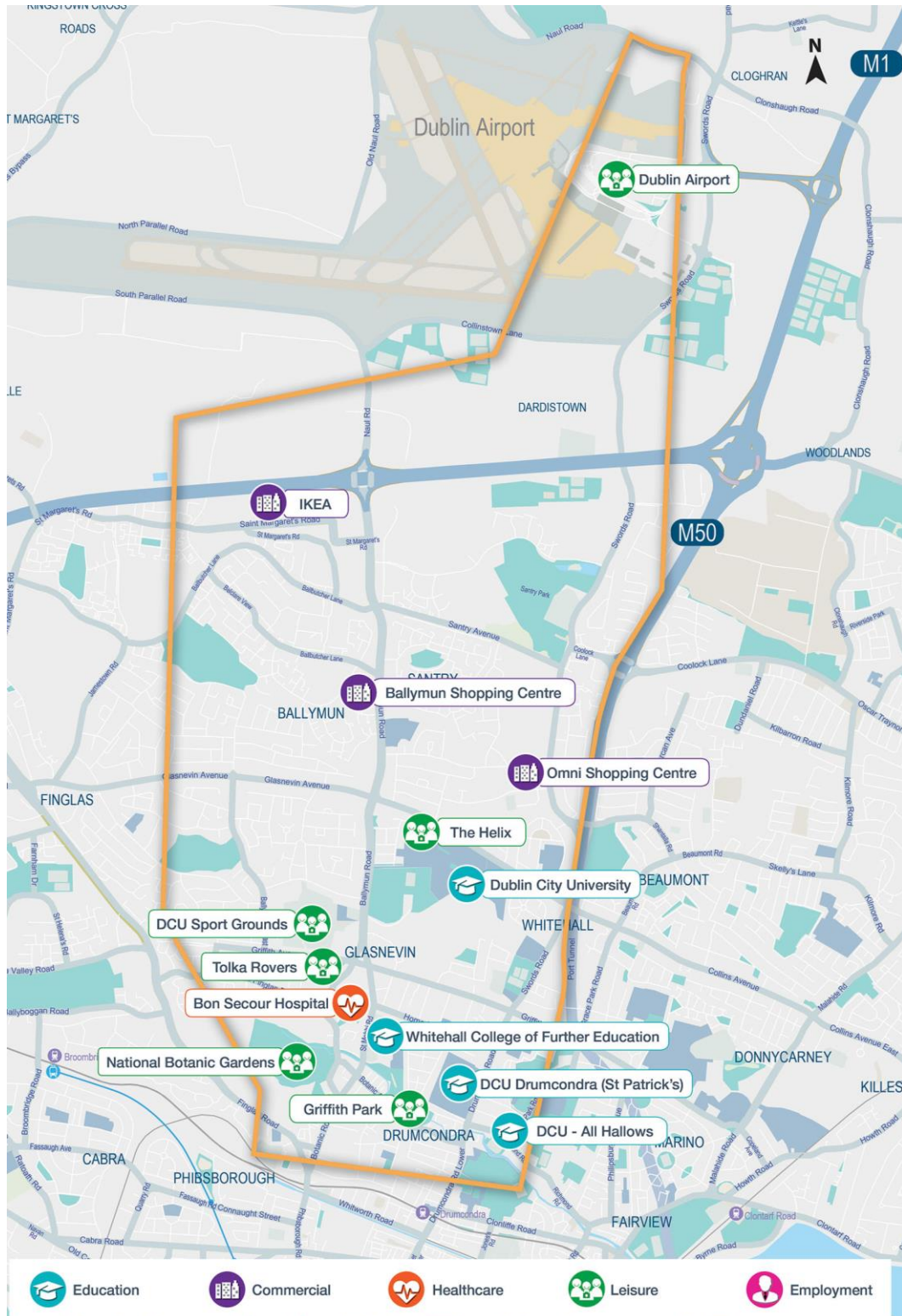
Figure 5.8: Study Area B - Employment Opportunity

Employment opportunity is varied both in terms of density and location across Study Area B in 2035 with the highest concentrations of employment forecast located generally through the centre of the study area in Glasnevin, Santry and Ballymun.

5.2.3.2 Key Trip Attractors

Key trip attractors which could potentially be served by NMN in Study Area B are illustrated in **Figure 5.9**.

Figure 5.9: Study Area B - Key Trip Attractors



5.2.3.3 Initial Metro Station Zones Locations

The initial potential MSZs which were identified within Study Area B are presented in **Figure 5.10** and summarised in **Table 5.3**.

Figure 5.10: Study Area B - Initial Potential Metro Station Zones

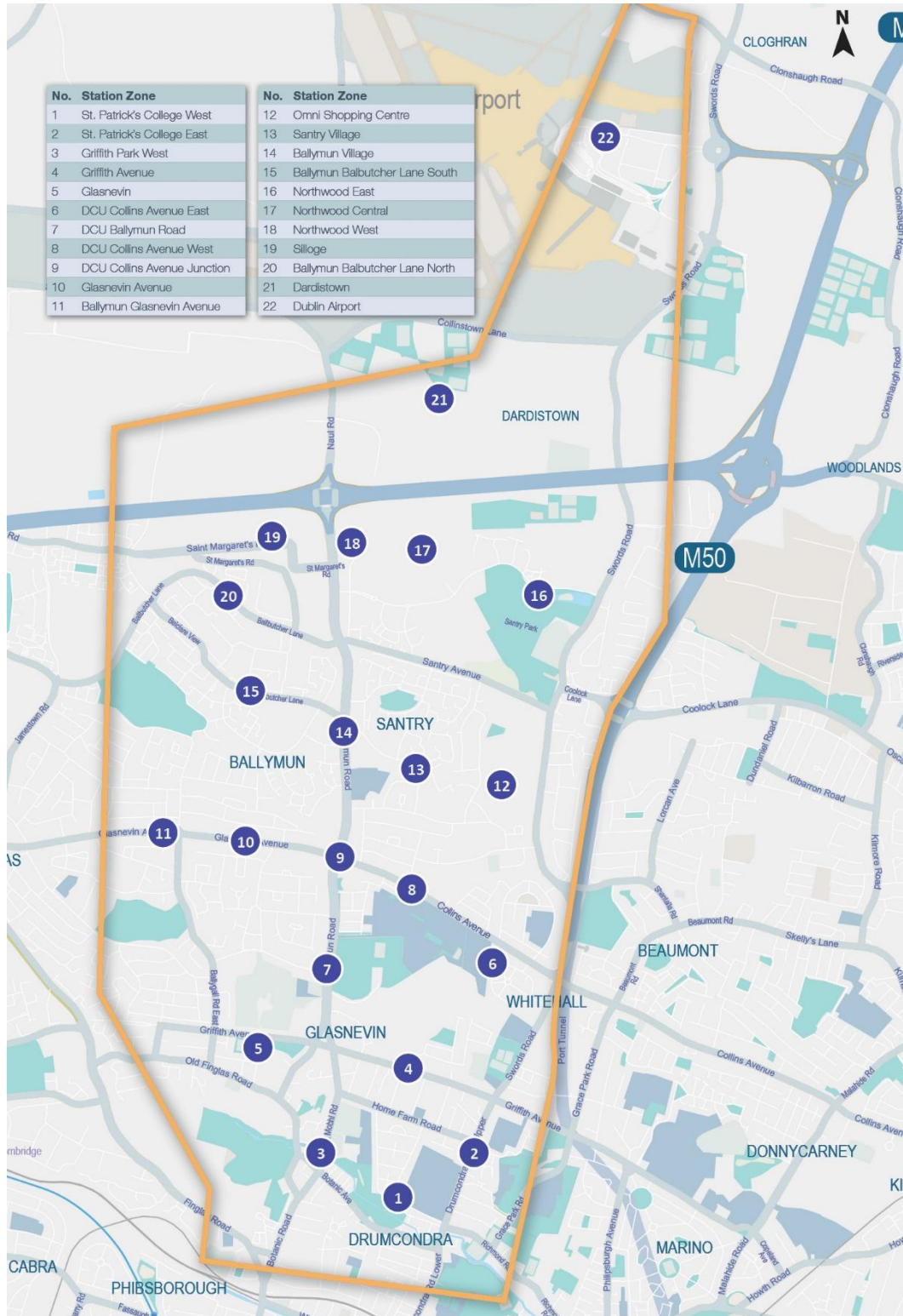


Table 5.3: Study Area B Potential Metro Station Zones

No.	Potential Metro Station Zone	Potential Metro Station Zone Description	Potential Trip Demand (trips/24 hours) within 1,000m ²	Key Trip Attractors Within 500m Station Zone
1	St. Patrick's College West	Broad area covering the western side of St. Patrick's College.	11,500	DCU St. Patrick's College DCU All Hallows Whitehall College of Further Education Griffith Park
2	St. Patrick's College East	Broad area to the north east of St. Patrick's College including Drumcondra Road Upper and Home Farm Road.	8,000	DCU St. Patrick's College DCU All Hallows
3	Griffith Park West	Broad area to the west of Griffith Park including St. Mobhi Road and Botanic Avenue.	9,500	Griffith Park National Botanic Gardens Whitehall College of Further Education Bon Secours Hospital Dublin
4	Griffith Avenue	Broad area covering Griffith Avenue between Lambay Road and Valentia Road.	8,250	Whitehall College of Further Education
5	Glasnevin	Broad area covering Griffith Avenue in the vicinity of Tolka Rovers Football Club.	5,000	Glasnevin Bon Secours Hospital Dublin DCU Sports Grounds Tolka Rovers
6	DCU Collins Avenue East	Broad area in the east of the DCU Campus south of St. Aidan's CBS.	11,750	DCU Glasnevin
7	DCU Ballymun Road	Broad area to the west of DCU on Ballymun Road in the vicinity of St. Canices Road.	12,250	DCU Glasnevin DCU Sports Grounds

² 2035 demand extracted from the ERM based on a representative centroid selected within each MSZ

No.	Potential Metro Station Zone	Potential Metro Station Zone Description	Potential Trip Demand (trips/24 hours) within 1,000m ²	Key Trip Attractors Within 500m Station Zone
8	DCU Collins Avenue West	Broad area to the north of DCU on Collins Avenue in the vicinity of Shanowen Avenue.	10,500	DCU Glasnevin The Helix
9	DCU Collins Avenue Junction	Broad area to the north-west of DCU at the junction of Ballymun Road, Collins Avenue and Glasnevin Avenue.	17,250	DCU Glasnevin The Helix
10	Glasnevin Avenue	Broad area covering Glasnevin Avenue in area approximately midway between Ballymun Road and Willow Park Road.	9,000	Glasnevin Residential Area
11	Ballymun Glasnevin Avenue	Broad area at the junction of Glasnevin Avenue and Beneavin Drive.	9,000	Glasnevin Residential Area
12	Omni Shopping Centre	Broad area within the Omni Shopping Centre grounds.	6,750	Omni Shopping Centre
13	Santry Village	Broad area in the vicinity of Shangan Road between Shangan Green and Longdale Terrace.	16,750	Ballymun Village
14	Ballymun Village	Broad area on Ballymun Road south of Balbutcher lane.	21,750	Ballymun Village
15	Ballymun Balbutcher Lane South	Broad area on Balbutcher Lane in the vicinity of Dane Road.	16,750	Ballymun Residential Area
16	Northwood East	Broad area on Northwood Avenue including adjacent parts of Santry Park.	4,250	Santry Park Santry Sports Stadium Northwood Estate
17	Northwood Central	Broad area to the north of Northwood Avenue in zoned land (currently open space).	9,500	Gulliver's Retail Park Northwood Estate
18	Northwood West	Broad area to the west of Northwood between Ballymun Road and the R108.	10,750	Gulliver's Retail Park Northwood Estate

No.	Potential Metro Station Zone	Potential Metro Station Zone Description	Potential Trip Demand (trips/24 hours) within 1,000m ²	Key Trip Attractors Within 500m Station Zone
19	Silloge	Broad area to the west of IKEA north of St. Margaret's Road in zoned land.	4,750	Ikea
20	Ballymun Balbutcher Lane North	Broad area on Balbutcher Lane in the vicinity of Carton Court.	11,250	Ikea
21	Dardistown	Broad area within Dardistown zoned lands. It is worth noting that the potential trip demand quoted does not fully reflect the proposed land use density for Dardistown and as such is likely underestimating the demand at this station. Combined with the future planned development, this location presents an ideal location for a station between Ballymun and Dublin Airport (approximately 2.8km apart).	3,250	NA
22	Dublin Airport	Defined station location within the Ground Transport Centre (GTC) to the north of the terminal 1 multi-storey car park.	18,000	Dublin Airport

5.2.3.4 Initial Metro Station Zones Sift

The initial MSZs identified were assessed at a high level to rule out those zones which could not be used to form routes which would meet the project objectives. In particular, consideration was given to station demand, the directness of routes which would pass through each zone and the potential for interchange with other modes.

Based on the high-level assessment, the following MSZs were not progressed as feasible MSZs:

- DCU Collins Avenue East (MSZ 6): Three Station Zones are identified that would serve DCU. Of these, DCU Collins Avenue East would attract the second highest potential trips/24 hours.

However, considering the elimination of the Omni Shopping Centre and Northwood East MSZ, as discussed later, any route connection to DCU Collins Avenue East would need to divert back to the central corridor to continue north. This diversion, and associated length and cost, was not considered to offer enough benefits over other central alignments and as such was not considered any further;

- Ballymun Glasnevin Avenue (MSZ 11): This MSZ was the westernmost MSZ identified within Study Area B. Any route alignment that would serve this MSZ would need to go out of its way to do so, thus adding considerable length and cost. The nearest alternative, Glasnevin Avenue (MSZ 10) attracts a similar trip demand but would be accommodated by a more direct alignment. As such the Ballymun Glasnevin Avenue MSZ was not considered any further;
- Omni Shopping Centre (MSZ 12): This MSZ is located on the eastern side of Study Area B and would attract a relatively low potential trip demand compared to alternatives in the vicinity. For example, the next MSZ to the west, Santry Village, would attract 9,500 more trips/24hours than Omni Shopping Centre. For this reason, the Omni Shopping Centre MSZ was not considered any further;
- Northwood East (MSZ 16): This MSZ is located on the eastern side of Study Area B and would attract one of the lowest potential transport demands of all MSZs considered in Study Area B. Additionally, alternatives in the vicinity would attract a higher transport demand. For example, Northwood Central would attract 6,000 more trips/24 hours than Northwood East. Furthermore, any route option passing through Northwood East would bypass Dardistown, a strategic development area which is reliant on metro to unlock its development potential. For these reasons, Northwood East MSZ is not considered any further; and
- Ballymun Balbutcher Lane North (MSZ 20): This MSZ would serve routes along the western side of Study Area B. Routes passing through this MSZ would be coming from either Ballymun Balbutcher Lane South (MSZ 15) or Glasnevin Avenue (MSZ 10). Coming from either of these MSZs there are two options available for the route to the north, either to serve Ballymun Balbutcher Lane North or turn towards a central alignment and serve Northwood West.

Northwood West would attract 1,500 more trips/24 hours while also directly serving more key trip attractors. Furthermore, an alignment from Balbutcher Lane South to Northwood West would form a more direct route towards Dardistown and the Airport, and thus provide a more cost-efficient scheme. For these reasons, Ballymun Balbutcher Lane North MSZ is not considered any further.

5.2.3.5 Feasible Metro Station Zones

Following the Metro Station Zone sift, a total of 16 feasible MSZs remained. These are presented in **Figure 5.11**.

No. Station Zone

1	St. Patrick's College West
2	St. Patrick's College East
3	Griffith Park West
4	Griffith Avenue
5	Glasnevin
7	DCU Ballymun Road
8	DCU Collins Avenue West
9	DCU Collins Avenue Junction
10	Glasnevin Avenue
13	Santry Village
14	Ballymun Village
15	Ballymun Balbutcher Lane South
17	Northwood Central
18	Northwood West
19	Sillloge
21	Dardistown
22	Dublin Airport

No. Station Zone

13	Santry Village
14	Ballymun Village
15	Ballymun Balbutcher Lane South
17	Northwood Central
18	Northwood West
19	Sillloge
21	Dardistown
22	Dublin Airport

5.2.4 Feasible and Practical Route Option Identification

Having identified feasible MSZs within Study Area B, geometrically feasible route options which connected these MSZs were generated and subsequently assessed in terms of the extent to which they would meet the project objectives.

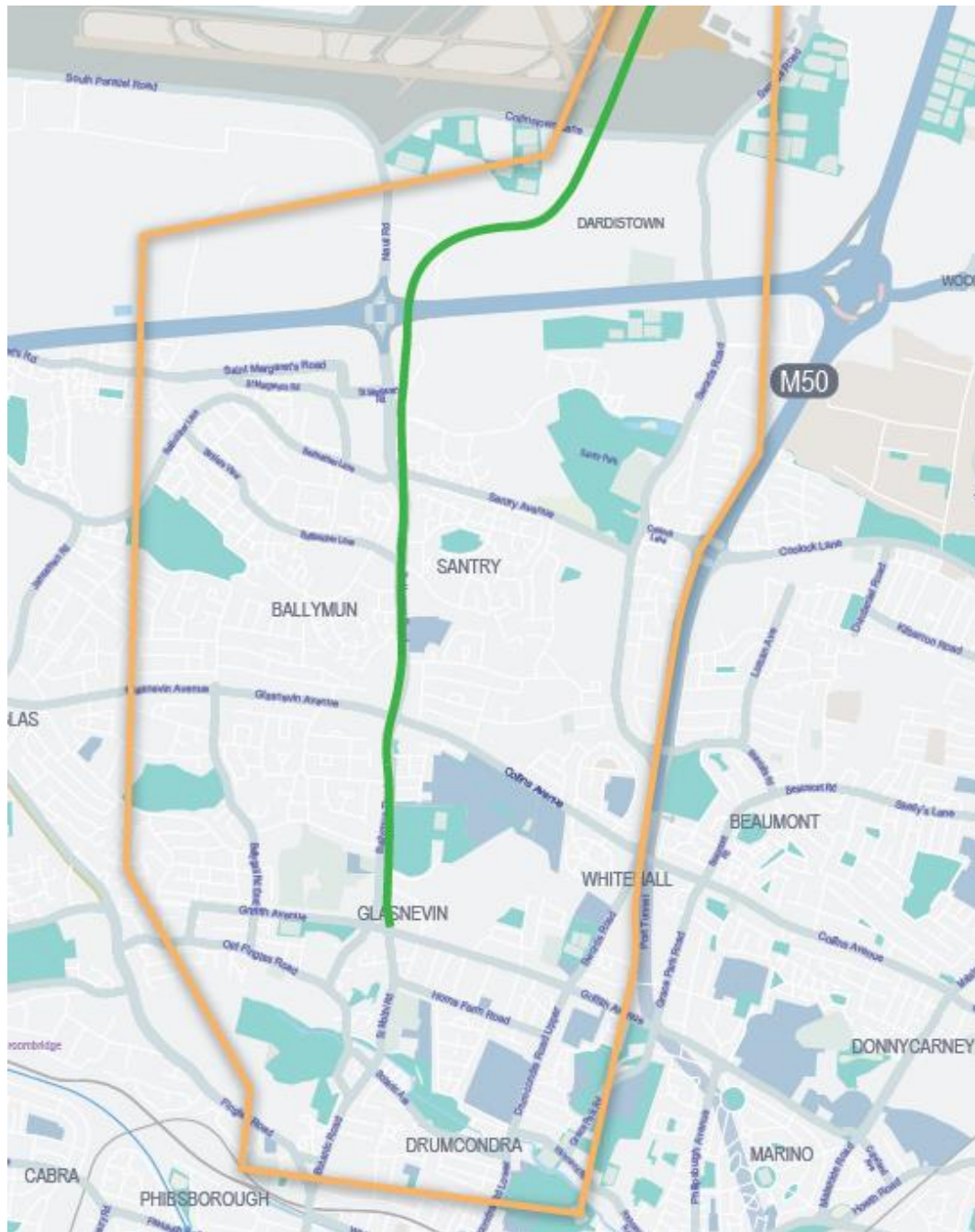
The initial geometrically feasible route options identified were assessed at a high level to rule out routes which would clearly not meet the project objectives. In particular, consideration was given to station demand and the directness of routes. In some cases, route options are ruled out owing to the presence of more suitable alternatives.

In addition to tunnel options to deliver metro segregation within Study Area B, the feasibility of at-grade and elevated running was also assessed and is summarised below.

Elevated/At-Grade Options

The only potential route in Area B which was considered suitable for either at-grade running or elevated running, due to space availability and impacts on the receiving environment, is presented in **Figure 5.12**. The potential elevated/at-grade section would start in the vicinity of Griffith Avenue and continue north on to the Ballymun Road. This is a wide road with large horizontal radii, providing adequate design complying with relevant design standards.

At Northwood the proposed route leaves the Ballymun Road and travels north west to cater for the traverse over the M50 Motorway before terminating at south of the Old Airport Road where it would enter a portal to the underground section required to serve Dublin Airport.

Figure 5.12: Study Area B - Elevated/At-Grade Option

Route sections between MSZs identified as being geometrically feasible were combined to form individual end-to-end route options within Study Area B. The resulting feasible and practical routes identified in Study Area B are illustrated in **Figure 5.13** and presented in greater detail in Chapter 6. **Table 5.4** summarises the route options and MSZs served.

Figure 5.13: Study Area B - Feasible and Practical Route Options

Table 5.4: Study Area B - Feasible and Practical Route Options Summary

Route Option	Potential Metro Station Zones Served	Vertical Alignment
B0	Griffith Avenue – DCU at Ballymun Road – Ballymun Village – Northwood West – Dardistown – Dublin Airport (MSZs 4 –7–14–18–21–22)	Underground (TBM) as far as DCU Underground (cut and cover) between DCU and Northwood Elevated across the M50 At-grade from north of M50 to just north of Dardistown Underground (TBM) from Dardistown to Dublin Airport
B1	Griffith Park West – Glasnevin – Glasnevin Avenue – Ballymun Balbutcher Lane South – Silloge – Dardistown – Dublin Airport (MSZs 3–5–10–15–19–21–22)	Underground (TBM) for entire route
B2	St. Patrick's College West – DCU at Ballymun Road – Ballymun Village – Northwood West – Dardistown – Dublin Airport (MSZs 1–7–14–18–21–22)	Underground (TBM) as far as DCU Portal between DCU and just north of Collins Avenue At-grade along Ballymun Road from Collins Avenue to Balbutcher Lane Elevated from Balbutcher Lane to just north of M50 At-grade from north of M50 to just north of Dardistown Underground (TBM) from Dardistown to Dublin Airport
B3	Griffith Park West – Glasnevin – Glasnevin Avenue – Ballymun Village – Northwood West – Dardistown – Dublin Airport (MSZs 3–5–10–14–18–21–22)	Underground (TBM) for entire route
B4	Griffith Park West – Glasnevin – Glasnevin Avenue – Ballymun Balbutcher Lane South – Northwood West – Dardistown – Dublin Airport (MSZs 3–5–10–15–18–21–22)	Underground (TBM) for entire route
B5	St. Patricks College West – DCU at Ballymun Road – Ballymun Village – Northwood West – Dardistown – Dublin Airport (MSZs 1–7–14–18–21–22)	Underground (TBM) as far as DCU Underground (cut and cover) between DCU and Northwood Elevated across M50 At-grade from north of M50 to just north of Dardistown Underground (TBM) from Dardistown to Dublin Airport
B6	St. Patricks College West – DCU at Collins Avenue West – Santry Village – Northwood Central – Dardistown – Dublin Airport (MSZs 1–8–13–17–21–22)	Underground (TBM) for entire route

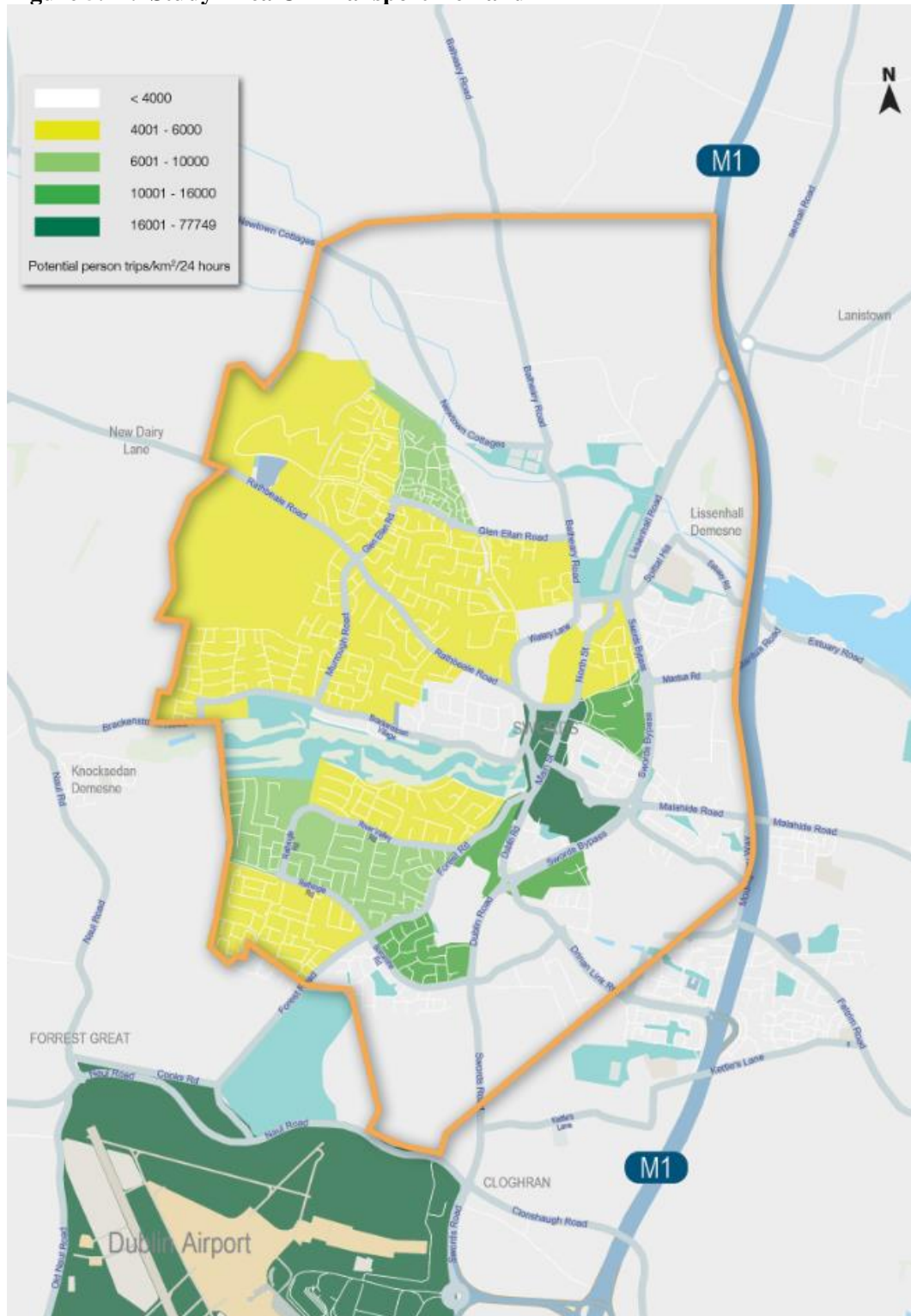
Route Option	Potential Metro Station Zones Served	Vertical Alignment
B8	Griffith Park West – DCU at Ballymun Road – Ballymun Village – Northwood West – Dardistown – Dublin Airport (MSZs 3–7–14–18–21–22)	Underground (TBM) as far as DCU Portal between DCU and just north of Collins Avenue At-grade along Ballymun Road from just north of Collins Avenue to Northwood Elevated across M50 At-grade from north of M50 to just north of Dardistown Underground (TBM) from Dardistown to Dublin Airport
B10	St. Patricks College West – DCU Collins Avenue Junction – Ballymun Village – Northwood West – Dardistown – Dublin Airport (MSZs 1–9–14–18–21–22)	Underground (TBM) for entire route
B12	Griffith Park West – DCU at Collins Avenue Junction – Ballymun Village – Northwood West – Dardistown – Dublin Airport (MSZs 3–9–14–18–21–22)	Underground (TBM) for entire route
B13	St. Patricks College West – DCU at Collins Avenue Junction – Ballymun Village – Northwood West – Dardistown – Dublin Airport (MSZs 1–9–14–18–21–22)	Underground (TBM) as far as DCU Elevated from DCU to just north of M50 At-grade from north of M50 to just north of Dardistown Underground (TBM) from Dardistown to Dublin Airport
B14	Griffith Park West – DCU at Collins Avenue Junction – Ballymun Village – Northwood West – Dardistown – Dublin Airport (MSZs 3–9–14–18–21–22)	Underground (TBM) as far as DCU Elevated from DCU to just north of M50 At-grade from north of M50 to just north of Dardistown Underground (TBM) from Dardistown to Dublin Airport
B15	Glasnevin – Glasnevin Avenue – Ballymun Village – Northwood Central – Dardistown – Dublin Airport (MSZs 5–10–14–17–21–22)	Underground (TBM) for entire route
B16	Glasnevin – DCU at Collins Avenue Junction – Ballymun Village – Northwood West – Dardistown – Dublin Airport (MSZs 5–9–14–18–21–22)	Underground (TBM) for entire route
B17	Griffith Park West – DCU at Ballymun Road – Ballymun Village – Northwood Central – Dardistown – Dublin Airport (MSZs 3–9–14–17–21–22)	Underground (TBM) for entire route

Route Option	Potential Metro Station Zones Served	Vertical Alignment
B18	St. Patricks College East – DCU at Collins Avenue West – Ballymun Village – Northwood West – Dardistown – Dublin Airport (MSZs 2–8–14–18–21–22)	Underground (TBM) for entire route

5.2.5 Study Area C

5.2.5.1 Transport Demand Assessment

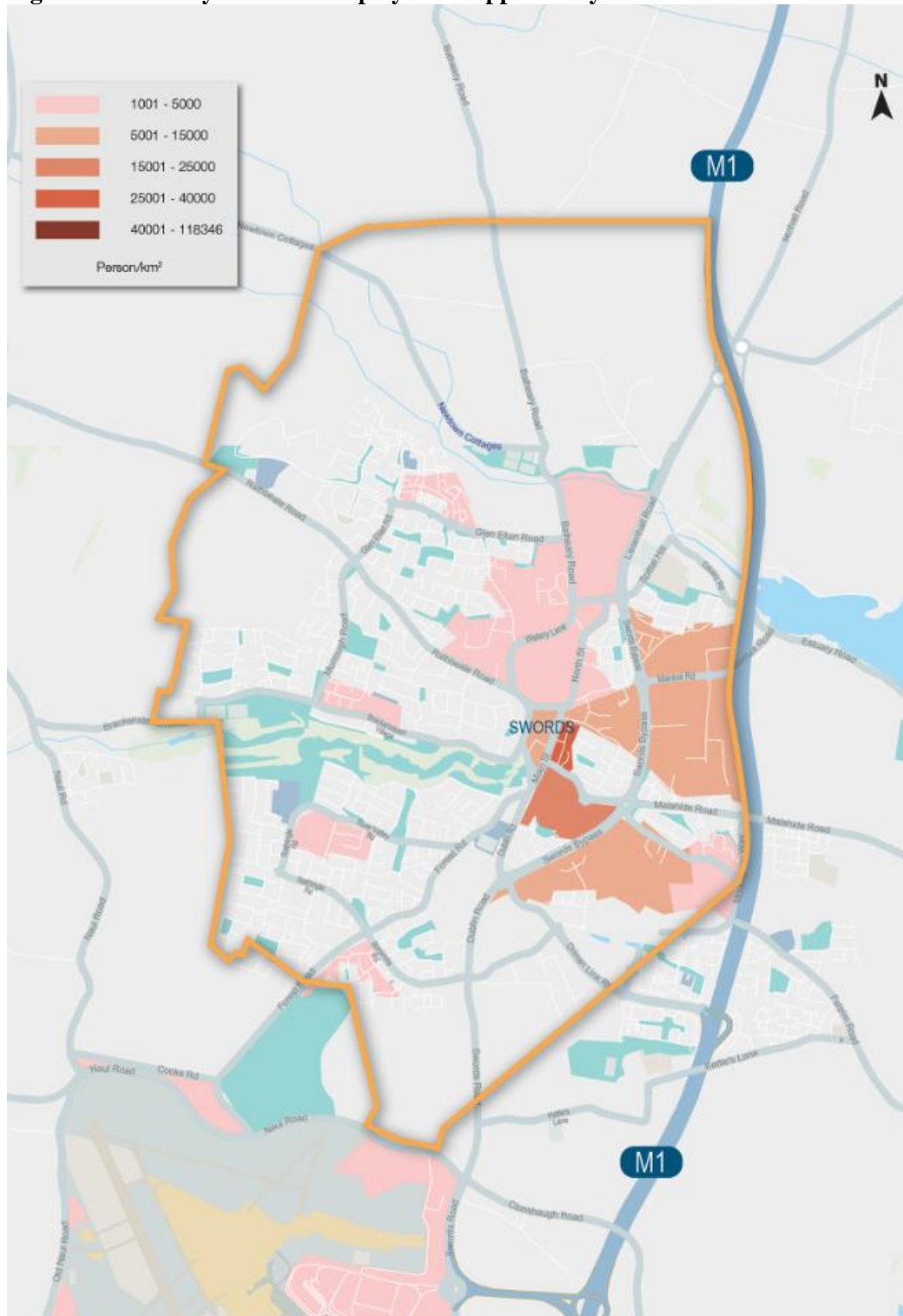
Figure 5.14 presents the variance in forecast transport demand from the ERM at cell level across Study Area C.

Figure 5.14: Study Area C - Transport Demand

As can be seen in **Figure 5.14**, there is generally a high forecast transport demand through the centre and east of Study Area C in 2035 with lower potential transport demand along the western side. It should be noted however, that the 2035 demand in the ERM does not take full account of the zoned development lands within the Metro Economic Corridor within the Fingal County Development Plan.

Figure 5.15 presents the variance in employment across the study area.

Figure 5.15: Study Area C - Employment Opportunity

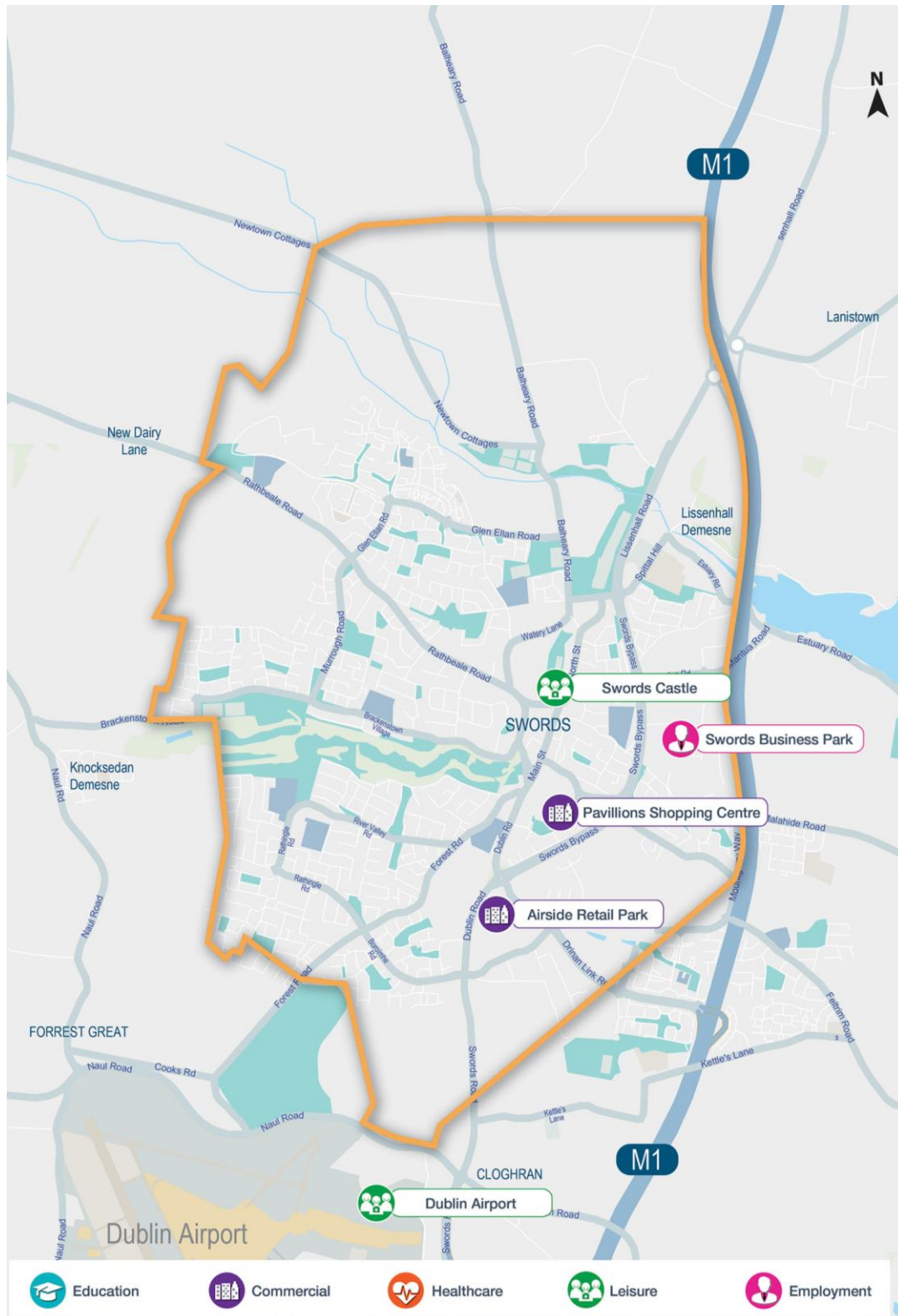


Employment opportunity in Study Area C in 2035 is concentrated in the central and eastern parts of the study area around Swords Village. As with the overall transport demand, the 2035 employment forecasts in the ERM does not take full account of the zoned development lands within the Metro Economic Corridor within the Fingal County Development Plan.

5.2.5.2 Key Trip Attractors

Key trip attractors which could potentially be served by NMN in Study Area C are illustrated in **Figure 5.16**.

Figure 5.16: Study Area C - Key Trip Attractors



5.2.5.3 Initial Metro Station Zones Locations

The initial potential MSZs which were identified within Study Area C are presented in **Figure 5.17** and summarised in **Table 5.5**.

Figure 5.17: Study Area C - Initial Potential Metro Station Zones

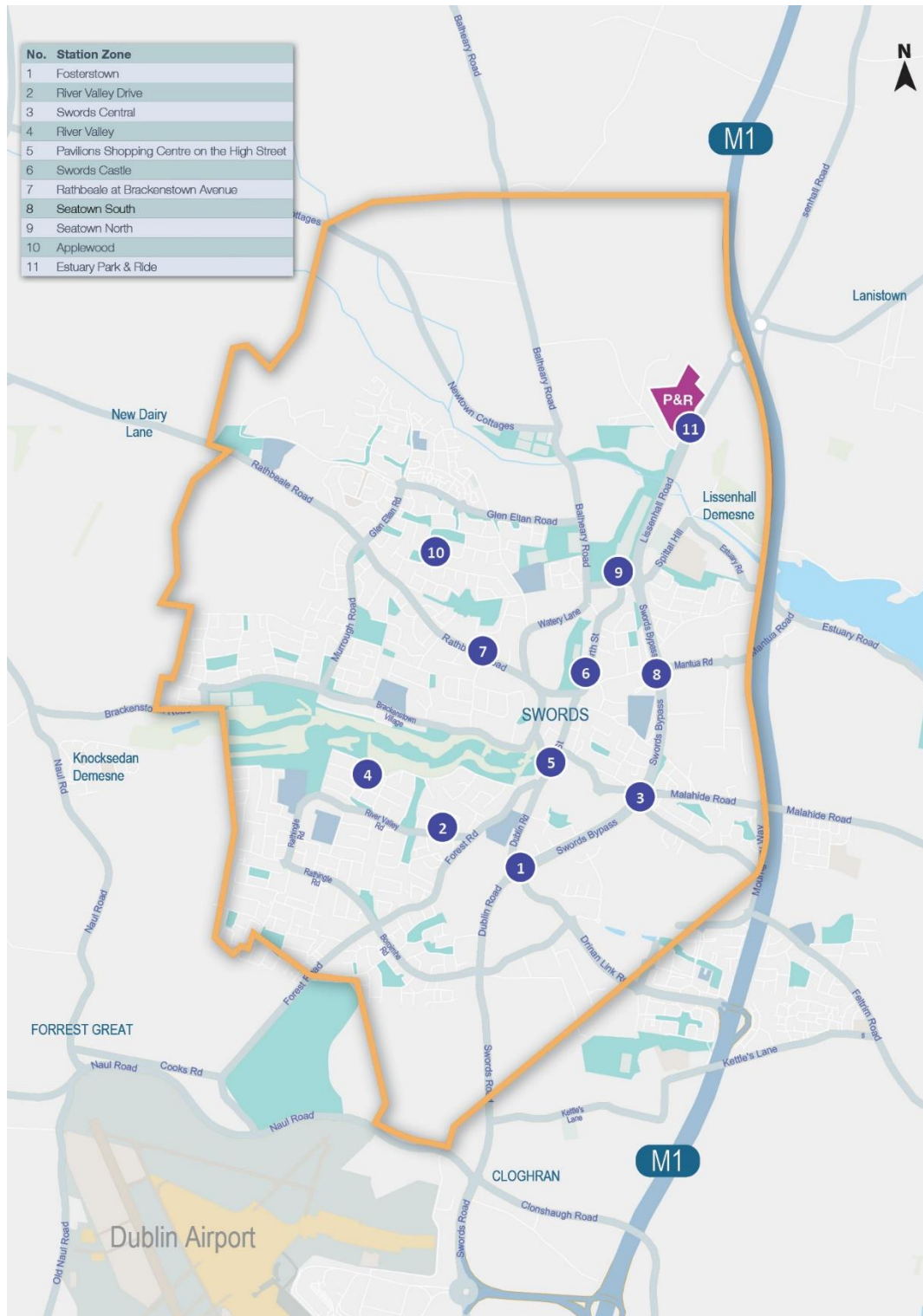


Table 5.5: Study Area C Potential Metro Station Zones

No.	Potential Metro Station Zone	Potential Metro Station Zone Description	Potential Trip Demand (trips / 24 hours) within 1,000m ²	Key Trip Attractors Within 500m Station Zone
1	Fosterstown	Broad area covering the junction of the R132, R125/Dublin Road including each approach to the junction. This zone also includes the R132 immediately west of Airside Retail Park.	14,750	Airside Retail Park
2	River Valley Drive	Broad area covering the junction of River Valley Drive and River Valley lawn including green area south of River Valley Lawn.	11,000	None
3	Swords Central	Broad area covering the junction of the R132/Malahide Road including each approach to the junction.	13,000	Pavilions Shopping Centre
4	River Valley	Broad area within Ward River Valley Park, south of St. Cronan's Junior National School.	5,750	None
5	Pavilions Shopping Centre on the High Street	Broad area in the vicinity of the Malahide Road/Swords Main Street junction including each approach to the junction.	15,750	Pavilions Shopping Centre Swords Village Swords Castle
6	Swords Castle	Broad area covering the junction of the North Street/Swords Main Street/Bridge Street including each approach to the junction and the open space in front of Fingal County Council offices.	15,000	Swords Castle Swords Village Pavilions Shopping Centre
7	Rathbeale at Brackenstown Avenue	Broad area covering the junction of the Rathbeale Road/Brackenstown Avenue including each approach to the junction.	10,000	Swords Castle Swords Village
8	Seatown South	Broad area covering the junction of the R132/Mantua Road including each approach to the junction.	12,000	Swords Business Park Swords Village Swords Castle

No.	Potential Metro Station Zone	Potential Metro Station Zone Description	Potential Trip Demand (trips / 24 hours) within 1,000m ²	Key Trip Attractors Within 500m Station Zone
9	Seatown North	Broad area on Castlegrange Road midway between the R132 and Balheary Road including Balheary Park.	8,000	None
10	Applewood	Broad area covering the green area between Sandford Wood and Glen Ellan Grove.	5,500	None
11	Estuary Park & Ride	Broad area on the western side of the R132 south of Lissenhall adjacent the proposed Park and Ride.	500	Strategic Park & Ride

5.2.5.4 Initial Metro Station Zones Sift

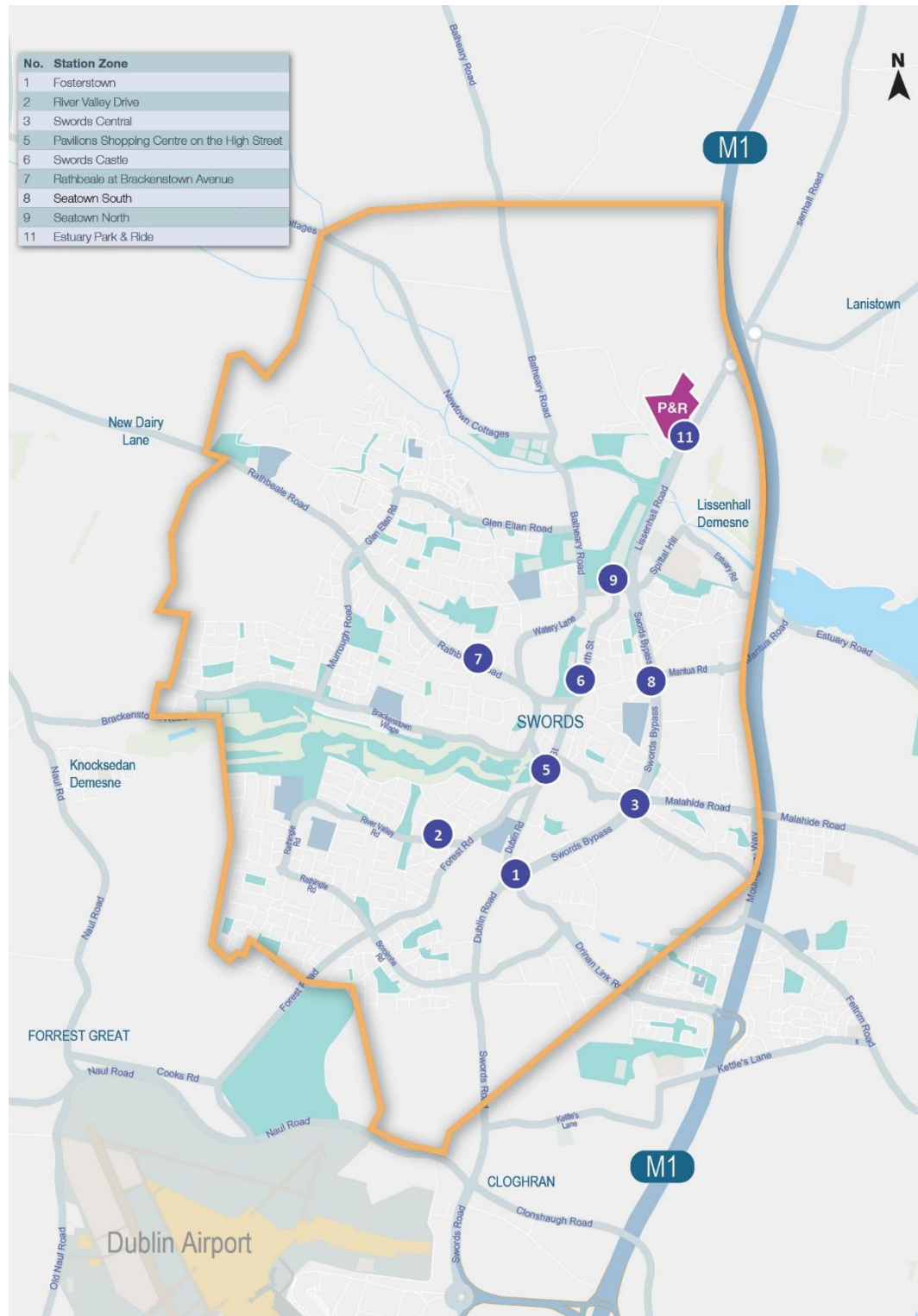
The initial MSZs identified were assessed at a high level to rule out those zones which could not be used to form routes which would meet the project objectives. In particular, consideration was given to station demand, the directness of routes which would pass through each zone and the potential for interchange with other modes.

Based on the high-level assessment, the following MSZs were not progressed as feasible MSZs:

- River Valley (MSZ 4): This MSZ is located on the western side of Study Area C and would attract one of the lowest potential transport demands of all MSZs considered. This MSZ would serve routes which would divert too far west from the central corridor where key trip attractors are located and demand is highest. For this reason, the River Valley MSZ was not considered any further; and
- Applewood (MSZ 10): As with MSZ 4, this MSZ is located on the western side of Study Area C and would attract one of the lowest potential transport demands of all MSZs considered. This MSZ also serves routes which would divert too far west from the central corridor where key trip attractors are located and demand is highest. For this reason, River Valley MSZ was not considered any further.

5.2.5.5 Feasible Metro Station Zones

Following the Metro Station Zone sift, a total of 9 feasible MSZs were identified. These are presented in **Figure 5.18**.

Figure 5.18: Study Area C - Metro Station Zones

5.2.6 Feasible and Practical Route Option Identification

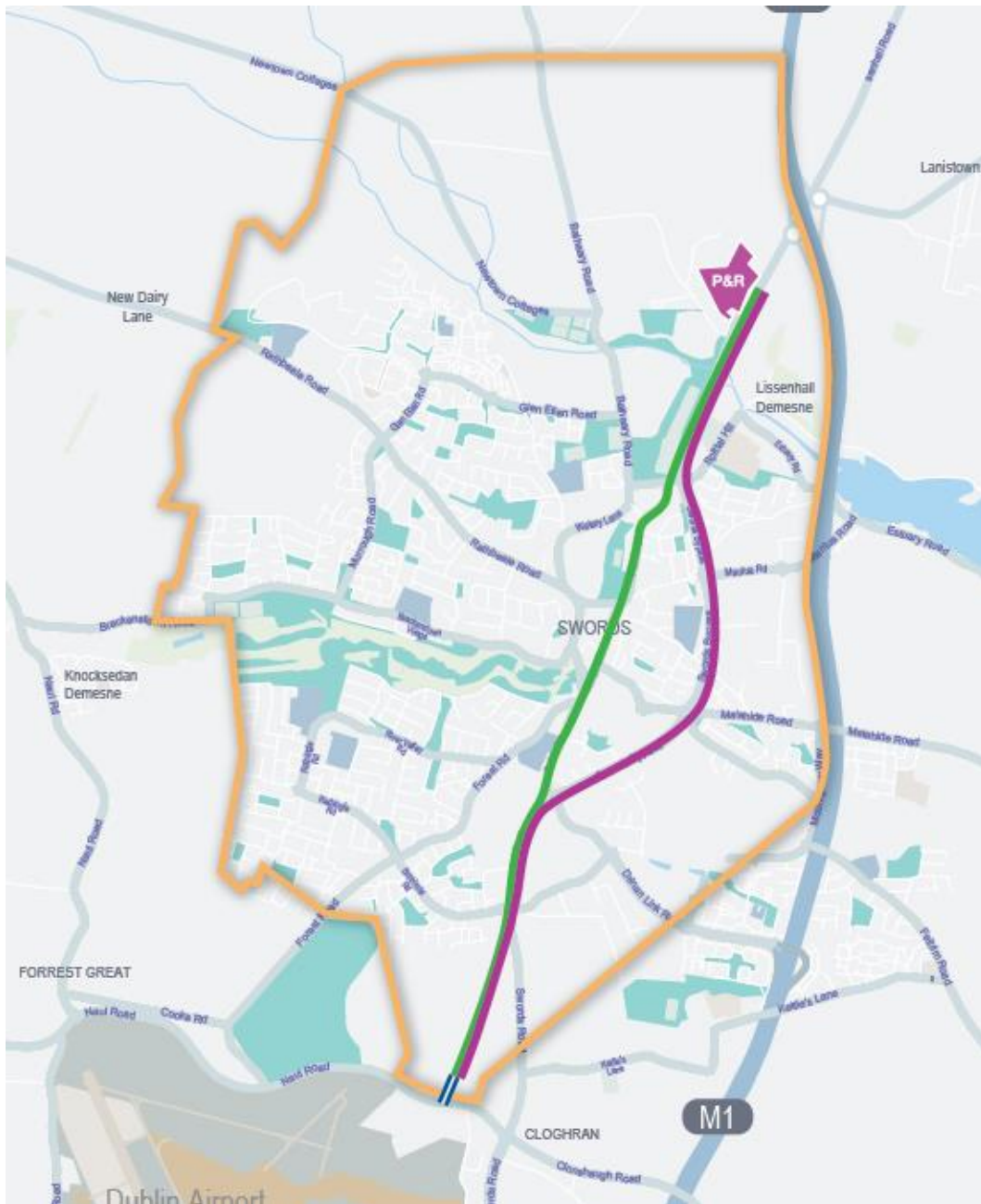
Having identified feasible MSZs within Study Area C, geometrically feasible route options which connected these MSZs were generated.

Within Study Area C, both full and partially segregated and mixed running alignment options for NMN were considered as described in Chapter 3. In addition to tunnel options to deliver metro segregation, the feasibility of at-grade and elevated running was also assessed.

Elevated/At-Grade Options

Initial potential elevated and at-grade route options identified in Study Area C are presented in **Figure 5.19** and described below:

- Option 1 – Green: This route, starts to the east of the Forrest Little Golf Course between the R132 and the Naul Road. The route then travels along the R132 and then on to the R836 Dublin Road and into Swords Main Street. The route continues north before terminating on the R132 at Lissenhall Little between the M1 Motorway and the Balheary Road; and
- Option 2 – Pink: This route starts to the west of the Forrest Little Golf Course between the R132 and the Naul Road. The proposed route then travels along the R132, passing the Pavilions' Shopping Centre and Swords Business Complex on the western and eastern side of the proposed alignment respectively. The route continues north before terminating on the R132 at Lissenhall Little between the M1 Motorway and the Balheary Road.

Figure 5.19: Study Area C - Potential Elevated/At-Grade Options

Route sections between MSZs identified as being geometrically feasible were combined to form individual end-to-end route options within Study Area C. The resulting feasible and practical routes identified in Study Area C are illustrated in **Figure 5.20** and presented in greater detail in Chapter 6. **Table 5.6** summarises the route options and stations served.

Figure 5.20: Study Area C - Feasible and Practical Route Options

Note: Station 1a reflects the likely location of Fosterstown station for C5 and C11.

Table 5.6: Study Area C - Feasible and Practical Route Options Summary

Route Option	Potential Metro Station Zones Served	Vertical Alignment
C0	Fosterstown – Swords Central – Seatown South – Estuary Park & Ride (MSZs 1–3–8–11)	<p>Fully Segregated Alignment:</p> <p>At-grade from Naul Road to Rathingle Road</p> <p>Cut-and-cover under R132/Rathingle Road Junction</p> <p>At-grade along R132 from Rathingle Road to Pinnock Hill Roundabout</p> <p>Elevated over Pinnock Hill Roundabout at the Dublin Road/R132 Junction</p> <p>At-grade along R132 from Pinnock Hill Roundabout to Malahide Road Roundabout</p> <p>Cut-and-cover under Malahide Road Roundabout</p> <p>At-grade along R132 between Malahide Road Roundabout and Seatown Roundabout</p> <p>Elevated from Seatown Roundabout to just north of Castlegrange Road</p> <p>At-grade from Castlegrange Road to Estuary</p>
C1	Fosterstown– Swords Central – Seatown South – Estuary Park & Ride (MSZs 1–3–8–11)	At-grade along entire route (non-segregated)
C2	Fosterstown – Pavilions Shopping Centre High Street – Swords Castle – Estuary Park & Ride (MSZs 1–5–6–11)	At-grade along entire route (non-segregated)
C3	Fosterstown – Swords Central – Seatown South – Estuary Park & Ride (MSZs 1–3–8–11)	<p>Fully Segregated Alignment:</p> <p>At-grade from Naul Road to Rathingle Road</p> <p>Cut-and-cover under R132/Rathingle Road Junction</p> <p>At-grade along R132 from Rathingle Road to just south of Pinnock Hill Roundabout</p> <p>Elevated just south of Pinnock Hill Roundabout to just south of the Malahide Road Roundabout</p> <p>Cut-and-cover under Malahide Road Roundabout</p> <p>At-grade along R132 between Malahide Road Roundabout and Seatown Roundabout</p> <p>Elevated from Seatown Roundabout to just north of Castlegrange Road</p> <p>At-grade from Castlegrange Road to Estuary</p>
C4	Fosterstown – Swords Central – Seatown South – Estuary Park & Ride (MSZs 1–3–8–11)	<p>At-grade from Naul Road to Rathingle Road</p> <p>Cut-and-cover under R132/Rathingle Road Junction</p> <p>At-grade along R132 from Rathingle Road to Pinnock Hill Roundabout</p> <p>Elevated over Pinnock Hill Roundabout to just north of Castlegrange Road</p>

Route Option	Potential Metro Station Zones Served	Vertical Alignment
		At-grade from Castlegrange Road to Estuary
C5	Fosterstown – River Valley Drive – Rathbeale at Brackenstown Avenue – Seatown North – Estuary Park and Ride ((MSZs 1a-2-7-9-11)	At-grade from Naul Road to Rathingle Road Underground from Rathingle Road as far as Castlegrange Road At-grade from Castlegrange Road to Estuary
C6	Fosterstown – Swords Central – Swords Castle - Seatown North – Estuary Park & Ride (MSZs 1–3–6–9–11)	At-grade from Naul Road to Rathingle Road Underground from Rathingle Road as far as Castlegrange Road At-grade from Castlegrange Road to Estuary
C11	Fosterstown – Pavilions Shopping Centre– North Street - Estuary Park & Ride (MSZs 1a–5–6–11)	Underground as far as Castlegrange Road At-grade from Castlegrange Road to Estuary

6 Preliminary Assessment

6.1 Introduction

This section of the report presents the Preliminary Assessment of Feasible and Practical Route Options identified in Chapter 5. This process identifies Assessment Options which were then progressed to the detailed Multi-Criteria Analysis Stage.

At the end of each study area section, the Assessment Options emerging are described in further detail. This includes consideration of potential station locations within MSZs on routes. Each Assessment Option developed is presented in further detail in **Appendix 6.1, Volume 2**.

6.2 Study Area A

6.2.1 Assessment Summary

Table 6.1 to **Table 6.10** presents the Preliminary Assessment for Study Area A.

Table 6.1: Route Option A0

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	<ul style="list-style-type: none"> -Luas Cross City and Luas Green Line at St. Stephens Green; -Luas Cross City at Parnell Square and O'Connell Street; -Luas Red Line at Abbey Street; -Heavy Rail at Drumcondra Station; -Swords/Airport to City Centre BRT at Drumcondra Station; -Clongriffin to Tallaght BRT at O'Connell Street. -Core bus services at St Stephen's Green, Westmoreland Street and O'Connell Street/Parnell Square. 	<p>This route option represents Old Metro North.</p> <p>This route option provides good interchange opportunities with other modes and serves important key trip attractors in the study area. This option also takes a reasonably direct line through areas of high demand. While this option is slightly longer than some other options considered, it would attract the highest potential trip demand of all options considered in Study Area A.</p> <p>For these reasons, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 64,750 trips/24hrs is forecast for the area within a 500m walk of the 6 stations proposed on this route (10,800 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -National Concert Hall -National Museum of Ireland -The Hugh Lane Gallery -Gaiety Theatre -Abbey Theatre -The Gate Theatre -Savoy Cinema -Cineworld -Croke Park -Royal Victoria Eye and Ear Hospital -Mater Hospital (Public and Private) -Rotunda Hospital -Temple Street Children's Hospital -Trinity College Dublin -DIT Bolton Street -Royal College of Surgeons Ireland -St. Stephen's Green -Ranelagh Village -South City Centre Employment -City Centre Retail Core – North -City Centre Retail Core – South 		
Directness	<p>4.0km</p> <p>This route option consists of a direct alignment through the centre of the study area</p>		

Figure 6.1: Route Option A0

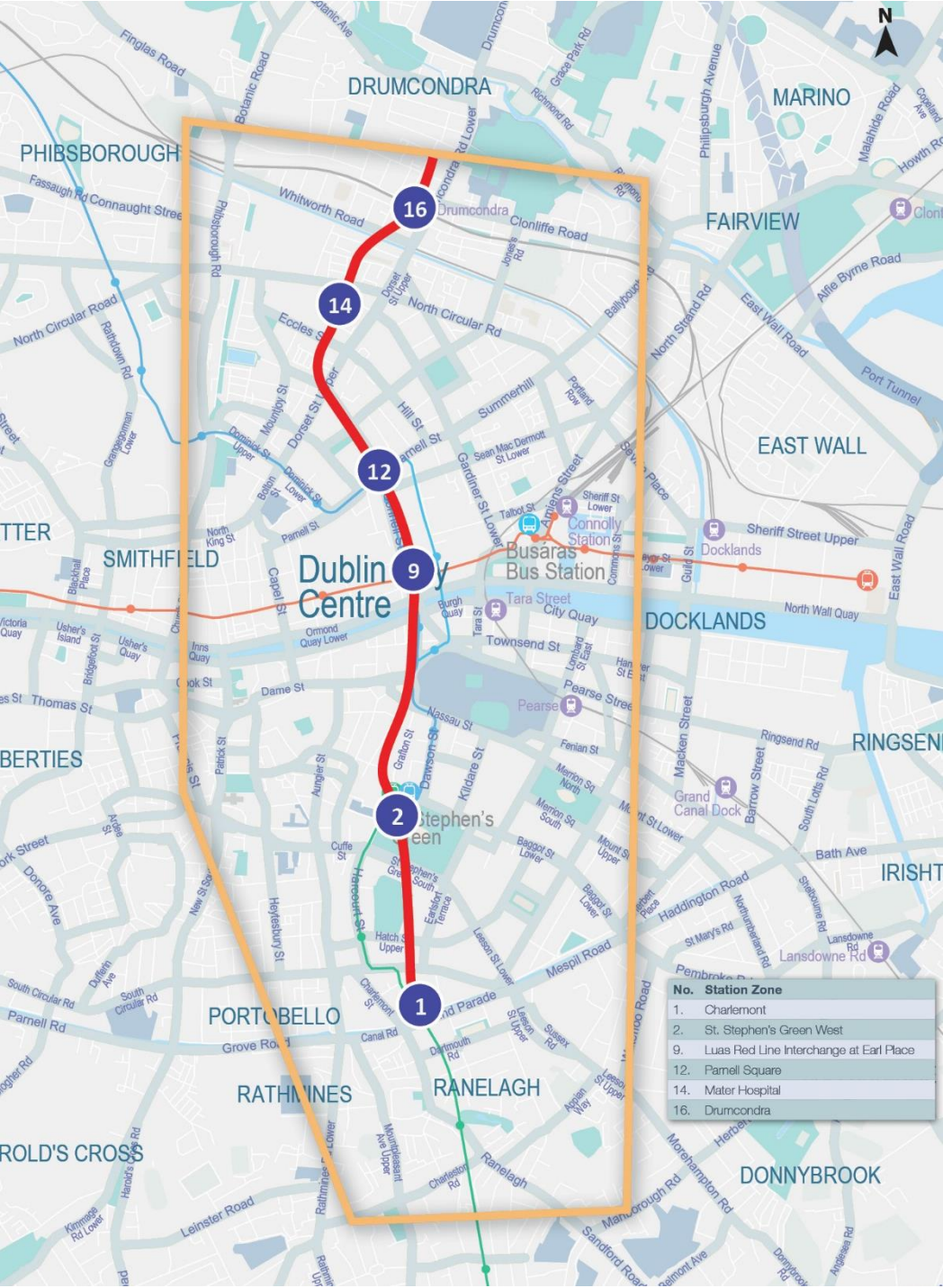


Table 6.2: Route Option A1

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	<ul style="list-style-type: none"> -Luas Green line at Charlemont Tie-In -Luas Cross City at College Green and Parnell Square -Heavy Rail at Drumcondra Station -Swords/Airport to City Centre BRT at Drumcondra Station and Parnell Square -Core bus services at Dame Street, College Green, Westmoreland Street and O'Connell Street/Parnell Square. 	<p>This route option provides good interchange opportunities and serves important key trip attractors in the study area. This option also takes a direct and short route through areas of high demand in the centre of the study area. For these reasons, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 53,000 trips/24hrs is forecast for the area within a 500m walk of the 5 stations proposed on this route (10,600 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -National Concert Hall -The Hugh Lane Gallery -Royal Victoria Eye and Ear Hospital -Rotunda Hospital -Temple Street Children's Hospital -Mater Hospital (Public and Private) -Olympia Theatre -Gaiety Theatre -The Gate Theatre -Savoy Cinema -Cineworld -Trinity College Dublin -DIT Bolton Street -Croke Park -Ranelagh Village -South City Centre Employment -City Centre Retail Core – South -City Centre Retail Core – North 		
Directness	<p>4.0km</p> <p>This route option consists of a direct alignment through the centre of the study area</p>		

Figure 6.2: Route Option A1

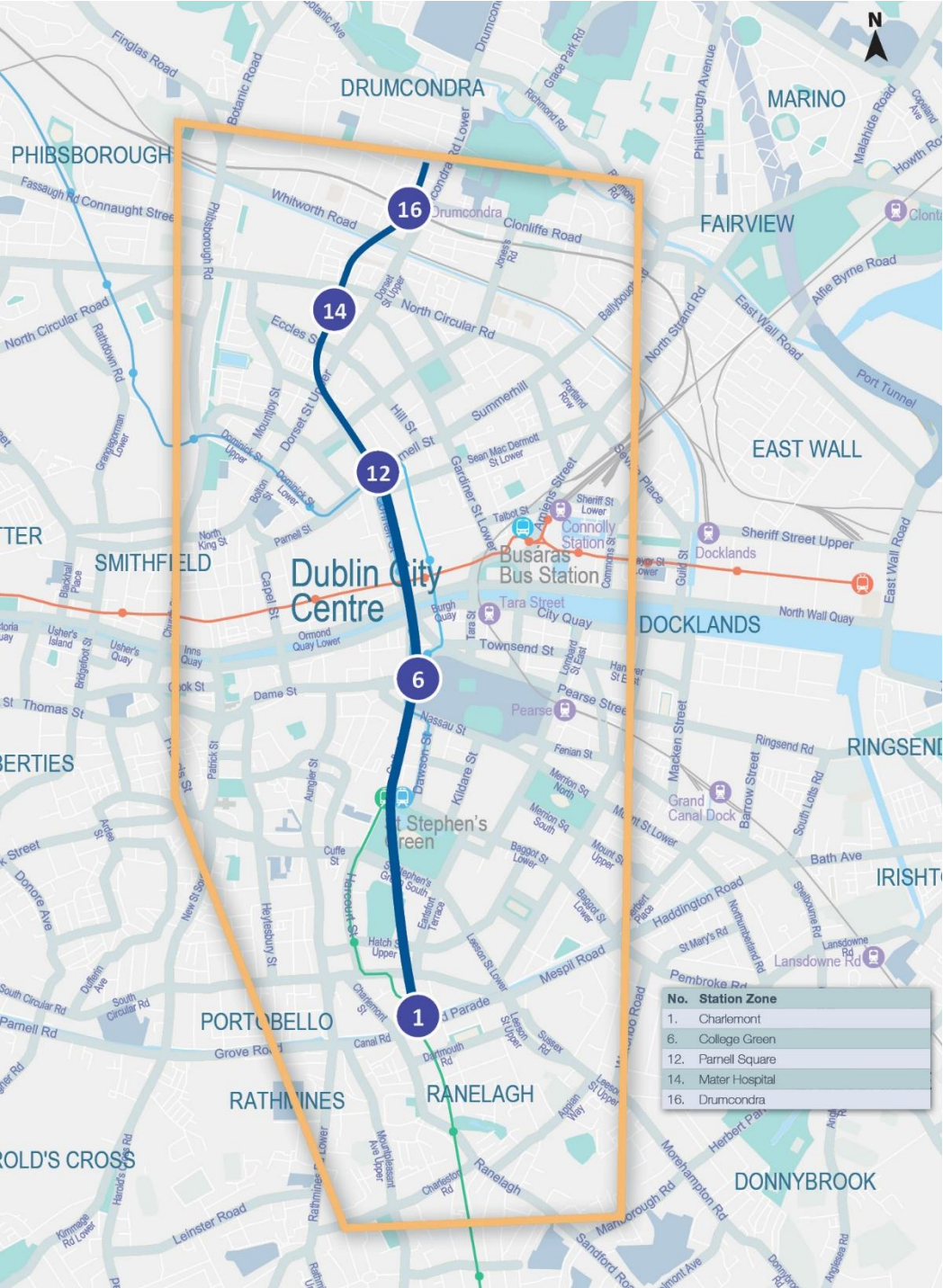


Table 6.3: Route Option A2

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	<ul style="list-style-type: none"> -Luas Green Line at Charlemont Tie-In. -Luas Cross City at Parnell Square -Heavy Rail and DART at Tara St. Station -Heavy Rail at Drumcondra Station -Swords/Airport to City Centre BRT at Drumcondra Station and Parnell Square -Core bus services at St Stephen's Green, on the Quays, and on O'Connell Street. 	<p>This route option provides good interchange opportunities and serves important key trip attractors in the study area. This option also takes a direct and short route through areas of high demand in the centre of the study area. For these reasons, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 55,700 trips/24hrs is forecast for the area within a 500m walk of the 6 stations proposed on this route (9,300 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -National Concert Hall -The Hugh Lane Gallery -Gaiety Theatre -Abbey Theatre -The Gate Theatre -Savoy Cinema -Cineworld -National Museum of Ireland -National Gallery of Ireland -RCSI -Trinity College Dublin -DIT Bolton Street -Royal Victoria Eye and Ear Hospital -Rotunda Hospital -Temple Street Children's Hospital -Mater Hospital (Public and Private) -Ranelagh Village -Croke Park -South City Centre Employment -St. Stephen's Green -City Centre Retail Core – South -City Centre Retail Core – North 		
Directness	<p>4.1km</p> <p>While this route moves west-east slightly between St. Stephens Green and Parnell Square, this route option consists of a reasonably direct alignment through the centre of the study area.</p>		

Figure 6.3: Route Option A2

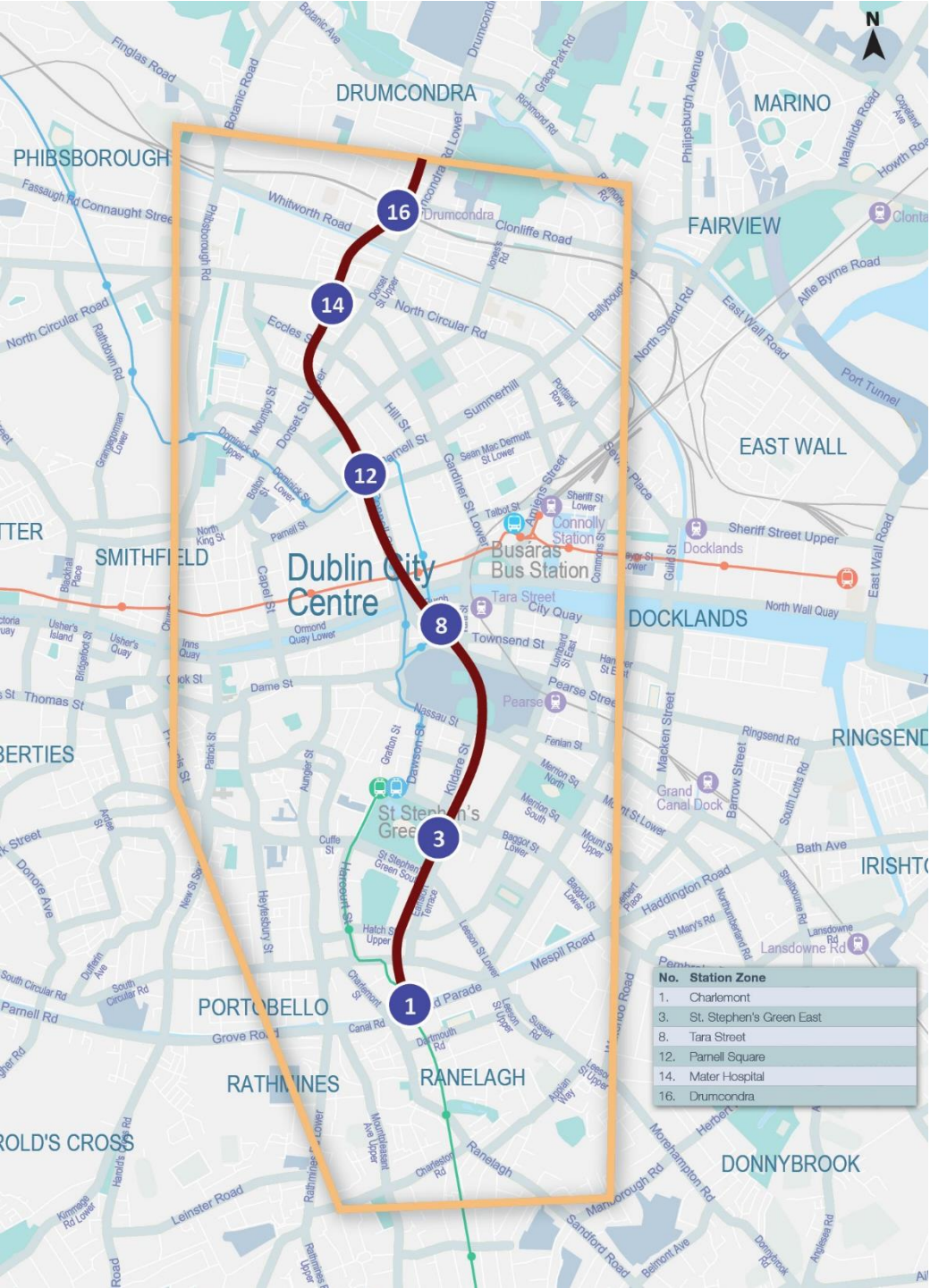


Table 6.4: Route Option A4

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	<ul style="list-style-type: none"> -Luas Green Line at Charlemont Tie in and St. Stephens Green. -Luas Cross City at Parnell Square and St. Stephens Green. -Heavy Rail and DART at Tara St. Station. -Core bus services at St Stephen's Green, on the Quays, and on O'Connell Street. 	<p>This route option provides good interchange opportunities and serves important key trip attractors in the study area. It also serves a high demand. Whilst the additional length to serve Whitworth Station adds journey time to the route in Study Area A, it reduces journey time for options in Study Area B as there are suitable options through the centre of Study Area B which align with this western edge of Study Area A. For this reason, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 55,950 trips/24hrs is forecast for the area within a 500m walk of the 6 stations proposed on this route (9,300 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -National Concert Hall -National Museum of Ireland -The Hugh Lane Gallery -Gaiety Theatre -Abbey Theatre -The Gate Theatre -St. Stephen's Green -Savoy Cinema -Cineworld -Royal Victoria Eye and Ear Hospital -Rotunda Hospital -Temple Street Children's Hospital -Mater Hospital (Public and Private) -Ranelagh Village -Phibsborough Village -South City Centre Employment -City Centre Retail Core – North -City Centre Retail Core – South -Trinity College Dublin -Royal College of Surgeons Ireland -DIT Bolton Street 		
Directness	<p>4.3km</p> <p>This route option diverts away from the central corridor as it moves north from Parnell Square.</p>		

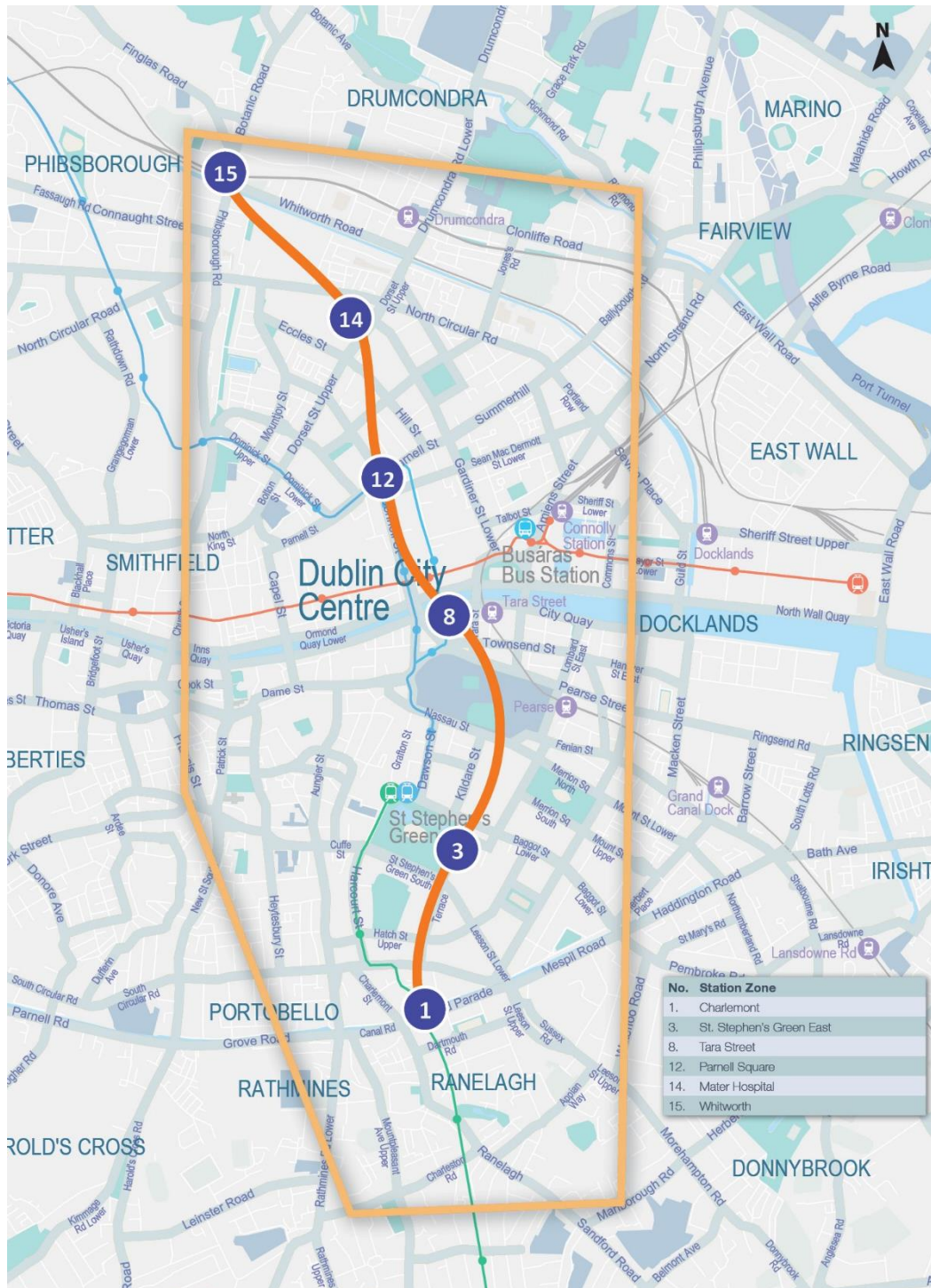
Figure 6.4: Route Option A4

Table 6.5: Route Option A6

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	<ul style="list-style-type: none"> -Heavy Rail and DART at Pearse Station -Heavy Rail at Drumcondra Station -Swords/Airport to City Centre BRT at St. Stephens Green, Mountjoy Square and Drumcondra. 	<p>This route option provides good interchange opportunities with DART and Heavy Rail and serves important key trip attractors in the study area.</p> <p>However, this route option adds unnecessary length and would serve a smaller demand than alternative options in the study area. For these reasons, this option is not considered any further.</p>	Fail
Potential Trip Demand	Potential trip demand of approximately 35,200 trips/24hrs is forecast for the area within a 500m walk of the 5 stations proposed on this route (7,000 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -National Concert Hall -National Museum of Ireland -National Gallery of Ireland -Gaiety Theatre -The Gate Theatre -Savoy Cinema -Croke Park -St. Stephen's Green -Royal Victoria Eye and Ear Hospital -Rotunda Hospital -Temple Street Children's Hospital -Ranelagh Village -South City Centre Employment -City Centre Retail Core – South -Trinity College Dublin -RCSI 		
Directness	<p>3.9km</p> <p>This route option diverts away from the central corridor but north of Pearse Station diverts back to the central portion of Study Area B.</p>		

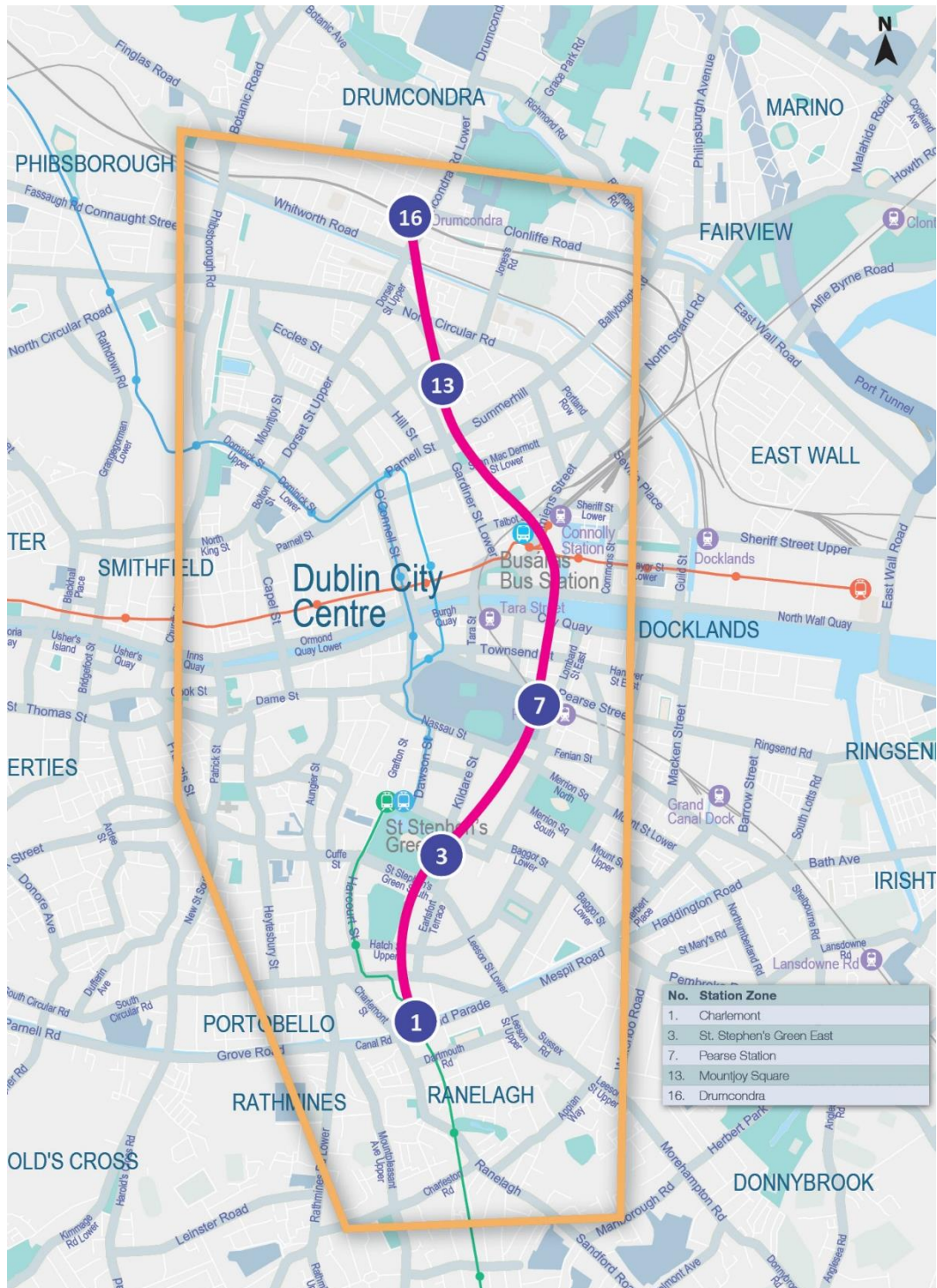
Figure 6.5: Route Option A6

Table 6.6: Route Option A8

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	<ul style="list-style-type: none"> -Heavy Rail and DART at Tara St. Station -Heavy Rail at Drumcondra Station -Swords/Airport to City Centre BRT at St. Stephens Green, Mountjoy Square and Drumcondra 	<p>This route option provides good interchange opportunities and serves key retail trip attractors both north and south of the River Liffey. The route is short and direct through the centre of the study area and would attract a comparably good potential trip demand. For these reasons, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 39,700 trips/24hrs is forecast for the area within a 500m walk of the 5 stations proposed on this route (7,900 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -National Concert Hall -National Museum of Ireland -National Gallery of Ireland -Gaiety Theatre -Abbey Theatre -The Gate Theatre -Savoy Cinema -Croke Park -Royal Victoria Eye and Ear Hospital -Rotunda Hospital -Temple Street Children's Hospital -St. Stephen's Green -Ranelagh Village -South City Centre Employment -City Centre Retail Core – South -City Centre Retail Core – North -Trinity College Dublin -RCSI 		
Directness	<p>3.8km</p> <p>This route option consists of a direct alignment through the centre of the study area</p>		

Figure 6.6: Route Option A8

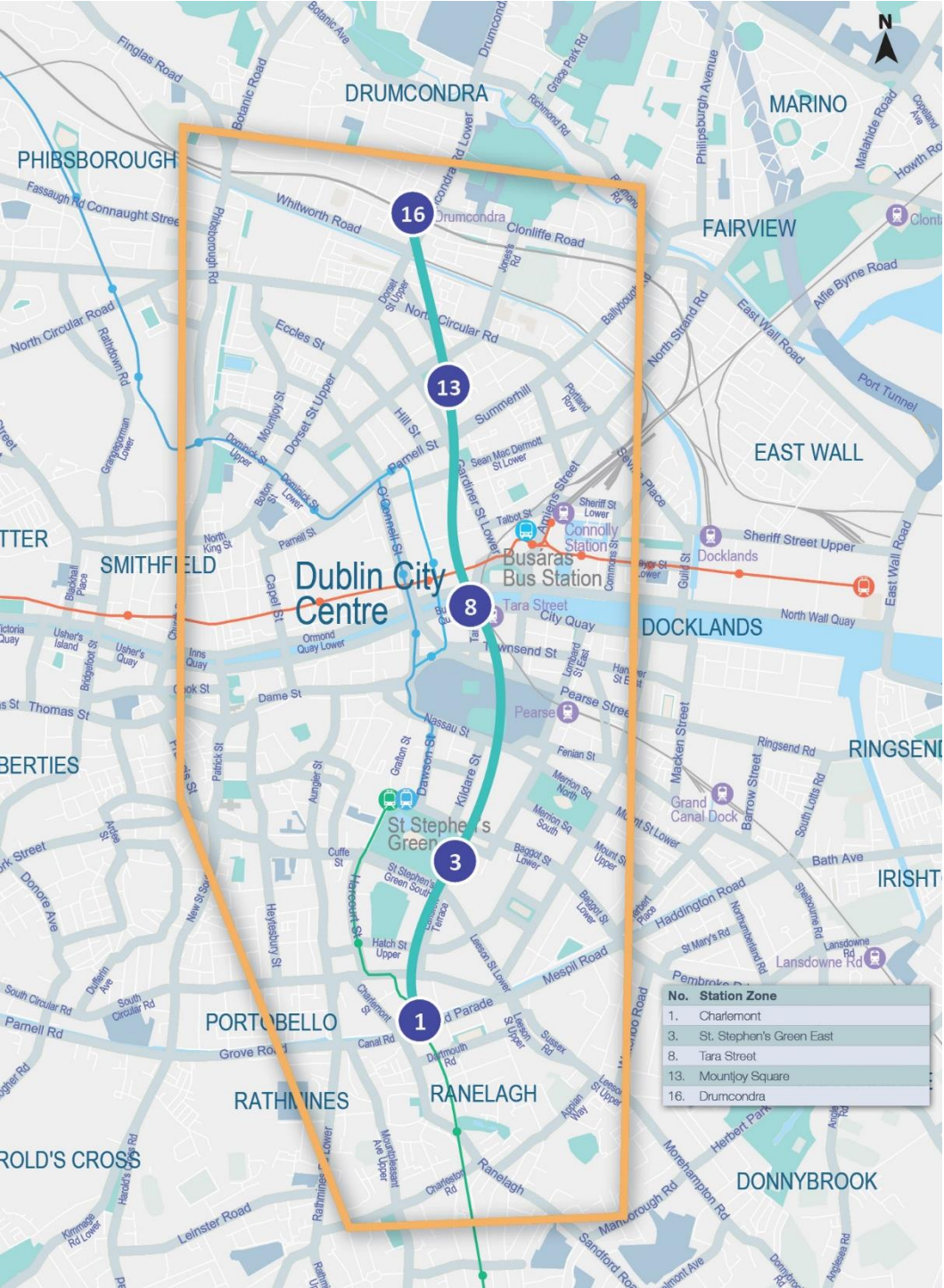


Table 6.7: Route Option A14

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	-Heavy Rail at Drumcondra Station -Luas Cross City at O'Connell St. Upper -Luas Cross City and Luas Green Line at St. Stephens Green	<p>This route option represents Optimised Metro North as per the Fingal/North Dublin Transport Study.</p> <p>This route option provides good interchange opportunities with heavy rail, Luas and BRT.</p> <p>This route option also serves key trip attractors north and south of the River Liffey.</p> <p>In terms of demand, this option penetrates the central portion of the study area, which would have a high potential demand.</p> <p>For these reasons, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 47,250 trips/24hrs is forecast for the area within a 500m walk of the 5 stations proposed on this route (9,500 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -National Concert Hall -National Museum of Ireland -Gaiety Theatre -St. Stephen's Green -Abbey Theatre -Savoy Cinema -Croke Park -Royal Victoria Eye and Ear Hospital -Rotunda Hospital -Mater Hospital (Public and Private) -Trinity College Dublin -Royal College of Surgeons Ireland -Ranelagh Village -South City Centre Employment -City Centre Retail Core – South -City Centre Retail Core – North 		
Directness	<p>4.0km</p> <p>This route option consists of a direct alignment through the centre of the study area</p>		

Figure 6.7: Route Option A14

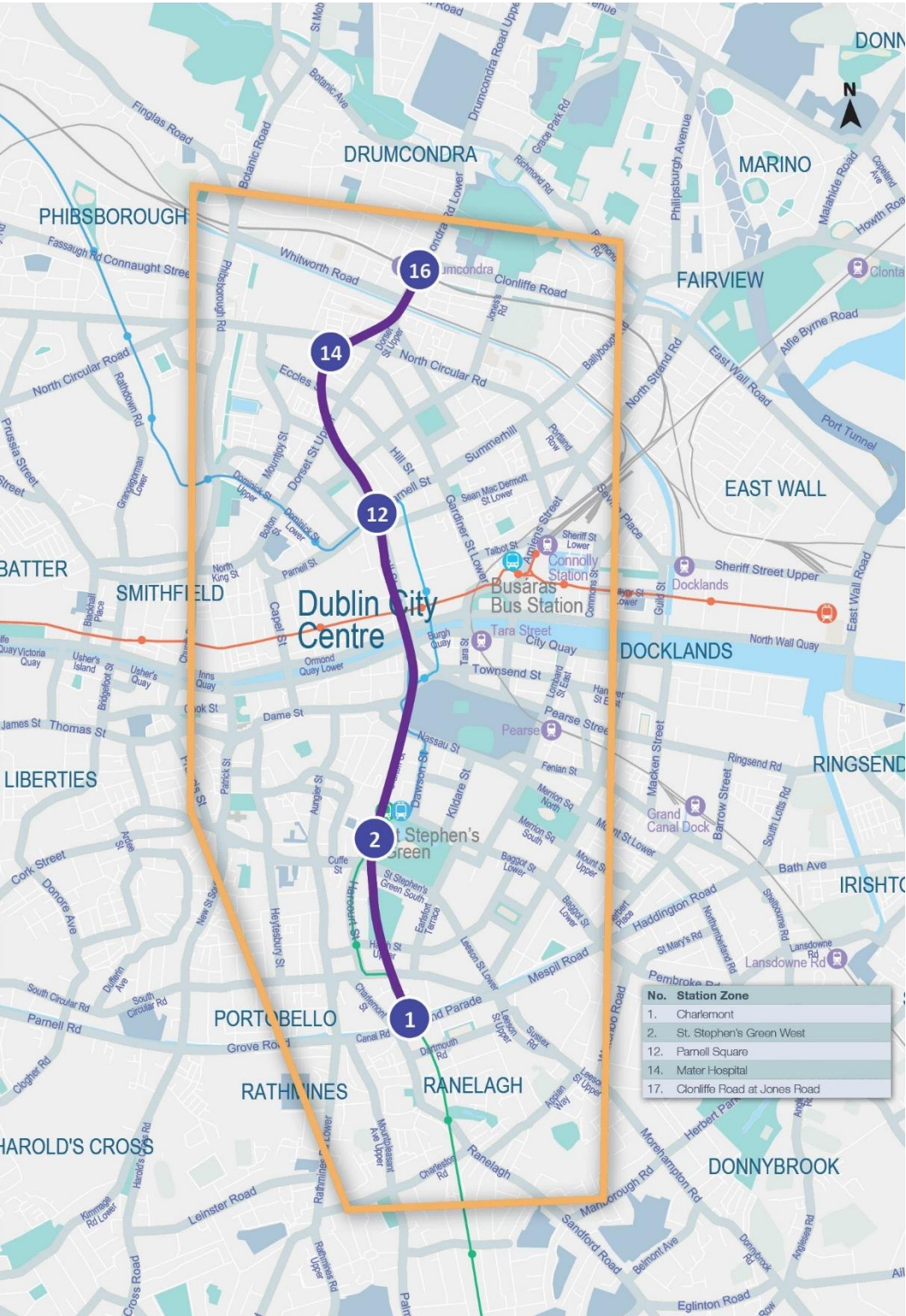


Table 6.8: Route Option A15

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	-Heavy Rail at Drumcondra Station -Luas Cross City and Luas Green Line at St. Stephens Green -Luas Red Line at Jervis Street	<p>This route option serves central and western portions of Study Area A. While this route would serve a relatively high demand, it serves less key trip attractors than other options and generally bypasses the core city centre area.</p> <p>Furthermore, this route option does not provide as many opportunities for interchange with other modes, particularly DART suburban services.</p> <p>For the above reasons, this route option is not considered any further.</p>	Fail
Potential Trip Demand	Potential trip demand of approximately 47,000 trips/24hrs is forecast for the area within a 500m walk of the 5 stations proposed on this route (9,400 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> - St. Stephen's Green - City Centre Retail Core – South - City Centre Retail Core – North - Trinity College Dublin - Royal College of Surgeons Ireland - National Museum of Ireland - Gaiety Theatre - Olympia Theatre - Cineworld - DIT Bolton Street - Mater Hospital (Public and Private) - Croke Park 		
Directness	<p>4.0km</p> <p>This route option diverts away from the central corridor as it moves north of St. Stephens Green West, but north of Wolfe Tone Square it diverts back to the central portion of Study Area B.</p>		

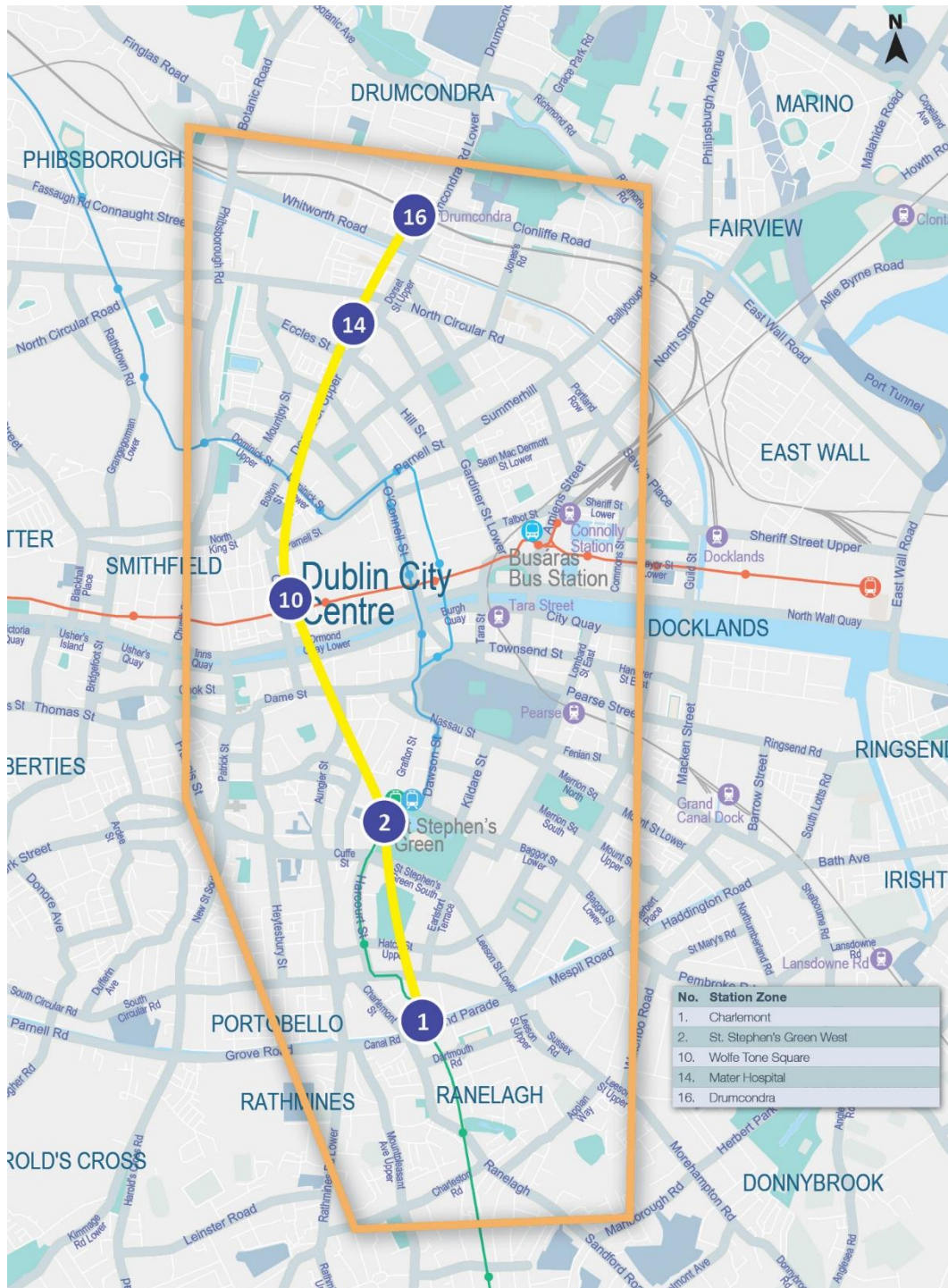
Figure 6.8: Route Option A15

Table 6.9: Route Option A16

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	-Heavy Rail at Whitworth Station -Luas Cross City and Luas Green Line at St. Stephens Green -Luas Red Line at Jervis Street	<p>This route option serves central and western portions of Study Area A. While this route would serve a reasonably high demand, it serves less key trip attractors than other options and generally bypasses the core city centre area.</p> <p>Furthermore, this route option does not provide as many opportunities for interchange with other modes, particularly DART suburban services.</p> <p>For the above reasons, this route option is not considered any further.</p>	Fail
Potential Trip Demand	Potential trip demand of approximately 39,500 trips/24hrs is forecast for the area within a 500m walk of the 4 stations proposed on this route (9,900 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> - National Concert Hall - Royal Victoria Eye and Ear hospital - Ranelagh Village - St. Stephen's Green - City Centre Retail Core – South - Trinity College Dublin - Royal College of Surgeons Ireland - National Museum of Ireland - Gaiety Theatre - Olympia Theatre - Cineworld - DIT Bolton Street - Phibsborough Village 		
Directness	<p>4.0km</p> <p>This route option diverts away from the central corridor as it moves north of St. Stephens Green West and generally serves the western side of the study area.</p>		

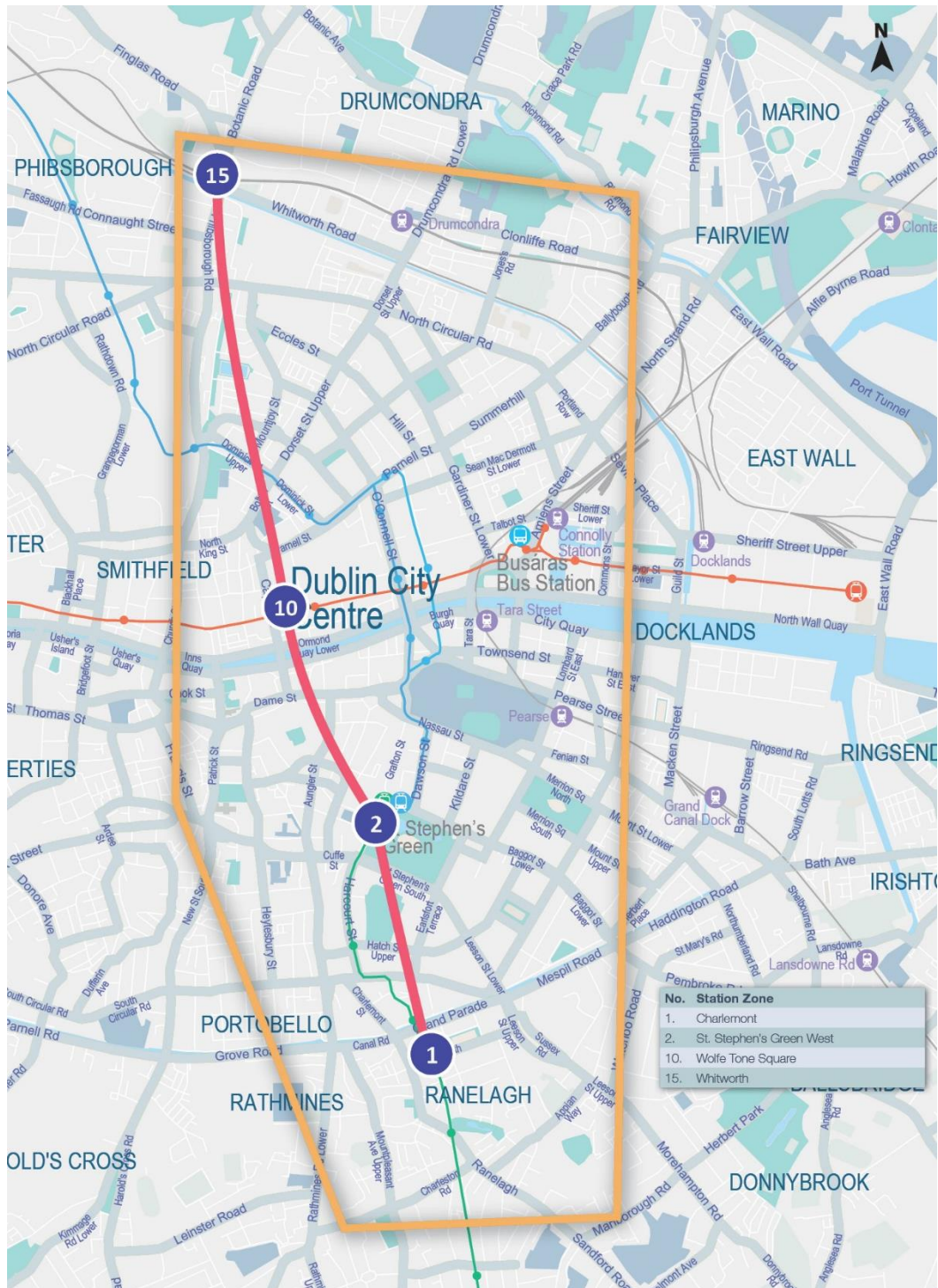
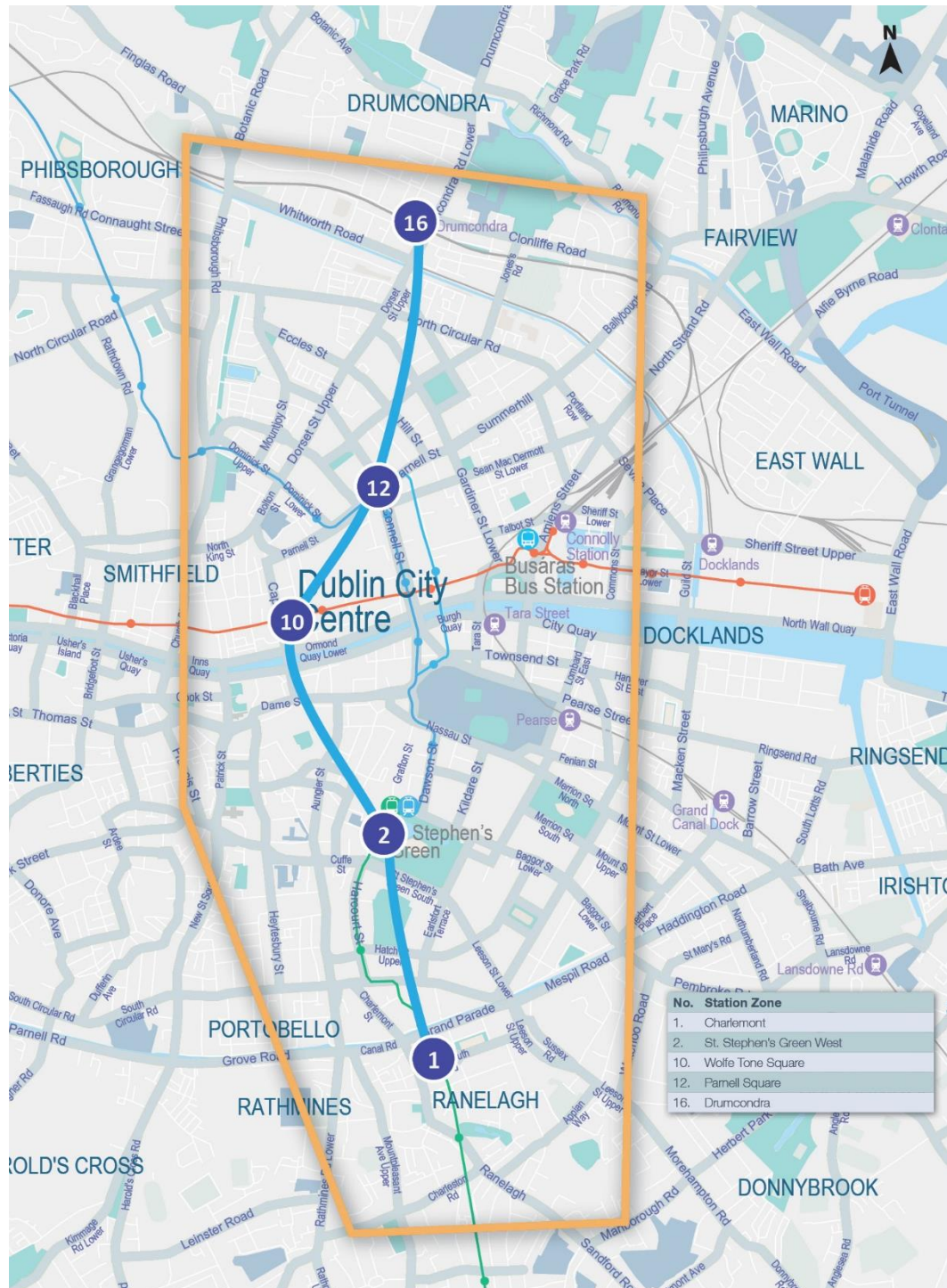
Figure 6.9: Route Option A16

Table 6.10: Route Option A17

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	<ul style="list-style-type: none"> - Heavy Rail at Drumcondra Station -Luas Cross City and Luas Green Line at St. Stephens Green -Luas Red Line at Jervis Street -Swords/Airport to City Centre BRT at Mountjoy Square and Drumcondra 	<p>This route option serves central and western portions of Study Area A. While this route would serve a relatively high demand, it generally bypasses the core city centre area and misses out on large trip attractors such as Trinity College.</p> <p>Furthermore, this route option does not provide as many opportunities for interchange with other modes, particularly DART suburban services.</p> <p>For the above reasons, this route option is not considered any further.</p>	Fail
Potential Trip Demand	Potential trip demand of approximately 56,750 trips/24hrs is forecast for the area within a 500m walk of the 5 stations proposed on this route (11,350 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> - National Concert Hall - Royal Victoria Eye and Ear hospital - Ranelagh Village - St. Stephen's Green - City Centre Retail Core – South - Trinity College Dublin - Royal College of Surgeons Ireland - National Museum of Ireland - Gaiety Theatre - City Centre Retail Core – North - City Centre Retail Core – South - Olympia Theatre - Cineworld - DIT Bolton Street - Rotunda Hospital - Temple Street Children's Hospital - The Gate Theatre - Savoy Cinema - Croke Park 		
Directness	<p>3.9km</p> <p>This route option diverts away from the central corridor as it moves north of St. Stephens Green West, but north of Wolfe Tone Square it diverts back to the central portion of Study Area B.</p>		

Figure 6.10: Route Option A17

6.2.2 Assessment Options

Following completion of the Preliminary Assessment, a total of 6 Assessment Options within Study Area A were carried forward to the Stage 1 MCA process. The assessment options are summarised in **Table 6.11** and discussed in further detail in the following sections and **Appendix 6.1, Volume 2**. Initial high-level concept alignment and station location plans for each Assessment Option are presented in **Volume 3**.

Table 6.11: Study Area A Assessment Options Summary

Route Option	Metro Stations
A0	Charlemont – St. Stephen’s Green West – O’Connell Street – Parnell Square – Mater Hospital – Drumcondra
A1	Charlemont – College Green – O’Connell Street – Mater Hospital – Drumcondra
A2	Charlemont – St. Stephen’s Green East – Tara Street - O’Connell Street – Mater Hospital - Drumcondra
A4	Charlemont – St. Stephen’s Green East – Tara Street – O’Connell Street – Mater Hospital – Whitworth
A8	Charlemont – St. Stephen’s Green East – Tara Street – Mountjoy Square – Drumcondra
A14	Charlemont – St. Stephen’s Green West – O’Connell Street – Mater Hospital – Drumcondra

6.2.2.1 Route Options A0

Route Option A0 is presented in **Figure 6.11** with corresponding initial concept scheme summary information presented in **Table 6.12**.

Figure 6.11: Route Option A0

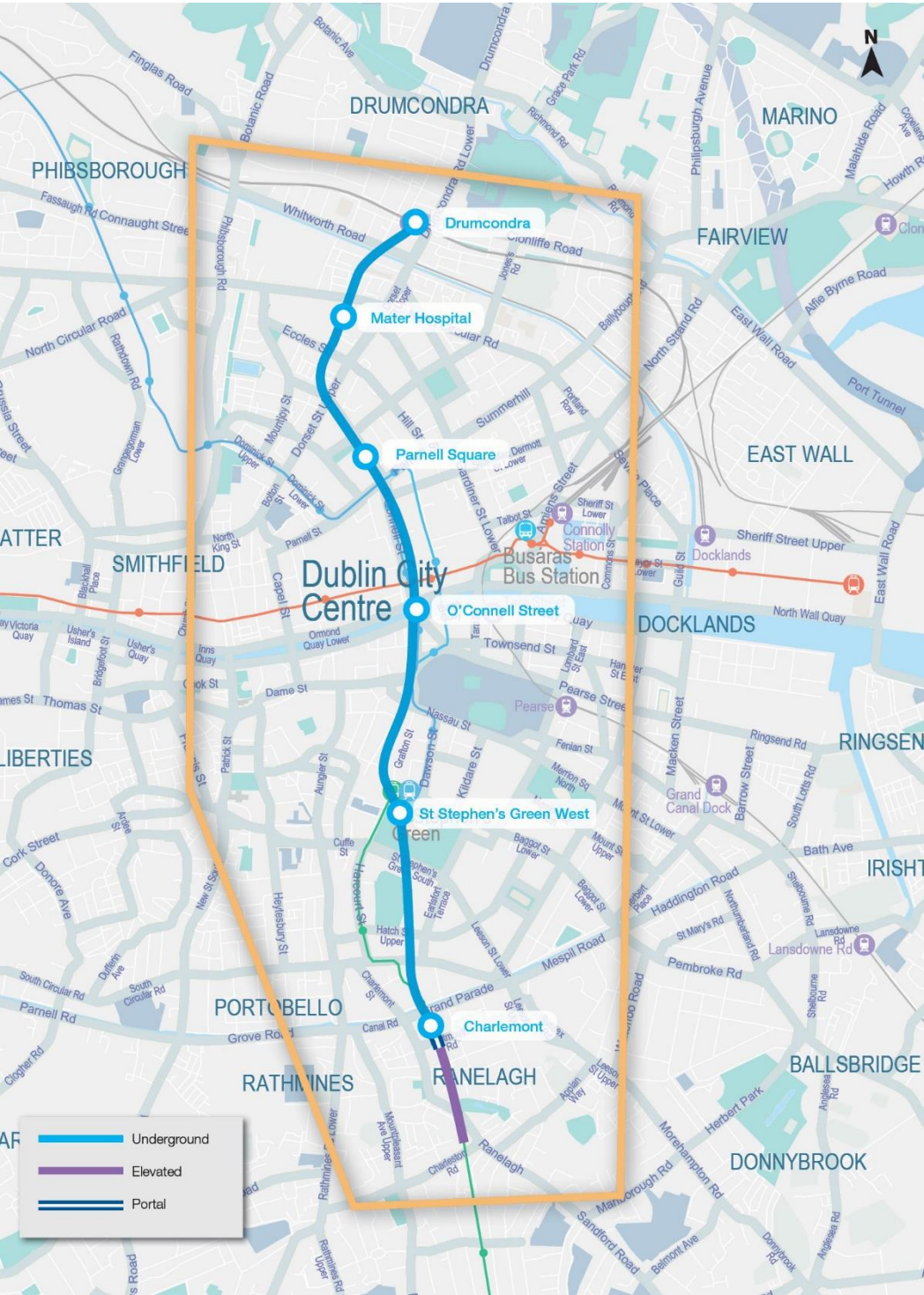


Table 6.12: Option A0 Summary

Route Length	4.4km
Alignment Type	Underground (TBM), other than at Green Line Tie-in
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • St. Stephen’s Green – Underground, top down construction • O’Connell Bridge – Underground, Mined Construction • Parnell Square – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction

Route Option A0 starts at Charlemont, in the vicinity of the existing Luas Stop which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north westwards to the first stop on the western side of St. Stephens Green within the confines of the park. From here, it continues north to its second station under the River Liffey at O’Connell Bridge before reaching the third station at Parnell Square East in front of the Garden of Remembrance. It then turns northwest towards the next stop at the Mater Hospital within the land in front of the hospital behind the row of houses on Leo Street. The final station would be located at Drumcondra within the area directly north of the existing rail line and station.

6.2.2.2 Route Options A1

Route Option A1 is presented in **Figure 6.12** with corresponding initial concept scheme summary information presented in **Table 6.13**.

Figure 6.12: Route Option A1

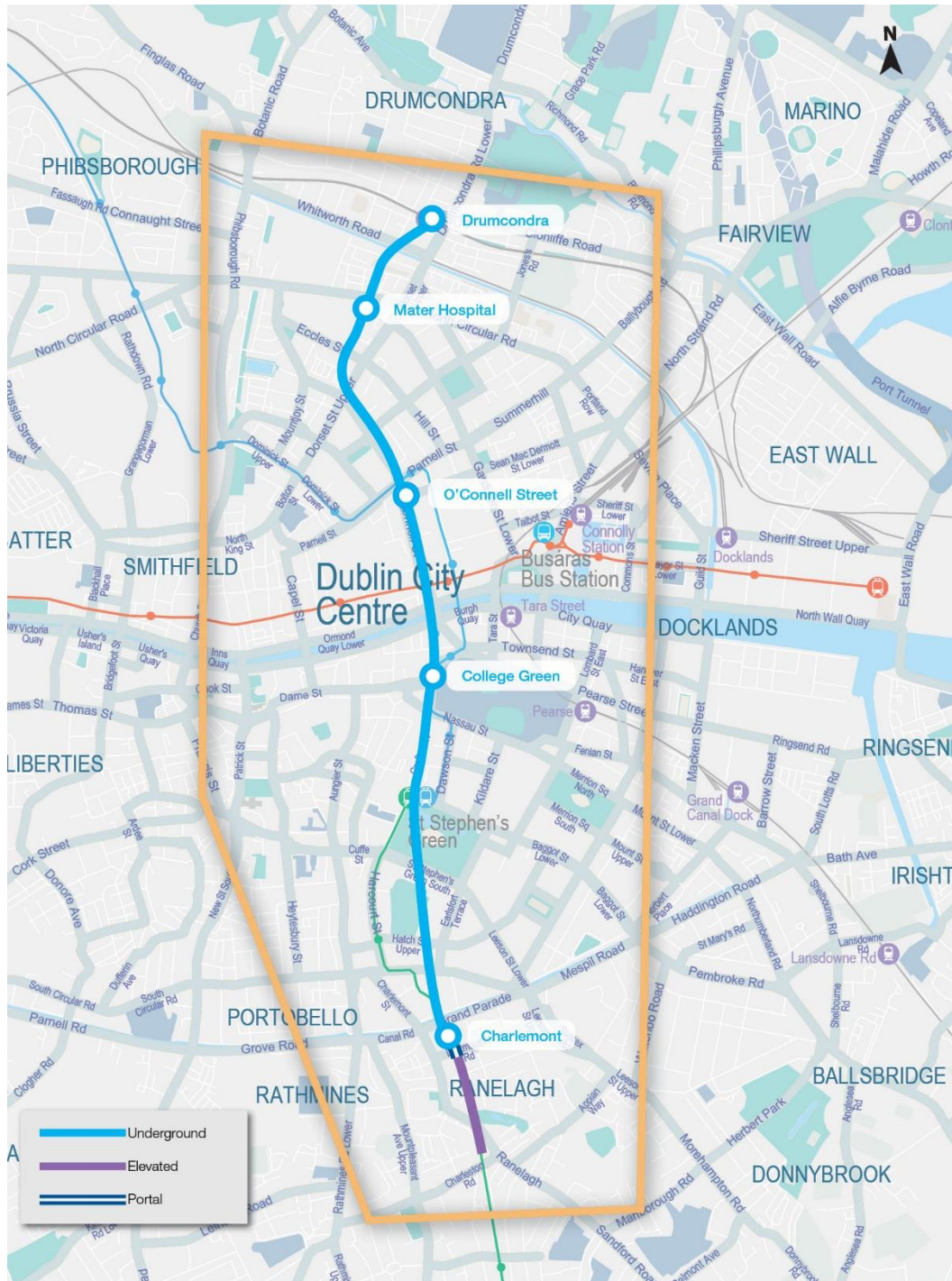


Table 6.13: Option A1 Summary

Route Length	3.9km
Alignment Type	Underground (TBM), other than at Green Line Tie-in
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • College Green – Underground, Mined Construction • O’Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction

Route Option A1 starts at Charlemont, in the vicinity of the existing Luas Stop which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north westwards to the first station at College Green which would be located on College Street between Trinity College and the Bank of Ireland building. From here, it continues north to its second station at the top of O’Connell Street opposite Cathal Brugha Street and The Gresham Hotel. It then turns northwest towards the next stop at the Mater Hospital within the land in front of the hospital behind the row of houses on Leo Street. The final station would be located at Drumcondra within the area directly north of the existing rail line and station.

6.2.2.3 Route Options A2

Route Option A2 is presented in **Figure 6.13** with corresponding initial concept scheme summary information presented in **Table 6.14**.

Figure 6.13: Route Option A2

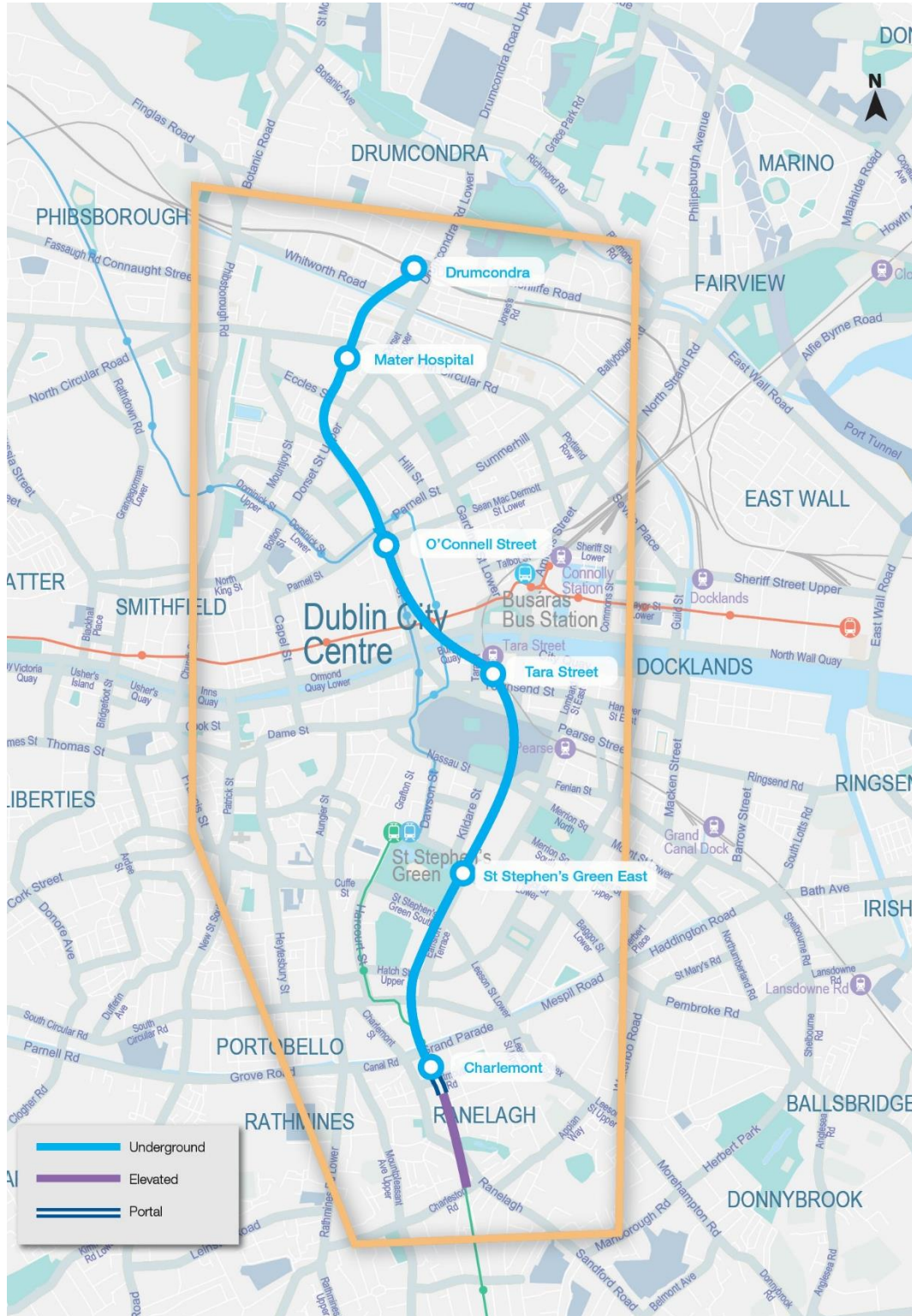


Table 6.14: Option A2 Summary

Route Length	4.1km
Alignment Type	Underground (TBM), other than at Green Line Tie-in
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • St. Stephen's Green – Underground, top down construction • Tara – Underground, top down construction • O'Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction

Route Option A2 starts at Charlemont, in the vicinity of the existing Luas Stop which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the first station on the eastern side of St. Stephens Green just south of the St. Stephens Green North/St. Stephens Green East junction. From here it continues north to its second station to the south western side of the existing Tara Street DART station between Townsend Street and Poolbeg Street. From here, the route crosses under the River Liffey and runs northwards to the next station at the top of O'Connell Street opposite Cathal Brugha Street and The Gresham Hotel. It then turns northwest towards the next stop at the Mater Hospital within the land in front of the hospital behind the row of houses on Leo Street. The final station would be located at Drumcondra within the area directly north of the existing rail line and station.

6.2.2.4 Route Options A4

Route Option A4 is presented in **Figure 6.14** with corresponding initial concept scheme summary information presented in **Table 6.15**.

Figure 6.14: Route Option A4

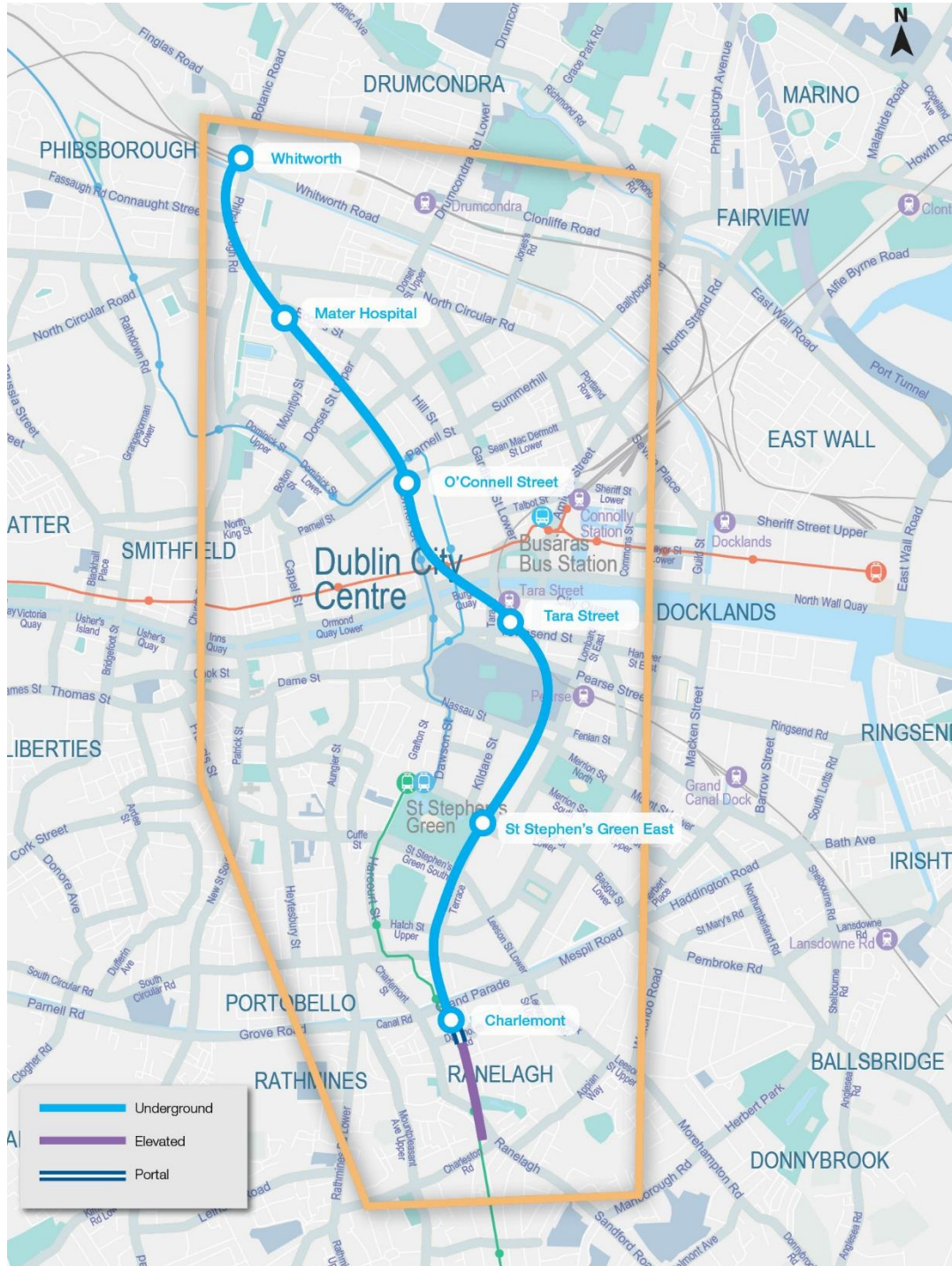


Table 6.15: Option A4 Summary

Route Length	4.4km
Alignment Type	Underground (TBM), other than at Green Line Tie-in
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • St. Stephen’s Green – Underground, top down construction • Tara – Underground, top down construction • O’Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Whitworth – Underground, top down construction

Route Option A4 starts at Charlemont, in the vicinity of the existing Luas Stop which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the first station on the eastern side of St. Stephens Green just south of the St. Stephens Green North/St. Stephens Green East junction. From here it continues north to its second station to the south western side of the existing Tara Street DART station between Townsend Street and Poolbeg Street. From here, the route crosses under the River Liffey and runs northwards to the next station at the top of O’Connell Street opposite Cathal Brugha Street and The Gresham Hotel. It then turns northwest towards the next stop at the Mater Hospital within a garden area at the corner of Eccles Street and Berkeley Road. The final station would be located at Whitworth under the Brian Boru pub, Des Kelly Carpets shop and Dalacasian apartments.

6.2.2.5 Route Options A8

Route Option A8 is presented in **Figure 6.15** with corresponding initial concept scheme summary information presented in **Table 6.16**.

Figure 6.15: Route Option A8

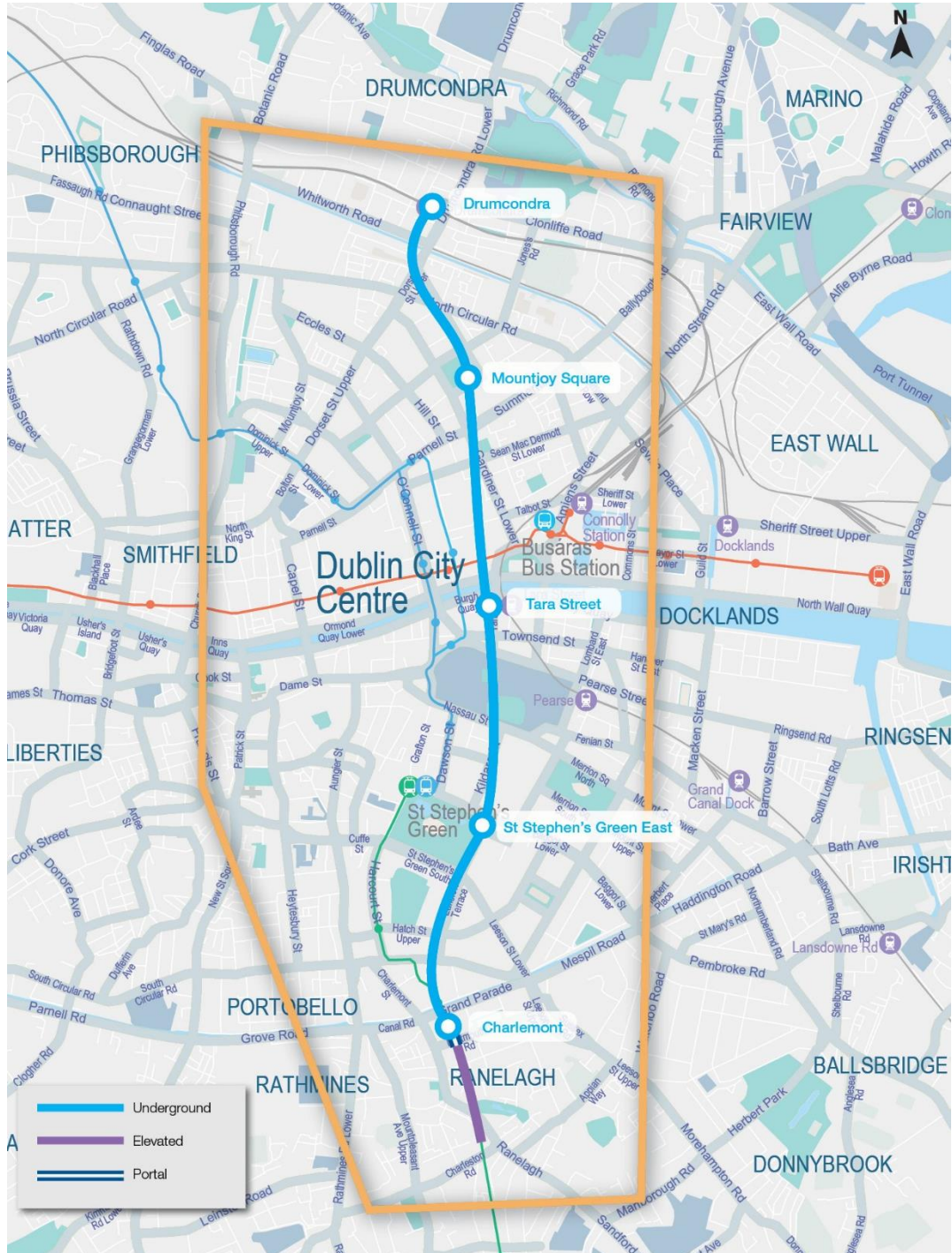


Table 6.16: Option A8 Summary

Route Length	3.9km
Alignment Type	Underground (TBM), other than at Green Line Tie-in
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • St. Stephen’s Green – Underground, top down construction • Tara – Underground, top down construction • Mountjoy Square – Underground, top down construction • Drumcondra – Underground, top down construction

Route Option A8 starts at Charlemont, in the vicinity of the existing Luas Stop which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the first station on the eastern side of St. Stephens Green just south of the St. Stephens Green North/St. Stephens Green East junction. From here it continues north to its second station to the west of the existing Tara Street DART station between Townsend Street and Poolbeg Street. From here, the route crosses under the River Liffey and runs northwards to the next station at the Mountjoy Square which would be located beneath Mountjoy Square Park. The final station would be located at Drumcondra within the area directly north of the existing rail line and station.

6.2.2.6 Route Options A14

Route Option A14 is presented in **Figure 6.16** with corresponding initial concept scheme summary information presented in **Table 6.17**.

Figure 6.16: Route Option A14

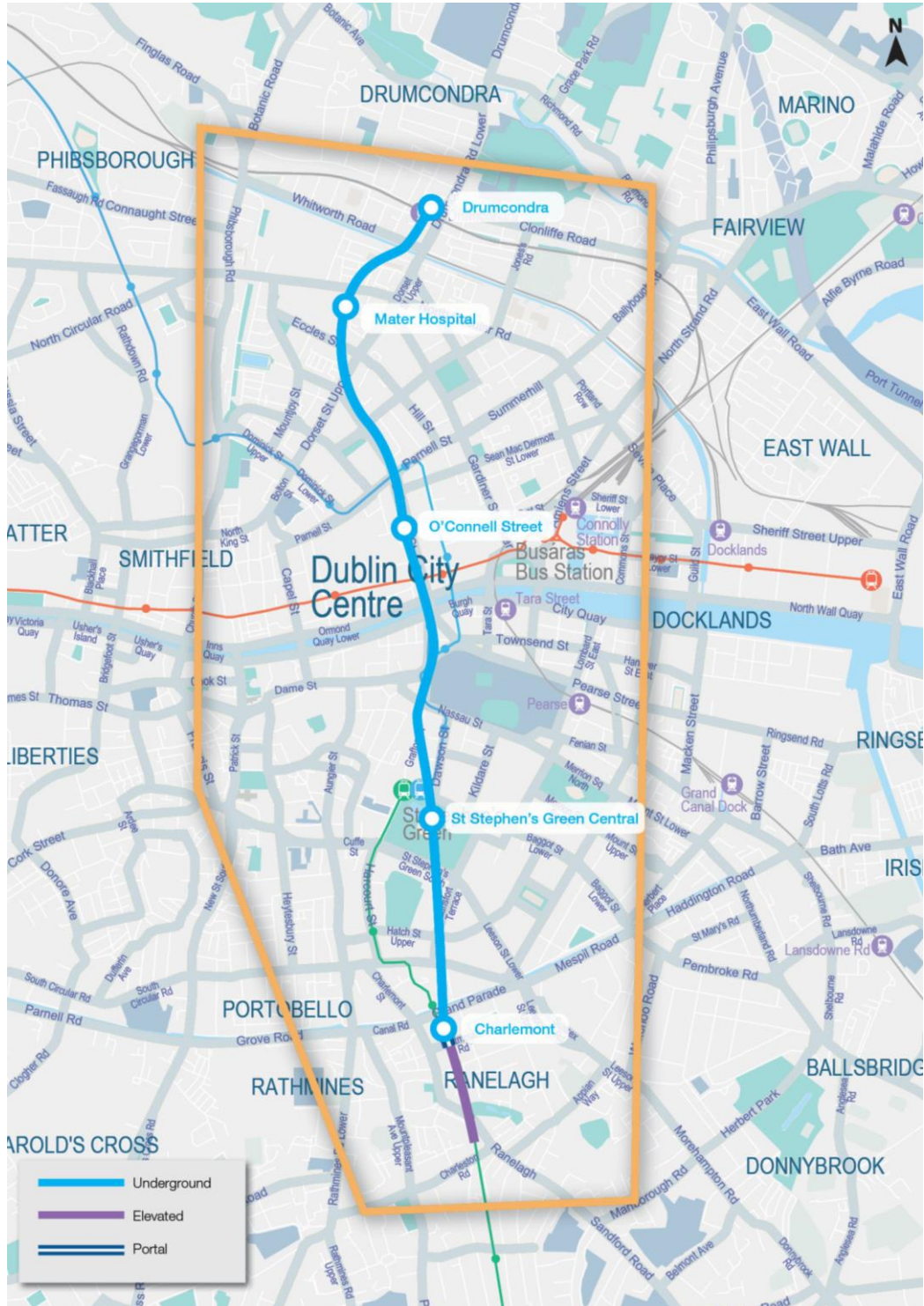


Table 6.17: Option A14 Summary

Route Length	4.2km
Alignment Type	Underground (TBM), other than at Green Line Tie-in
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • St. Stephen's Green – Underground, top down construction • O'Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction

Route Option A14 starts at Charlemont, in the vicinity of the existing Luas Stop which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north westwards to the first station on the western side of St. Stephens Green within the confines of the park. From here, the route crosses under the River Liffey and runs northwards to the next station on O'Connell Street south of Cathal Brugha Street. It then turns northwest towards the next stop at the Mater Hospital within the land in front of the hospital behind the row of houses on Leo Street. The final station would be located at Drumcondra within the area directly north of the existing rail line and station.

6.3 Study Area B

6.3.1 Preliminary Assessment

Table 6.18 to **Table 6.33** present a summary of the Preliminary Assessment for Study Area B.

Table 6.18: Route Option B0

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	<p>This route option represents Old Metro North.</p> <p>This route option provides a direct route through the centre of Study Area B serving key trip attractors. This route option would have a high potential trip demand compared to other route options in the study area.</p> <p>For these reasons, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 74,250 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (12,400 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Griffith Park -DCU St. Patricks College -DCU Glasnevin -DCU Sports Grounds -Whitehall College of Further Education -Ballymun Village -Ballymun Residential Area -Gulliver's Retail Park -Dublin Airport 		
Directness	<p>7.8km</p> <p>This route option consists of a direct alignment through the centre of the study area.</p>		

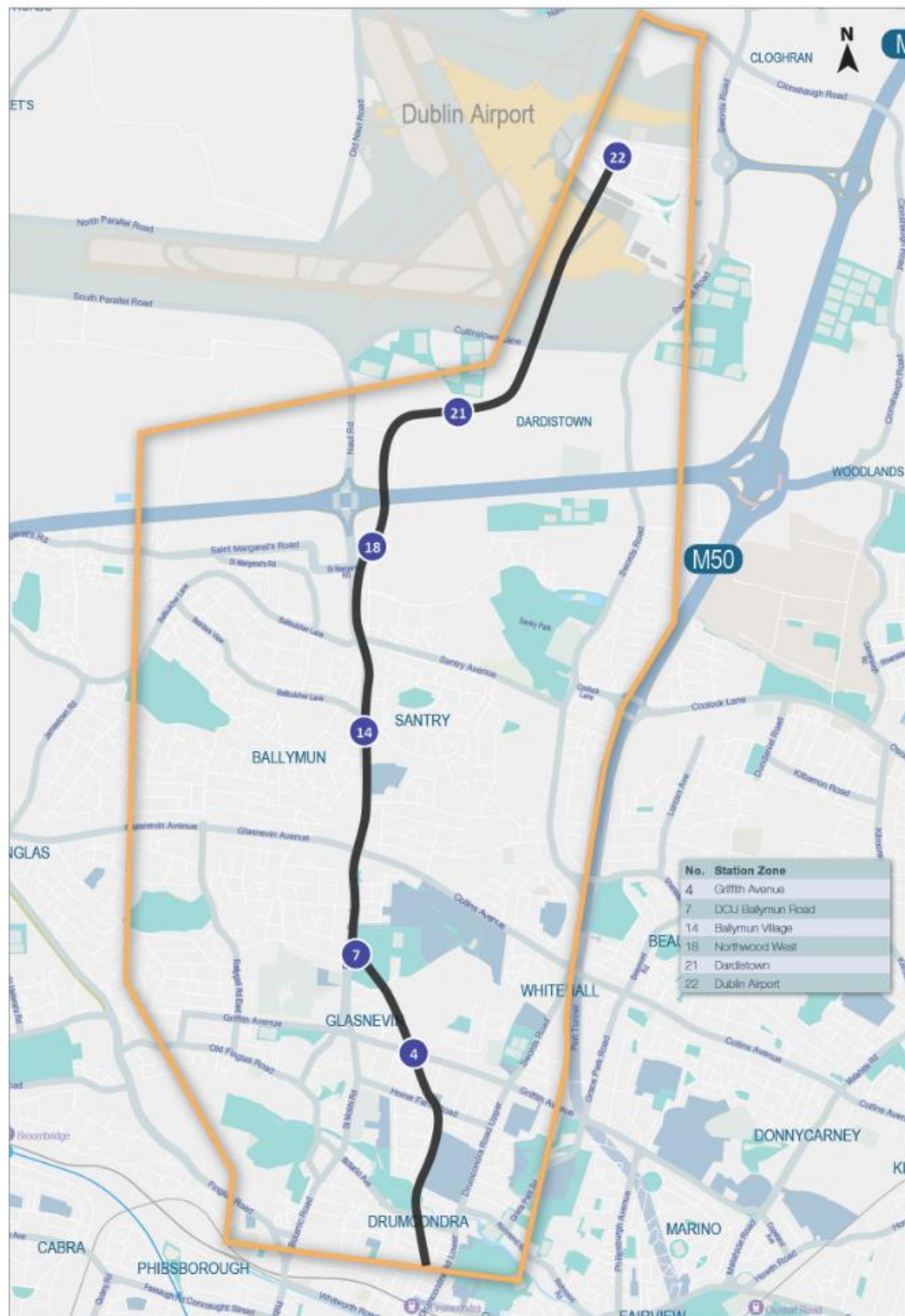
Figure 6.17: Route Option B0

Table 6.19: Route Option B1

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	<p>This route option serves the western side of Study Area B and has one of the lower potential trip demands of all routes considered in Study Area B. This is largely due to the fact that, it does not serve some of the major key trip attractors, namely Dublin City University, Ballymun and Santry Villages.</p> <p>Furthermore, this route option is the longest route option considered in Study Area B with one station more than most other options and would therefore have an associated impact in terms of cost and journey time.</p> <p>For the reasons outlined above, this option is not considered any further.</p>	Fail
Potential Trip Demand	Potential trip demand of approximately 66,250 trips/24hr is forecast for the area within a 1km walk catchment of the 7 stations proposed on this route (9,500 trips/24hr/station)		
Key Trip Attractors	<ul style="list-style-type: none"> -Griffith Park -National Botanic Gardens -Whitehall College of Further Education -Bon Secours Hospital Dublin -Glasnevin -Bon Secours Hospital Dublin -DCU Sports Grounds -Tolka Rovers -Glasnevin Residential Area -Ballymun Residential Area -Ikea -Dublin Airport 		
Directness	<p style="text-align: center;">8.2km</p> <p>This route option starts along a central alignment before diverting to the western side of Study Area B. The route returns to the central alignment at the northern end of the Study Area.</p>		

Figure 6.18: Route Option B1

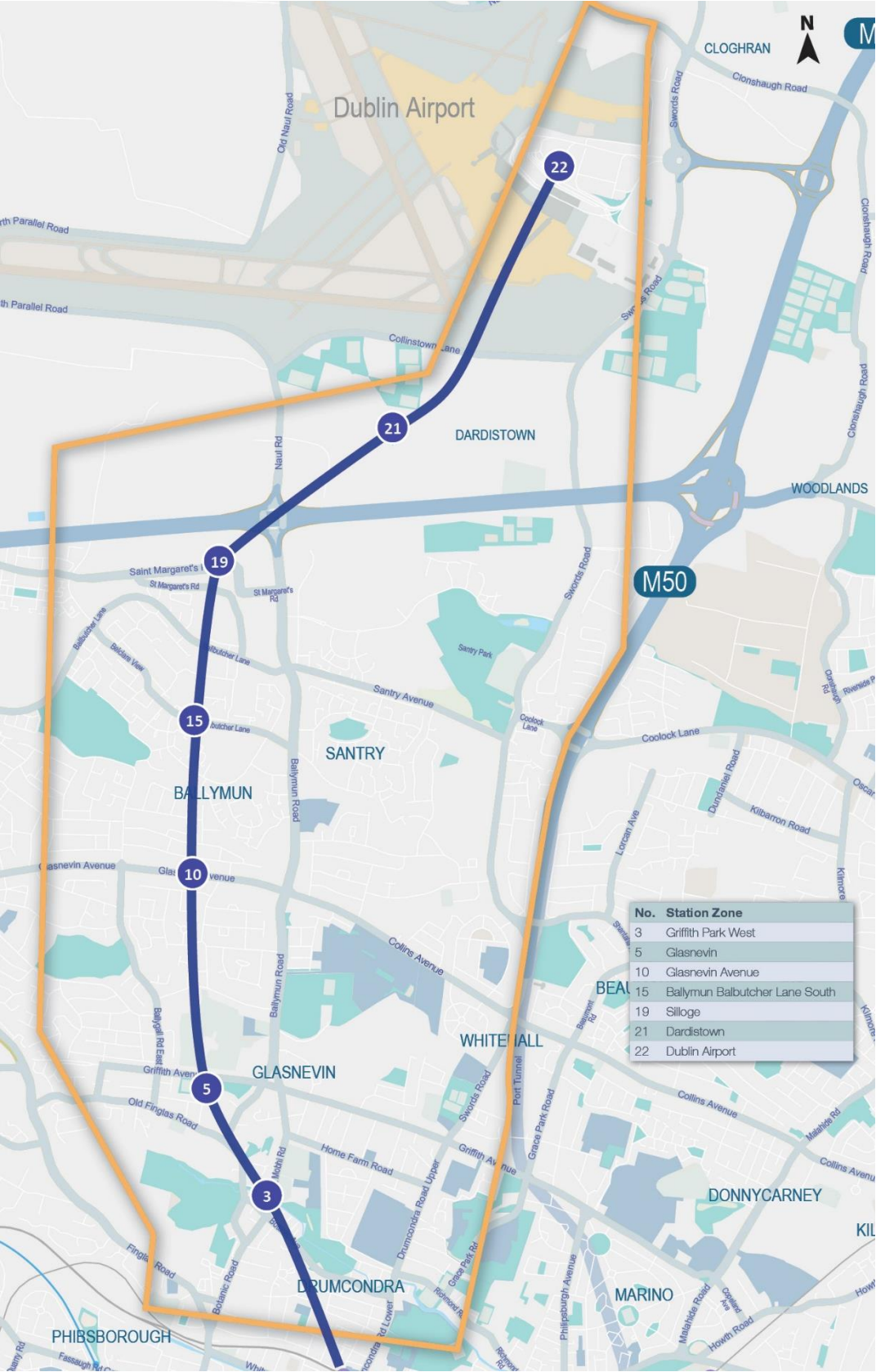


Table 6.20: Route Option B2

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	<p>This route option represents Optimised Metro North as per the Fingal/North Dublin Transport Study.</p> <p>This route option provides a direct route through the centre of Study Area B serving key trip attractors in the area. This route option would have a high potential trip demand compared to other route options in the study area.</p> <p>For these reasons, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 77,500 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (12,900 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Griffith Park -DCU St. Patricks College -DCU Glasnevin -DCU Sports Grounds -Whitehall College of Further Education -Ballymun Village -Ballymun Residential Area -Gulliver's Retail Park -Dublin Airport 		
Directness	<p style="text-align: center;">7.8km</p> <p>This route option consists of a direct alignment through the centre of the study area.</p>		

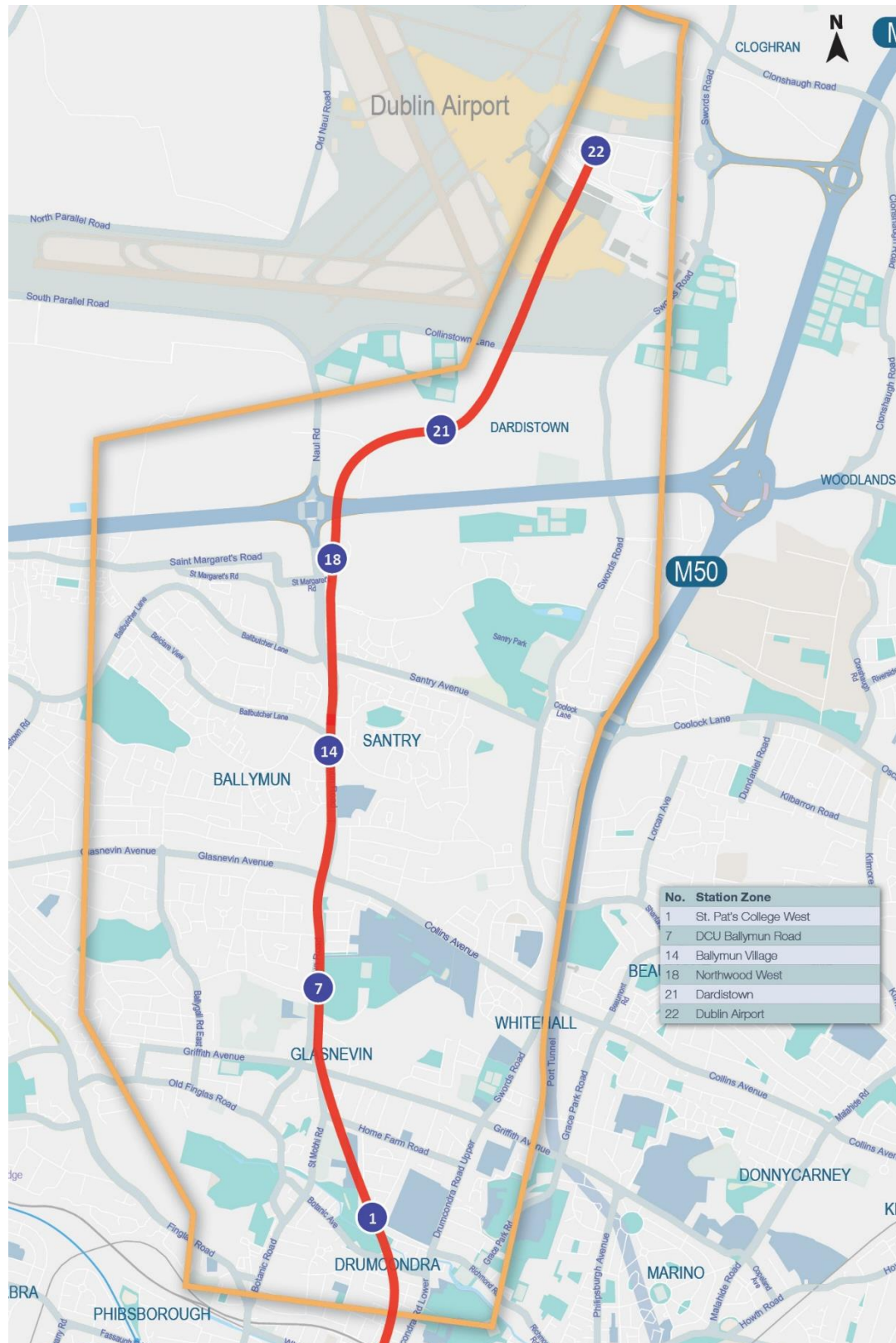
Figure 6.19: Route Option B2

Table 6.21: Route Option B3

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	This route option serves the western side of Study Area B.	Fail
Potential Trip Demand	Potential trip demand of approximately 77,250 trips/24hr is forecast for the area within a 1km walk catchment of the 7 stations proposed on this route (11,000 trips/24hr/station).	Although this option would have a high potential trip demand, it does not serve some of the major key trip attractors in Study Area B, particularly Dublin City University.	
Key Trip Attractors	<ul style="list-style-type: none"> -Griffith Park -National Botanic Gardens -Whitehall College of Further Education -Bon Secours Hospital Dublin -Glasnevin -Bon Secours Hospital Dublin -DCU Sports Grounds -Tolka Rovers -Glasnevin Residential Area -Ballymun Village -Ballymun Residential Area -Gulliver's Retail Park -Dublin Airport 	Furthermore, this route option is one of the longest route options considered in Study Area B with one station more than most other options and would therefore have an associated impact in terms of cost and journey time.	
Directness	<p>8.2km</p> <p>This route option diverts from a centre of the study area to the western part north of Griffith park (west) before diverting to a central alignment north of Glasnevin Avenue.</p>	For the reasons outlined above, this option is not considered any further	

Figure 6.20: Route Option B3

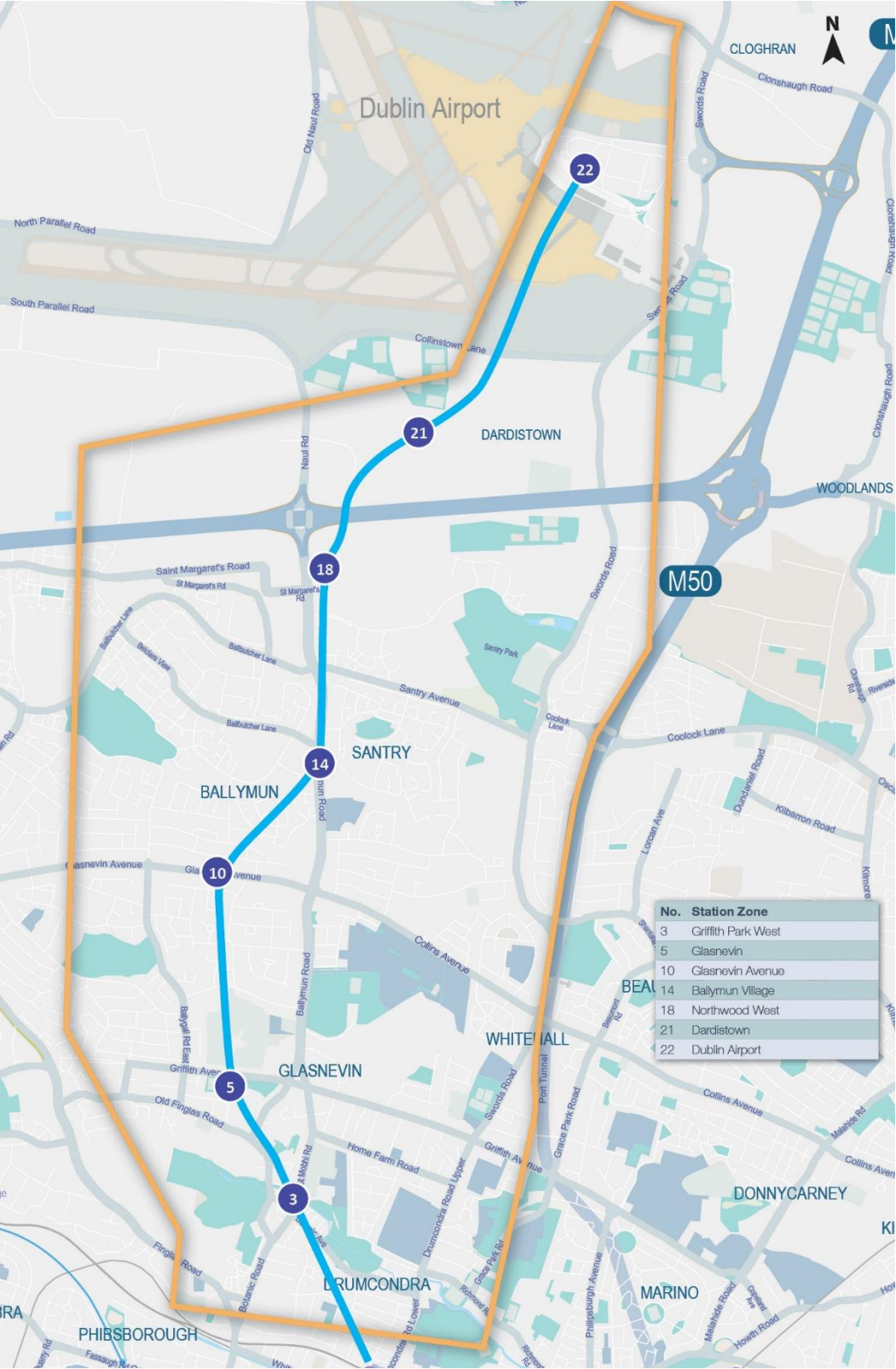


Table 6.22: Route Option B4

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	<p>This route option serves the western side of Study Area B. Although this option would have a high potential trip demand, it does not serve some of the major key trip attractors in Study Area B in particular Dublin City University.</p> <p>Furthermore, this route option is one of the longest route options considered in Study Area B with one station more than most other options and would therefore have an associated impact in terms of cost and journey time.</p> <p>For the reasons outlined above, this option is not considered any further.</p>	Fail
Potential Trip Demand	Potential trip demand of approximately 72,250 trips/24hr is forecast for the area within a 1km walk catchment of the 7 stations proposed on this route (10,300 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Griffith Park -National Botanic Gardens -Whitehall College of Further Education -Bon Secours Hospital Dublin -Glasnevin -Bon Secours Hospital Dublin -DCU Sports Grounds -Tolka Rovers -Glasnevin Residential Area -Ballymun Residential Area -Gulliver's Retail Park -Dublin Airport 		
Directness	<p style="text-align: center;">8.1km</p> <p>This route option starts along a central alignment before diverting to the western side of Study Area B. The route returns to the central alignment at the northern end of the Study Area.</p>		

Figure 6.21: Route Option B4

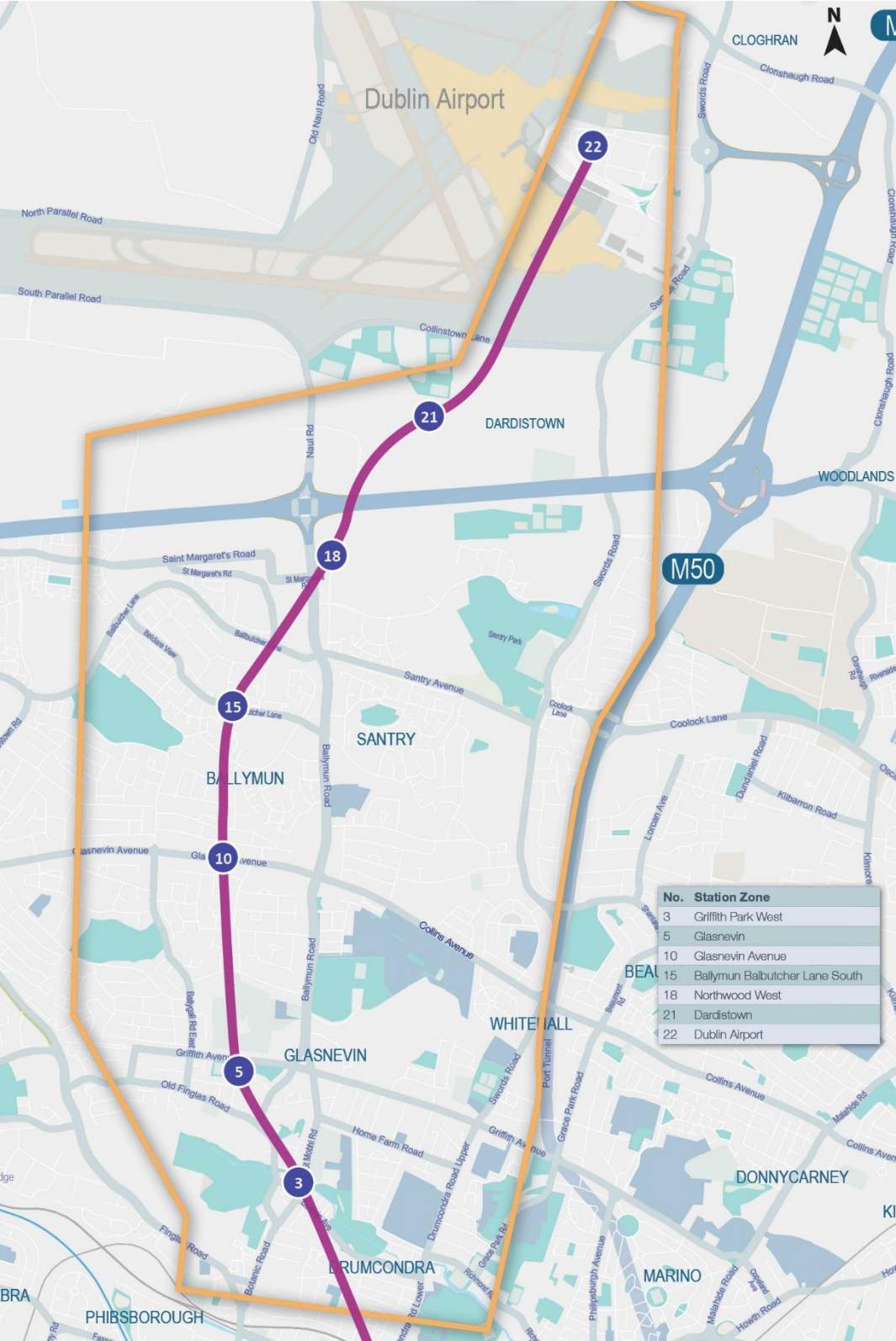


Table 6.23: Route Option B5

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	This route option provides a direct route through the centre of Study Area B serving key trip attractors in the area. This route option would have a high potential trip demand compared to other route options in the study area. Furthermore, this option provides an opportunity for cut and cover construction through Ballymun which offers an alternative to the above ground running of Route Option B2.	Pass
Potential Trip Demand	Potential trip demand of approximately 77,500 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (13,000 trips/24hr/station).		
Key Trip Attractors	-Griffith Park -DCU St. Patricks College -DCU Glasnevin -DCU Sports Grounds -Whitehall College of Further Education -Ballymun Village -Ballymun Residential Area -Gulliver's Retail Park -Dublin Airport		
Directness	7.8km This route option consists of a direct alignment through the centre of the study area.		

Figure 6.22: Route Option B5

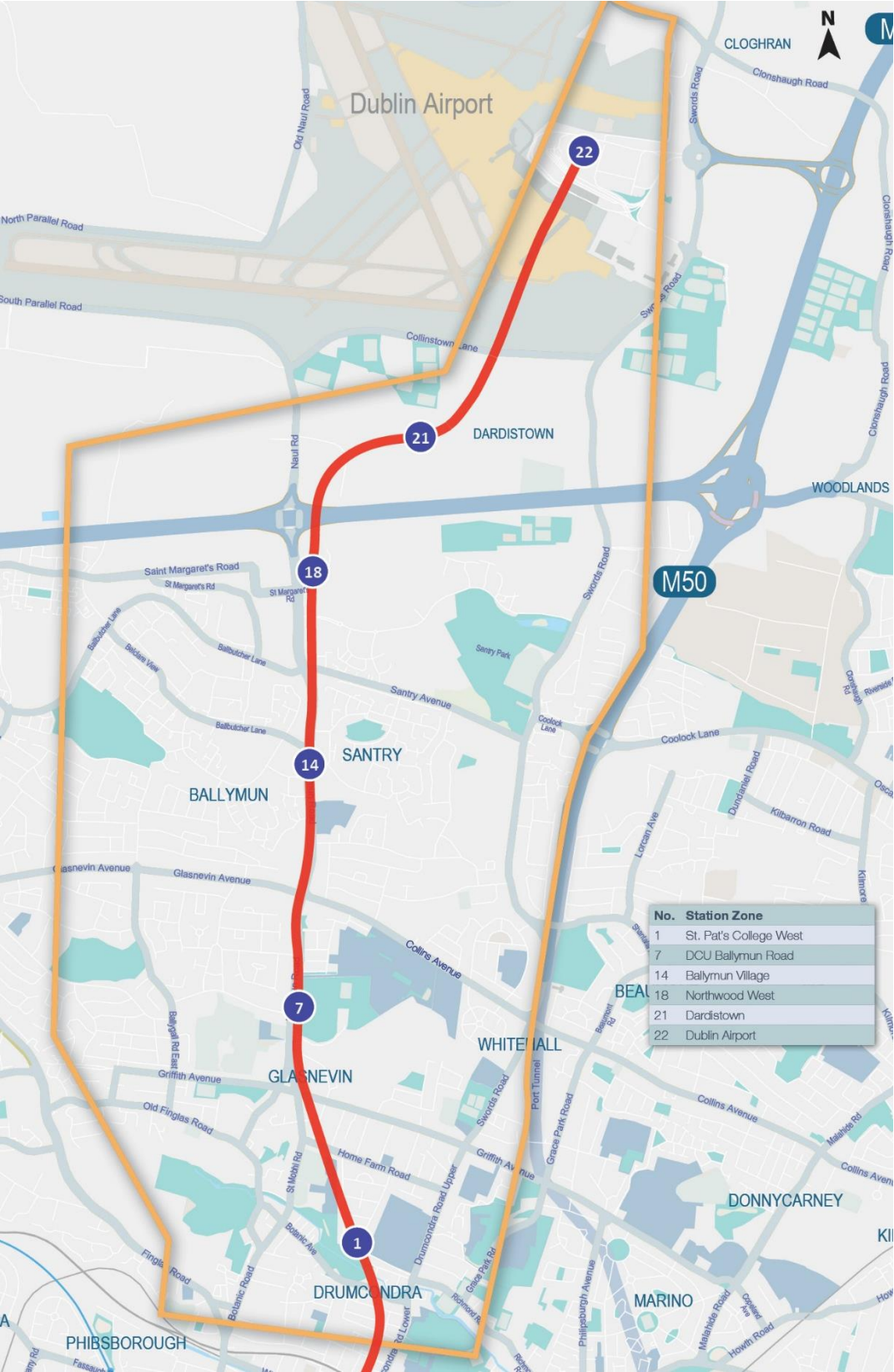


Table 6.24: Route Option B6

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Some opportunity for integration with core bus services, though will require reconfiguration of bus network and / or long walk distances to transfer.	<p>This route option provides a direct route through the centre of Study Area B, offset to the west of Ballymun Town Centre, serving key trip attractors in the area.</p> <p>Although this route option would have a lower potential overall trip demand than other options, it does offer one of the shortest route options with less stations which has benefits in terms of journey time and cost.</p> <p>For these reasons, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 69,500 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (11,600 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -DCU St. Patricks College -DCU All Hallows -DCU Glasnevin -Ballymun Village -Santry Village -Gulliver's Retail Park -Northwood Estate -Dublin Airport 		
Directness	<p style="text-align: center;">7.6km</p> <p>This route option consists of a direct alignment through the centre of the study area.</p>		

Figure 6.23: Route Option B6

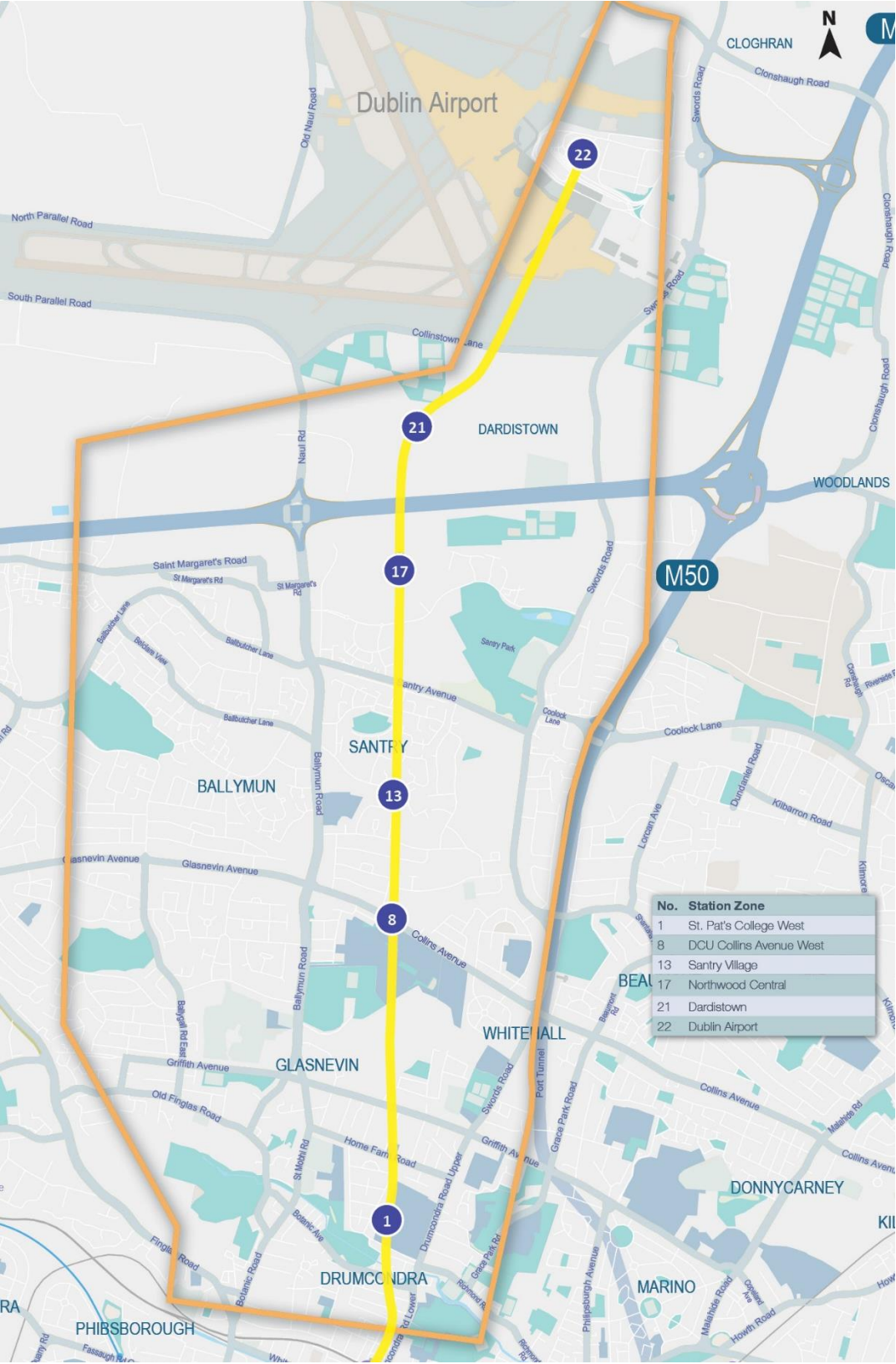


Table 6.25: Route Option B8

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	This route option provides a direct route through the centre of Study Area B serving key trip attractors in the area. This route option would have a high potential trip demand and is one of the shortest route options considered in Study Area B which has benefits in terms of journey time and cost. Additionally, this route option offers an alternative connection at the southern end of Study Area B which could connect a potential option emerging from Study Area A at Whitworth. This option would be provided at-grade which may have the potential for cost savings over a tunnel alignment.	Pass
Potential Trip Demand	Potential trip demand of approximately 75,500 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (12,600 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Griffith Park -National Botanic Gardens -Whitehall College of Further Education -Bon Secours Hospital Dublin -DCU Glasnevin -DCU Sports Grounds -Ballymun Village -Ballymun Residential Area -Gulliver's Retail Park -Dublin Airport 		
Directness	<p style="text-align: center;">7.5km</p> <p>This route option consists of a direct alignment through the centre of the study area.</p>		

Figure 6.24: Route Option B8

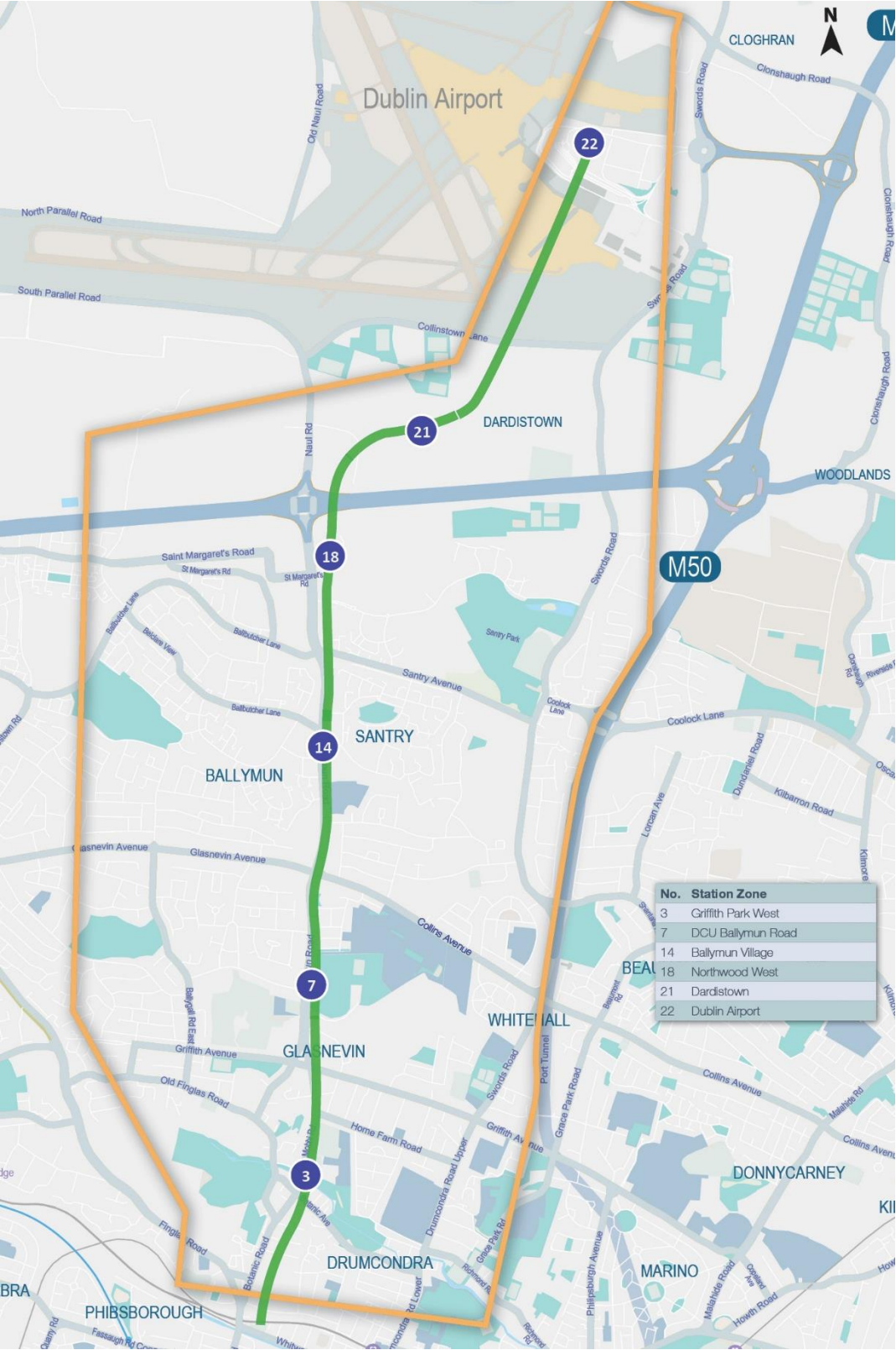


Table 6.26: Route Option B10

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	<p>This route option provides a direct route through the centre of Study Area B serving key trip attractors in the area. This route option would have a high potential trip demand compared to other route options in the study area.</p> <p>Furthermore, this option provides an opportunity for an TBM tunnel alignment through Ballymun which offers an alternative to options B2 and B5 along the same route.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 82,500 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (13,800 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Griffith Park -DCU St. Patricks College -DCU Glasnevin -DCU Sports Grounds -Whitehall College of Further Education -Ballymun Village -Ballymun Residential Area -Dublin Airport 		
Directness	<p>7.8km</p> <p>This route option consists of a direct alignment through the centre of the study area.</p>		

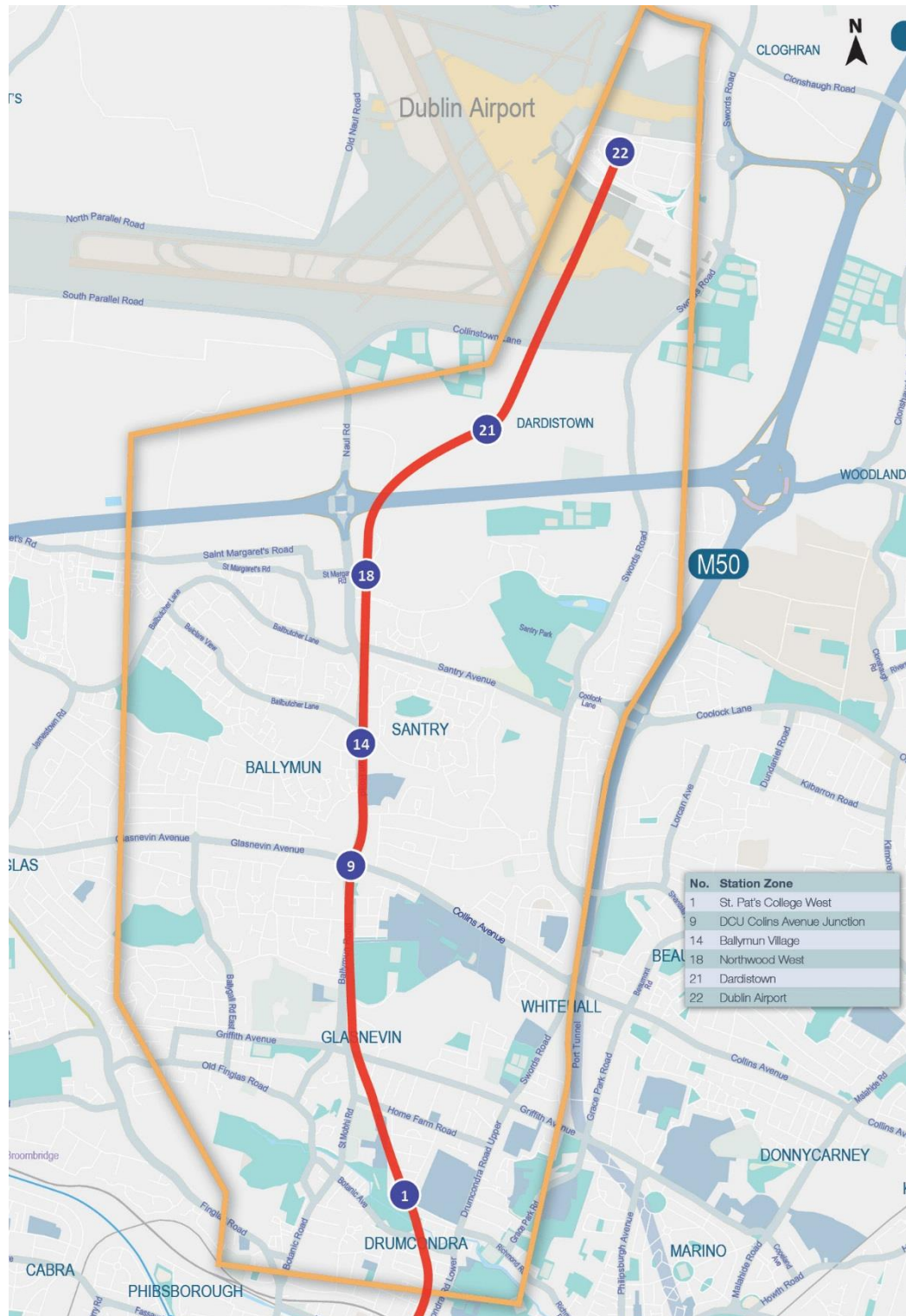
Figure 6.25: Route Option B10

Table 6.27: Route Option B12

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B.	<p>This route option provides a direct route through the centre of Study Area B serving key trip attractors in the area. This route option would have a high potential trip demand and is one of the shortest route options considered in Study Area B which has benefits in terms of journey time and cost.</p> <p>Additionally, this route option offers an alternative connection at the southern end of Study Area B which could connect a potential option emerging from Study Area A at Whitworth.</p> <p>This route option runs along the same route as option B8 but offers a tunnel alignment.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 80,500 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (13,400 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Griffith Park -National Botanic Gardens -Whitehall College of Further Education -Bon Secours Hospital Dublin -DCU Glasnevin -DCU Sports Grounds -Ballymun Village -Ballymun Residential Area -Gulliver's Retail Park -Dublin Airport 		
Directness	<p style="text-align: center;">7.5km</p> <p>This route option consists of a direct alignment through the centre of the study area.</p>		

Figure 6.26: Route Option B12

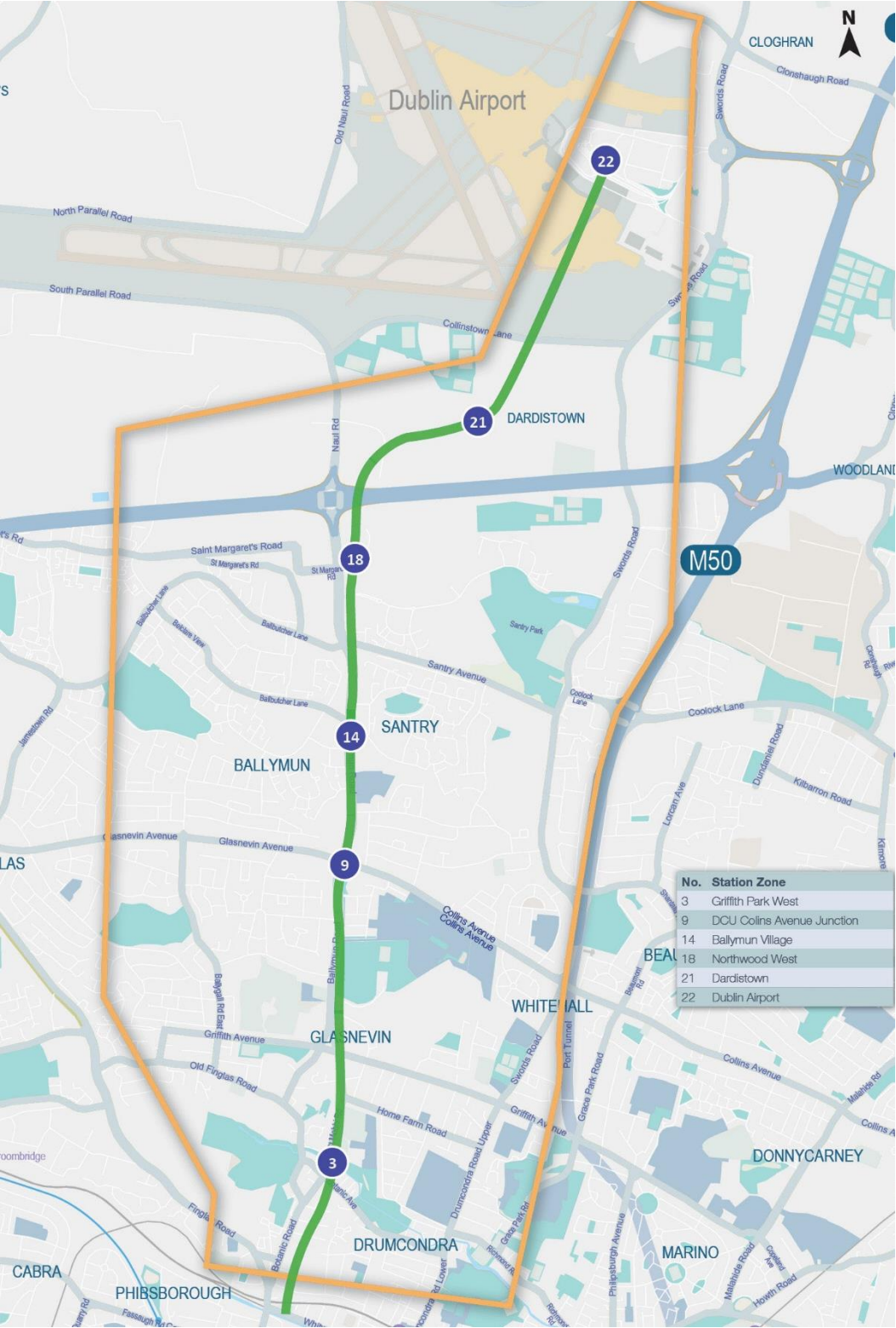


Table 6.28: Route Option B13

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	<p>This route option provides a direct route through the centre of Study Area B serving key trip attractors in the area. This route option would have a high potential trip demand compared to other route options in the study area.</p> <p>This option provides an elevated version of Route Option B2.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 82,500 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (13,750 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Griffith Park -DCU St. Patricks College -DCU Glasnevin -DCU Sports Grounds -Whitehall College of Further Education -Ballymun Village -Ballymun Residential Area -Gulliver's Retail Park -Dublin Airport 		
Directness	<p style="text-align: center;">7.8km</p> <p>This route option consists of a direct alignment through the centre of the study area.</p>		

Figure 6.27: Route Option B13

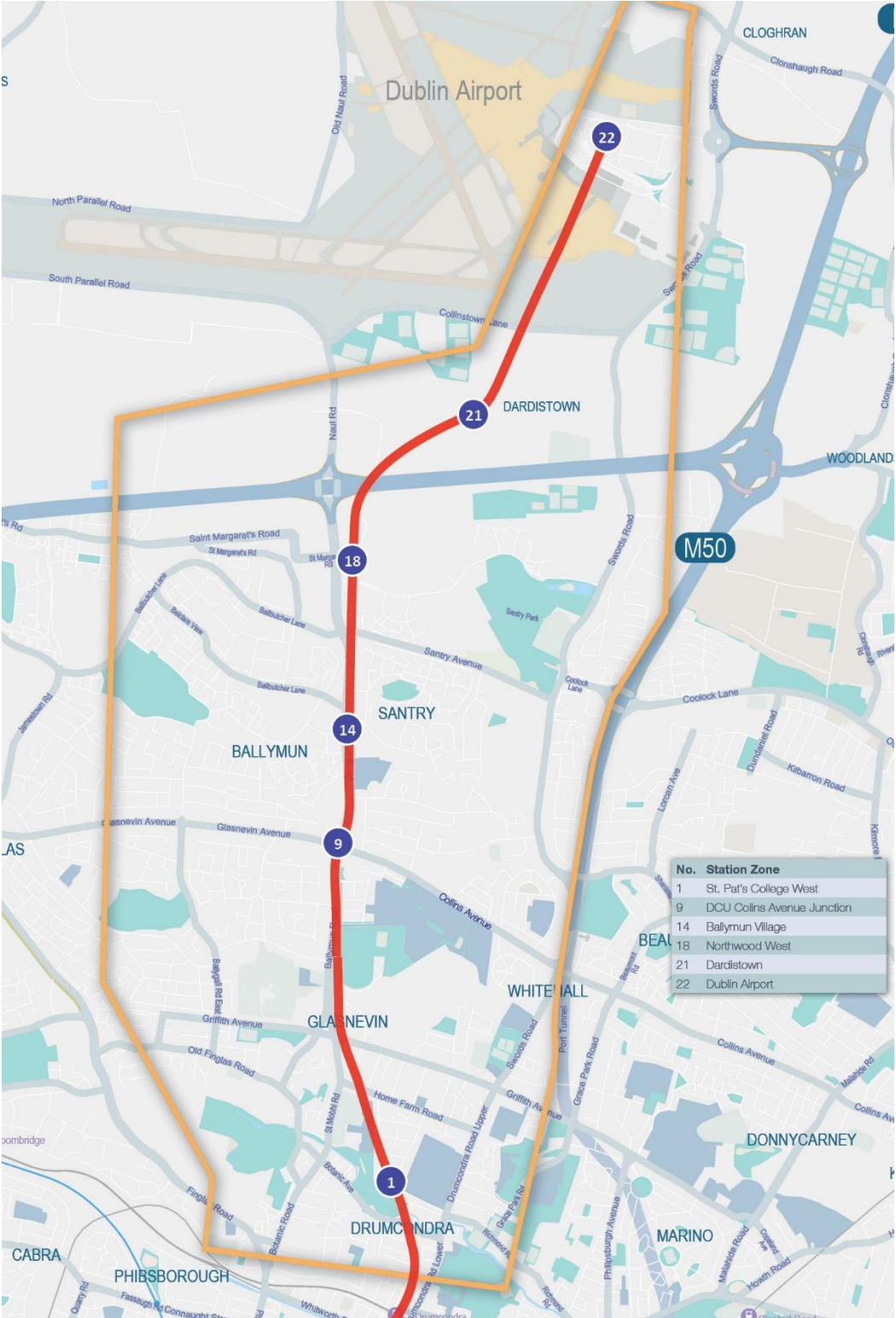


Table 6.29: Route Option B14

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	This route option provides a direct route through the centre of Study Area B serving key trip attractors in the area.	Pass
Potential Trip Demand	Potential trip demand of approximately 80,500 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (13,400 trips/24hr/station).	This route option would have a high potential trip demand and is one of the shortest route options considered in Study Area B which has benefits in terms of journey time and cost.	
Key Trip Attractors	<ul style="list-style-type: none"> -Griffith Park -National Botanic Gardens -Whitehall College of Further Education -Bon Secours Hospital Dublin -DCU Glasnevin -DCU Sports Grounds -Ballymun Village -Ballymun Residential Area -Gulliver's Retail Park -Dublin Airport 	Additionally, this route option offers an alternative connection at the southern end of Study Area B which could connect a potential option emerging from Study Area A at Whitworth.	
Directness	<p>7.5km</p> <p>This route option consists of a direct alignment through the centre of the study area.</p>	This option provides an elevated version of Route Option B8.	

Figure 6.28: Route Option B14

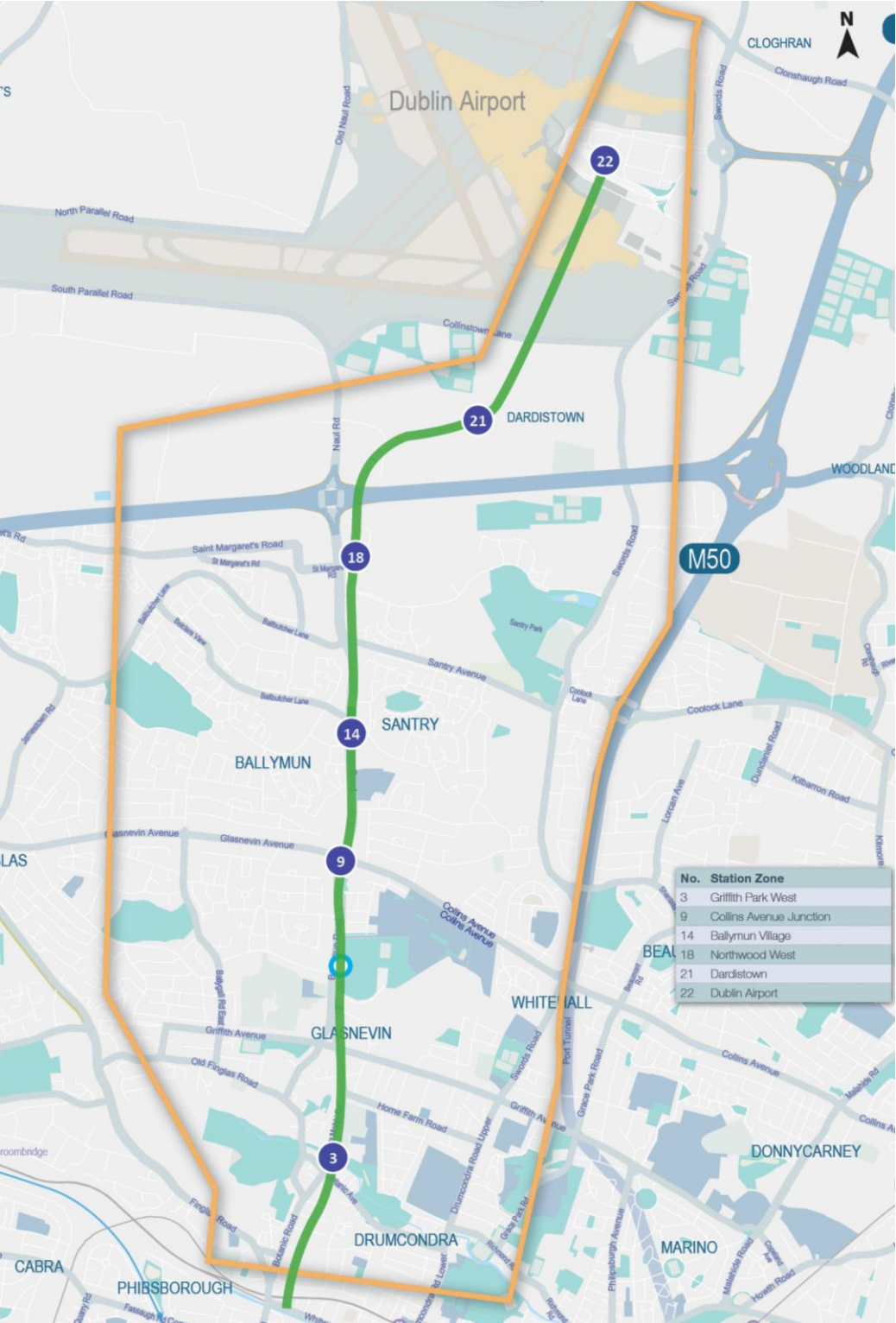


Table 6.30: Route Option B15

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	<p>This route option serves the western and central portions of Study Area B.</p> <p>This option would attract one of the lowest trip demands of all route options considered in Study Area B. Furthermore, it does not serve some of the major key trip attractors in Study Area B, particularly Dublin City University.</p> <p>In addition, this route option is one of the longer route options considered in Study Area B and would therefore have an associated impact in terms of cost and journey time.</p> <p>For the reasons outlined above, this option is not considered any further</p>	Fail
Potential Trip Demand	Potential trip demand of approximately 66,500 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (11,100 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> - Glasnevin - Bon Secours Hospital Dublin - DCU Sports Grounds - Tolka Rovers - Glasnevin Residential Area - Ballymun Village - Gulliver's Retail Park - Northwood Estate - Dublin Airport 		
Directness	<p>7.7km</p> <p>This route option starts along a western alignment before diverting to the central portion of Study Area B and onwards to the eastern side.</p>		

Figure 6.29: Route Option B15

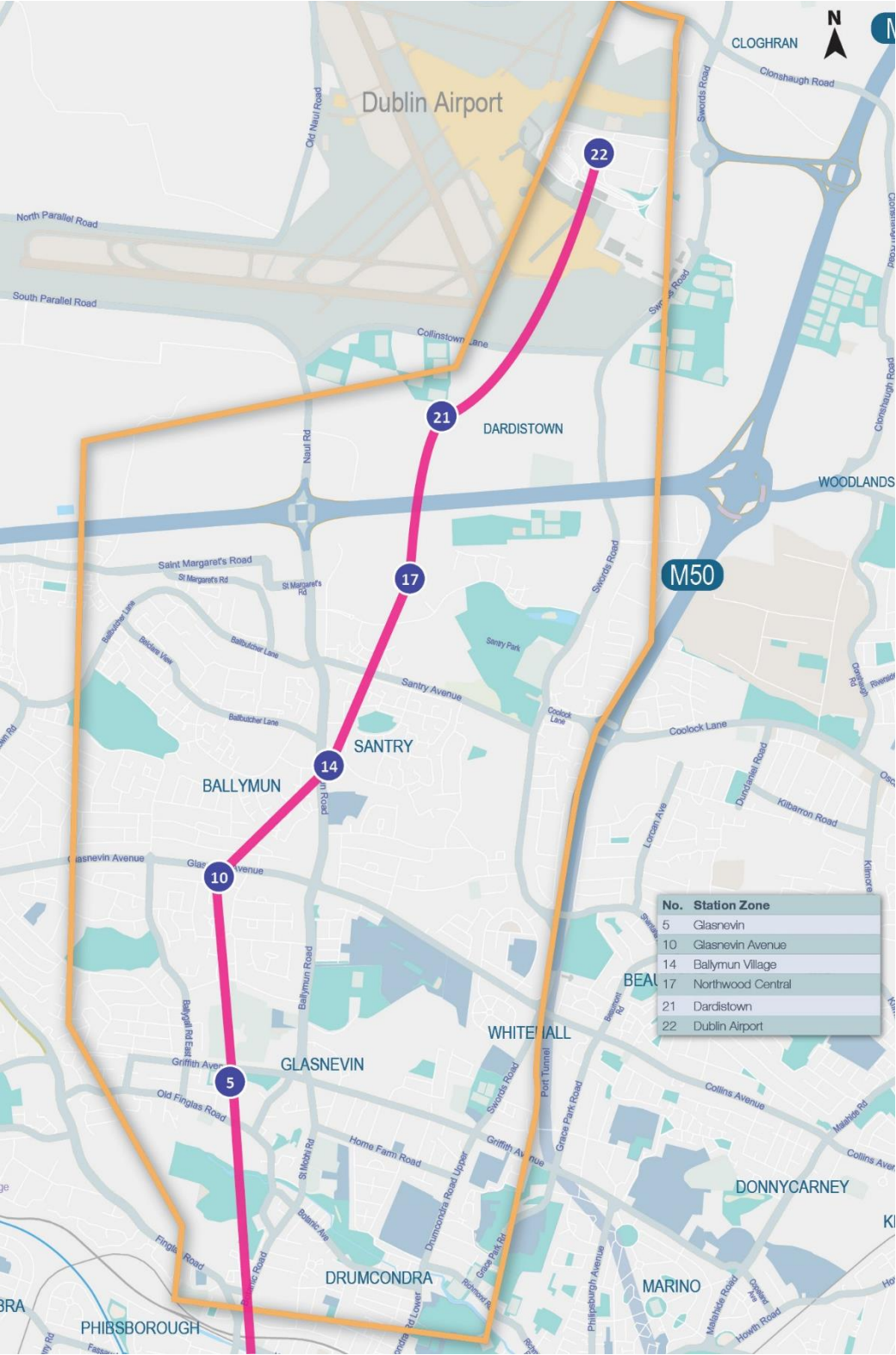


Table 6.31: Route Option B16

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	<p>This route option provides a reasonably direct route through the centre of Study Area B serving key trip attractors in the area.</p> <p>This route option would have a reasonably high potential trip demand and is one of the shorter route options considered in Study Area B which has benefits in terms of journey time and cost.</p> <p>However, this route option is similar to route options B8, B12 and B14 with the only difference being that it serves Glasnevin MSZ rather than Griffith Park West MSZ. The additional length required to serve Griffith Park West MSZ does not result in any additional patronage and Options B8, B12 and B14 are considered to be better alternatives along a similar alignment.</p> <p>For this reason, this option is not considered any further.</p>	Fail
Potential Trip Demand	Potential trip demand of approximately 76,000 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (12,700 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> - Glasnevin - Bon Secours Hospital Dublin - DCU Sports Grounds - Tolka Rovers - DCU Glasnevin - The Helix - Ballymun Village - Gulliver's Retail Park - Northwood Estate - Dublin Airport 		
Directness	<p>7.7km</p> <p>This route option starts along a western alignment before diverting to the central portion of Study Area B north of Collins Avenue.</p>		

Figure 6.30: Route Option B16

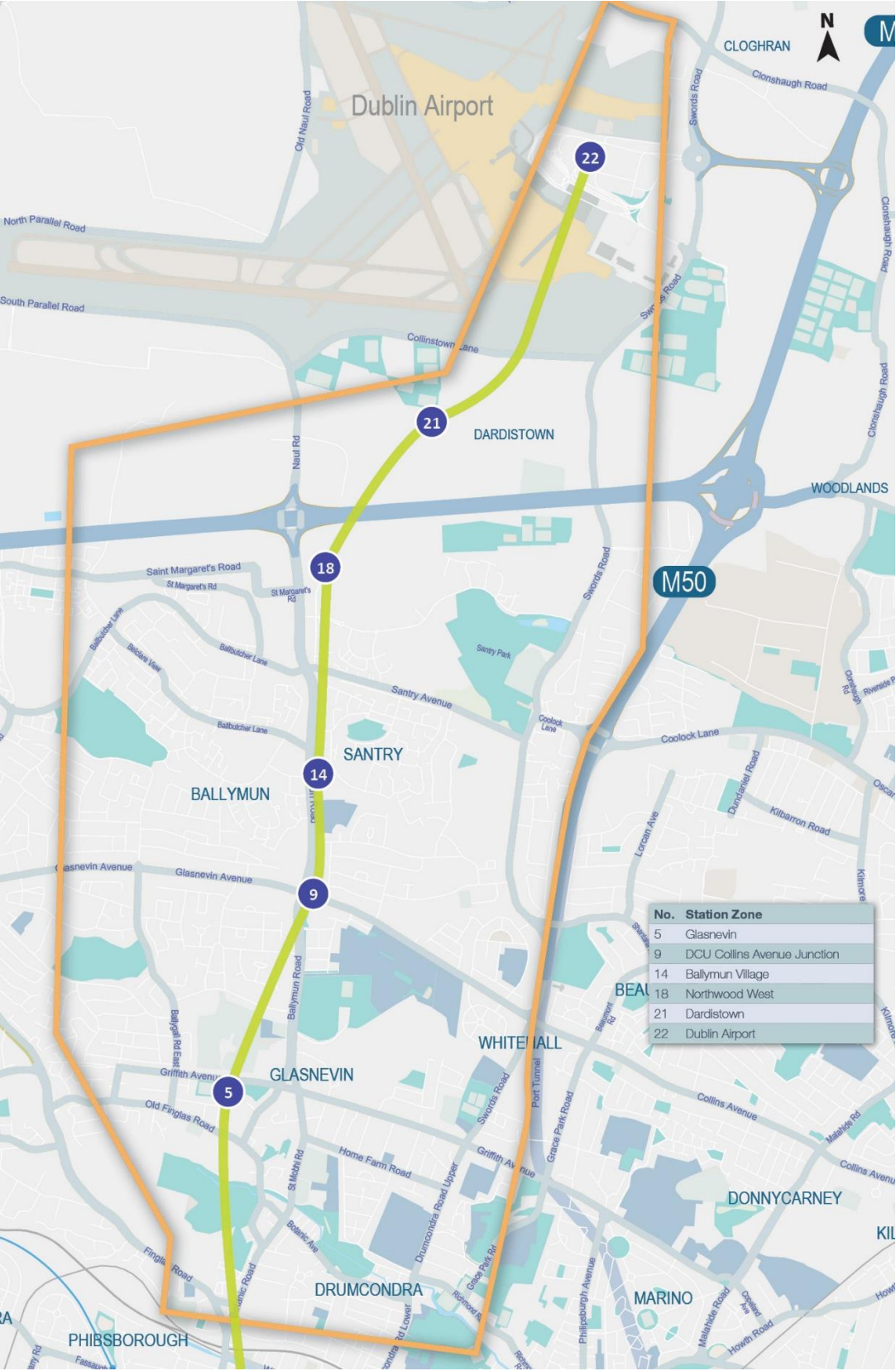


Table 6.32: Route Option B17

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	This route option provides a direct route through the centre of Study Area B serving key trip attractors in the area. This route option would have a high potential trip demand and is one of the shortest route options considered in Study Area B which has benefits in terms of journey time and cost. Additionally, this route option offers an alternative connection at the southern end of Study Area B which could connect a potential option emerging from Study Area A at Whitworth. However, this route option is similar to options B12 and B14 with the only difference being that B17 serves Northwood Central rather than Northwood West. This does not add any length to this route option but results in a small reduction in the potential trip demand. Options B12 and B14 are therefore considered to be more suitable. For this reason, Option B17 is not considered any further.	Fail
Potential Trip Demand	Potential trip demand of approximately 79,250 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (13,200 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Griffith Park -National Botanic Gardens -Whitehall College of Further Education -Bon Secours Hospital Dublin -DCU Glasnevin -DCU Sports Grounds -Ballymun Village -Ballymun Residential Area -Gulliver's Retail Park - Northwood Estate -Dublin Airport 		
Directness	<p style="text-align: center;">7.5km</p> <p>This route option consists of a direct alignment through the centre of the study area.</p>		

Figure 6.31: Route Option B17

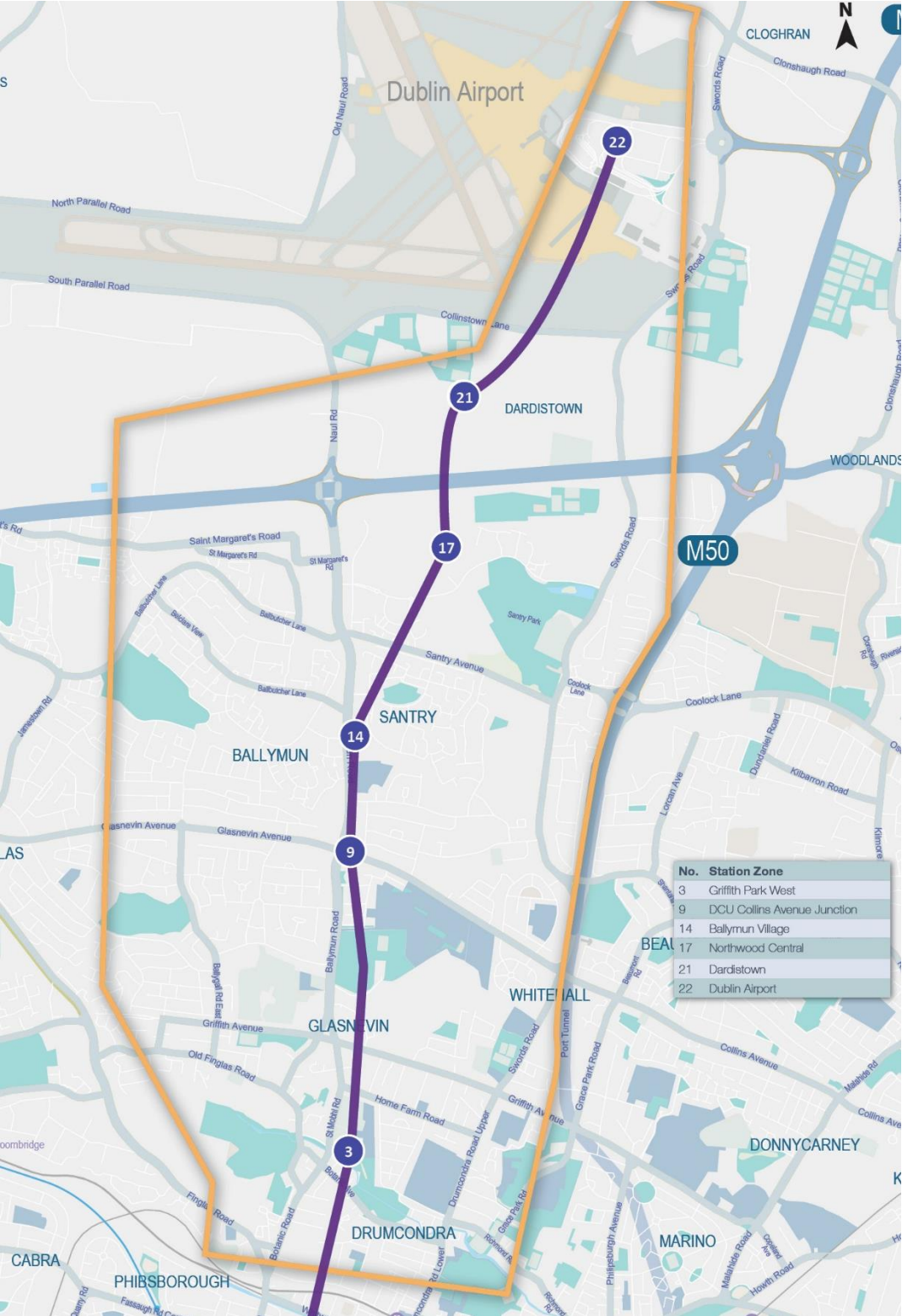
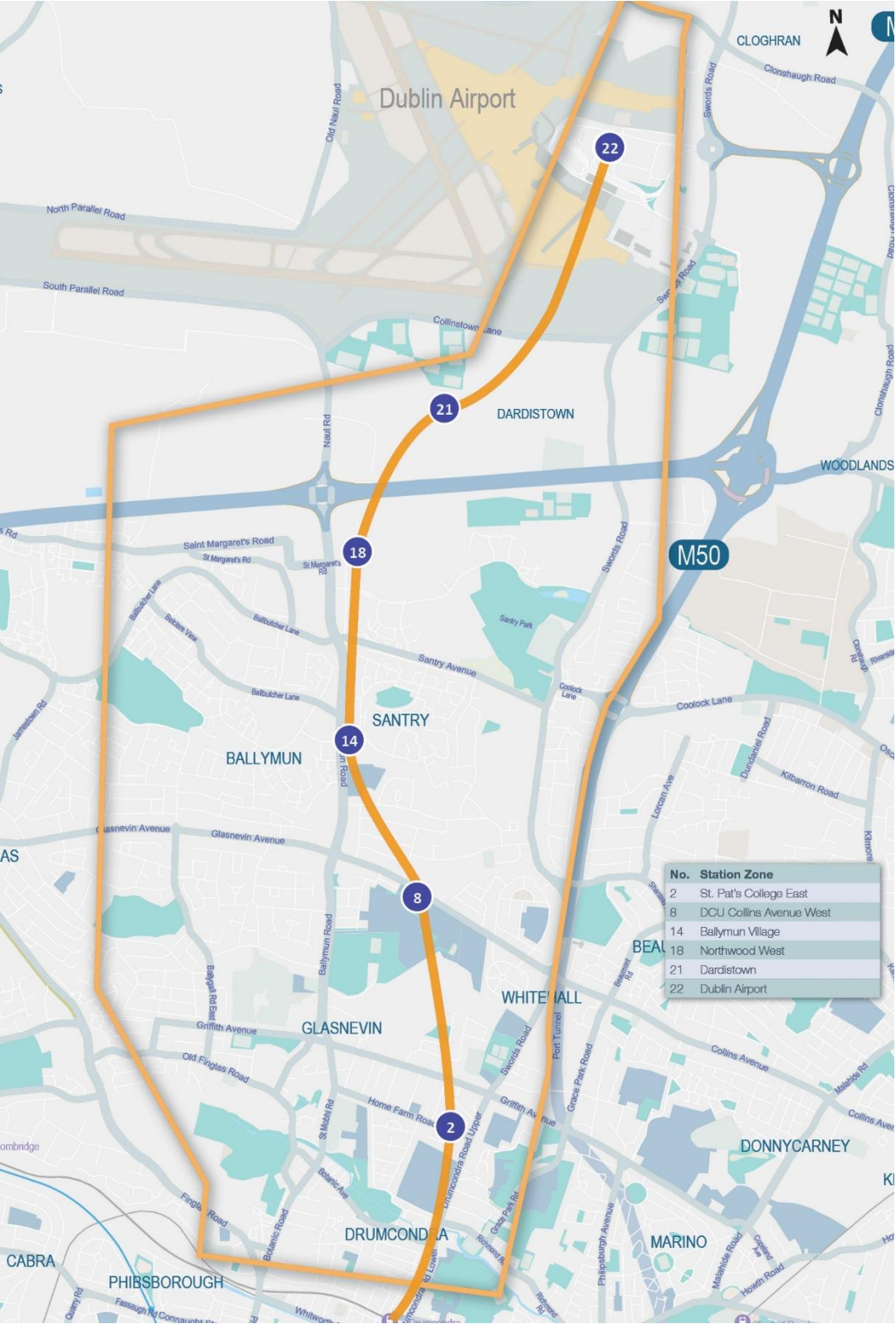


Table 6.33: Route Option B18

Criteria	Qualitative Assessment	Summary	Pass/Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area B. Opportunity for integration with core bus services on Ballymun Road.	<p>This route option provides a direct route through the centre of Study Area B, serving key trip attractors in the area.</p> <p>This route option would have a lower potential overall trip demand than other options. It is also similar to route options B2, B5 B10 and B13 with the exception that the route moves from the Santry corridor to Ballymun Road in advance of DCU. It is considered that this represents a better location to switch corridors owing to the generally higher demand along the Ballymun Road.</p> <p>For these reasons, this route option is not considered further.</p>	Fail
Potential Trip Demand	Potential trip demand of approximately 72,250 trips/24hr is forecast for the area within a 1km walk catchment of the 6 stations proposed on this route (12,000 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> - DCU St. Patricks College - DCU All Hallows - Whitehall College of Further Education - Griffith Park - DCU Glasnevin - The Helix - Ballymun Village - Gulliver's Retail Park - Northwood Estate - Dublin Airport 		
Directness	<p>7.8km</p> <p>This route option starts along a western alignment before diverting to the central portion of Study Area B north of Collins Avenue.</p>		

Figure 6.32: Route Option B18



6.3.2 Assessment Options

Following completion of the Preliminary Assessment, a total of 9 Assessment Options within Study Area B were carried forward to the Stage 1 MCA process. The assessment options are summarised in **Table 6.34** and discussed in further detail in the following sections and **Appendix 6.1, Volume 2**, with initial high level concept alignment and station location plans presented in **Volume 3**.

Table 6.34: Study Area B Assessment Options Summary

Route Option	Metro Stations	Vertical Alignment
B0	Griffith Avenue – DCU at Ballymun Road – Ballymun Village – Northwood West – Dardistown – Dublin Airport	Underground (TBM) as far as DCU Underground (cut and cover) between DCU and Northwood Elevated across the M50 At-grade from north of M50 to just north of Dardistown Underground (TBM) from Dardistown to Dublin Airport
B2	St. Patrick's College West – DCU at Ballymun Road – Ballymun Village – Northwood West – Dardistown – Dublin Airport	Underground (TBM) as far as DCU Portal between DCU and just north of Collins Avenue At-grade along Ballymun Road from Collins Avenue to Balbutcher Lane Elevated from Balbutcher Lane to just north of M50 At-grade from north of M50 to just north of Dardistown Underground (TBM) from Dardistown to Dublin Airport
B5	St. Patrick's College West – DCU at Ballymun Road – Ballymun Village – Northwood West – Dardistown – Dublin Airport	Underground (TBM) as far as DCU Underground (cut and cover) between DCU and Northwood Elevated across M50 At-grade from north of M50 to just north of Dardistown Underground (TBM) from Dardistown to Dublin Airport
B6	St. Patrick's College West – DCU at Collins Avenue West – Santry Village – Northwood Central – Dardistown – Dublin Airport	Underground (TBM) for entire route
B8	Griffith Park West – DCU at Ballymun Road – Ballymun Village – Northwood West – Dardistown – Dublin Airport	Underground (TBM) as far as DCU Portal between DCU and just north of Collins Avenue At-grade along Ballymun Road from just north of Collins Avenue to Northwood Elevated across M50 At-grade from north of M50 to just north of Dardistown

Route Option	Metro Stations	Vertical Alignment
		Underground (TBM) from Dardistown to Dublin Airport
B10	St. Patricks College West – DCU at Collins Avenue Junction – Ballymun Village – Northwood West – Dardistown - Dublin Airport	Underground (TBM) for entire route
B12	Griffith Park West – DCU at Collins Avenue Junction – Ballymun Village – Northwood West – Dardistown – Dublin Airport	Underground (TBM) for entire route
B13	St. Patricks College West – DCU at Collins Avenue Junction – Ballymun Village – Northwood West – Dardistown – Dublin Airport	Underground (TBM) as far as DCU Elevated from DCU to just north of M50 At-grade from north of M50 to just north of Dardistown Underground (TBM) from Dardistown to Dublin Airport
B14	Griffith Park (West) – DCU at Collins Avenue Junction – Ballymun Village – Northwood West – Dardistown – Dublin Airport	Underground (TBM) as far as DCU Elevated from DCU to just north of M50 At-grade from north of M50 to just north of Dardistown Underground (TBM) from Dardistown to Dublin Airport

6.3.2.1 Route Options B0

Route Option B0 is presented in **Figure 6.33** with corresponding initial concept scheme summary information presented in **Table 6.35**.

Figure 6.33: Route Option B0

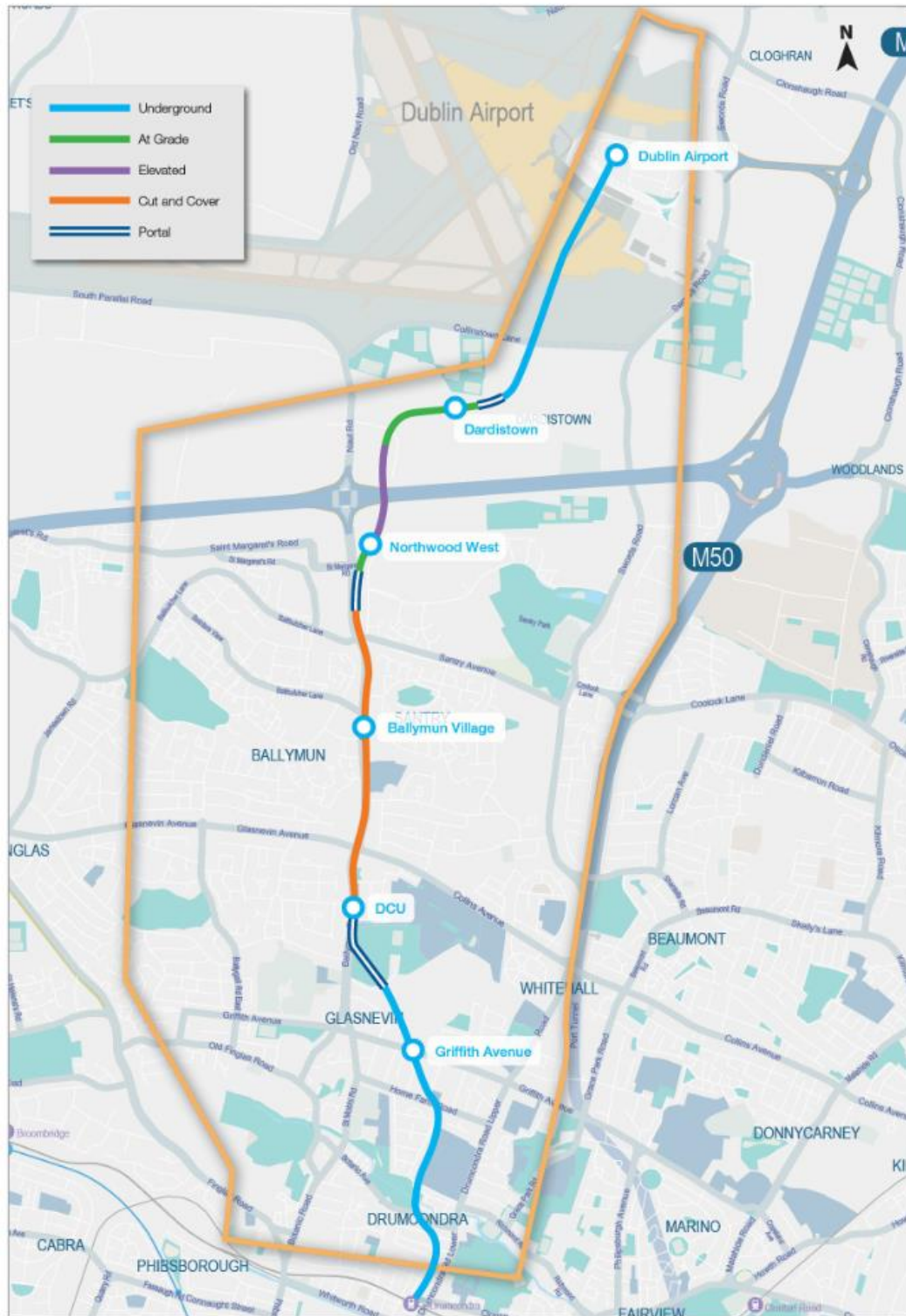


Table 6.35: Option B0 Summary

Route Length	8.2km
Alignment Type	Underground (TBM) from Drumcondra to DCU Underground (Cut & Cover) from DCU to Northwood At-Grade at Northwood Elevated from Northwood to North of the M50 At-Grade from North of the M50 to the Airport Perimeter Road Underground (TBM) from the Airport Perimeter Road to the Airport
Station Locations /Type	<ul style="list-style-type: none"> • Griffith Avenue – Underground, top down construction • DCU – Underground, top down construction • Ballymun Village– Underground, top down construction • Northwood – At-Grade • Dardistown – At-Grade • Airport – Underground, top down construction

Route Option B0 runs from Drumcondra northwards in a bored tunnel with a station provided at Griffith Avenue in areas of green space on the north side of Griffith Avenue opposite Griffith Lawns. From here the route continues to Ballymun Road where it transitions from bored tunnel to cut and cover via a portal structure. Cut and cover construction involves the excavation of the metro tunnel alignment from ground level so the tunnel structure can be constructed after which the box is covered back over so the ground above can be reinstated. The second station along the route is provided in this portal serving Dublin City University (DCU) and surrounding residential areas.

The metro continues under Griffith Avenue/Collins Avenue junction with Ballymun Road to Ballymun Village where the next station is located opposite the Civic Centre. From here, the metro begins to rise exiting the cut and cover section to an at-grade station located on the western side of Northwood Business Park in open space between the Naul Road and the Old Ballymun Road. From here the metro rises on a viaduct to run elevated over the M50 before returning to at-grade running through Dardistown where the next station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the final station provided in the Airport at the Ground Transportation Hub.

6.3.2.2 Route Options B2

Route Option B2 is presented in **Figure 6.34** with corresponding initial concept scheme summary information presented in **Table 6.36**.

Figure 6.34: Route Option B2

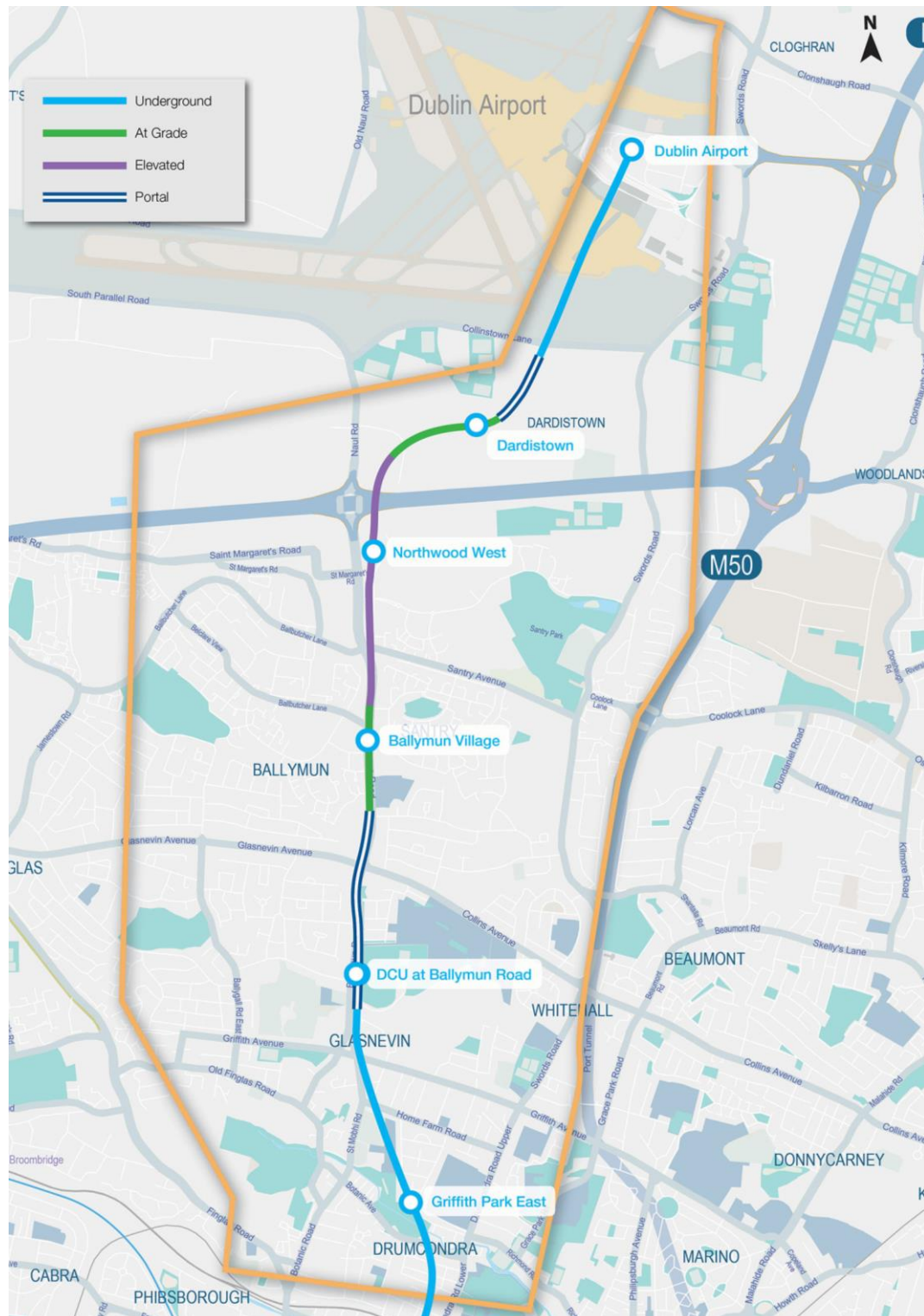


Table 6.36: Option B2 Summary

Route Length	8.0km
Alignment Type	Underground (TBM) from Drumcondra to DCU At-Grade from DCU to Santry Avenue Elevated from Santry Avenue to North of the M50 At-Grade from North of the M50 to the Airport Perimeter Road Underground (TBM) from the Airport Perimeter Road to the Airport
Station Locations /Type	<ul style="list-style-type: none"> Griffith Park East (St. Patricks College West MSZ) – Underground, top down construction DCU – Underground, top down construction Ballymun Village – At-Grade Northwood – Elevated Dardistown – At-Grade Airport – Underground, top down construction

Route Option B2 runs from Drumcondra northwards in a bored tunnel with a station provided at Griffith Park East at the junction of Millmount Avenue, Millbourne Avenue, Ferguson Road and Walsh Road. From here the route continues to Ballymun Road where it transitions from bored tunnel to at-grade running via a portal structure. The second station along the route is provided in this portal serving Dublin City University (DCU) and surrounding residential areas. The metro continues under Griffith Avenue / Collins Avenue junction with Ballymun Road before reaching at-grade running along the median of the R108 to Ballymun Village where the next station is located opposite the Civic Centre. From here, the metro begins to rise to an elevated viaduct to cross Santry Avenue with an elevated station provided on the western side of Northwood Business Park in open space between the Naul Road and the Old Ballymun Road. From here the metro stays elevated over the M50 before returning to at-grade running through Dardistown where the next station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the final station provided in the Airport at the Ground Transportation Hub.

6.3.2.3 Route Options B5

Route Option B5 is presented in **Figure 6.35** with corresponding initial concept scheme summary information presented in **Table 6.37**.

Figure 6.35: Route Option B5

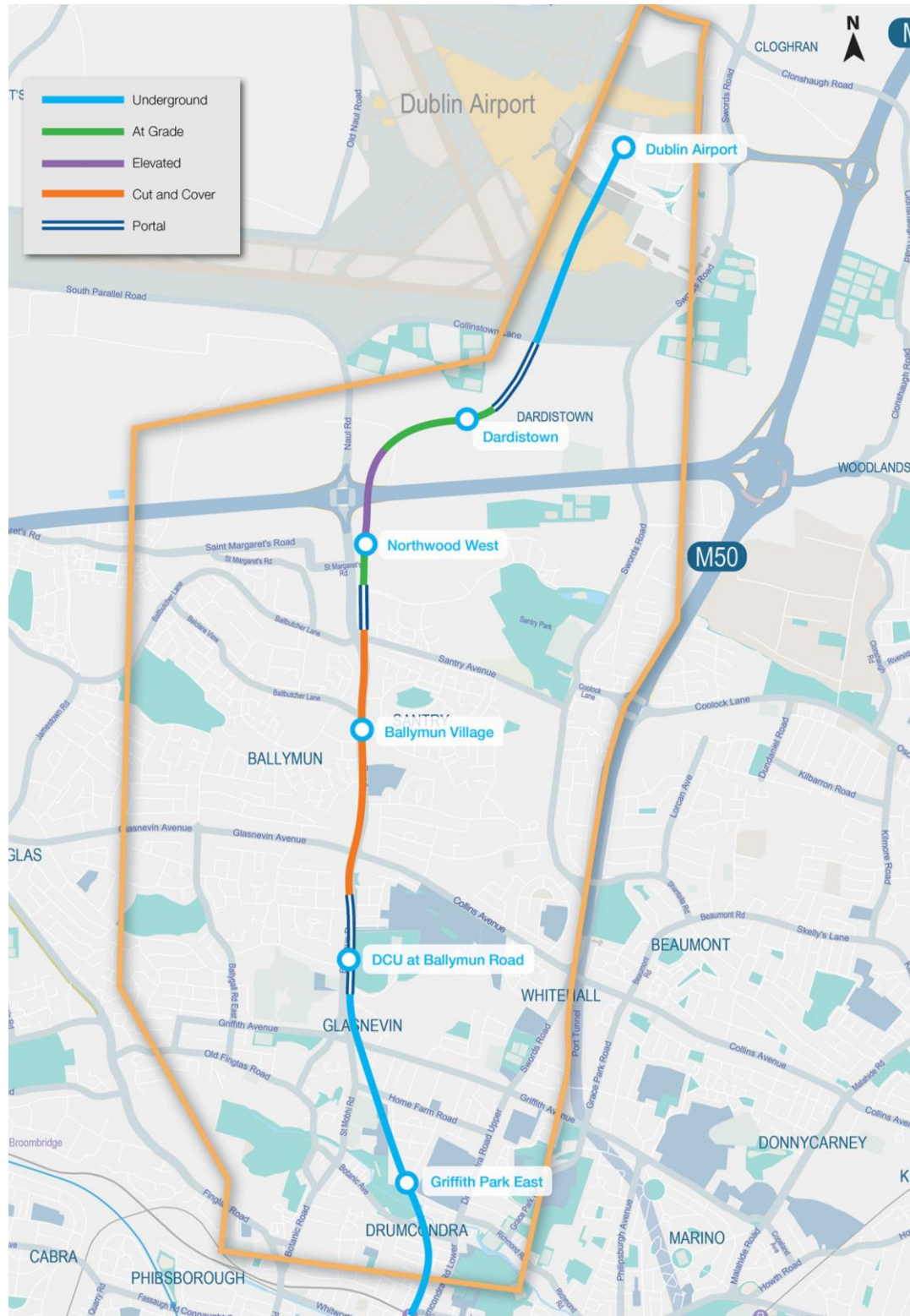


Table 6.37: Option B5 Summary

Route Length	8.0km
Alignment Type	Underground (TBM) from Drumcondra to DCU Cut & Cover from DCU to Northwood At-Grade at Northwood Elevated from Northwood to North of the M50 At-Grade from North of the M50 to the Airport Perimeter Road Underground (TBM) from the Airport Perimeter Road to the Airport
Station Locations / Type	<ul style="list-style-type: none"> Griffith Park East (St. Patricks College West MSZ) – Underground, top down construction DCU – Underground, top down construction Ballymun Village– Underground, top down construction Northwood – At-Grade Dardistown – At-Grade Airport – Underground, top down construction

Route Option B5 runs from Drumcondra northwards in a bored tunnel with a station provided at Griffith Park East at the junction of Millmount Avenue, Millbourne Avenue, Ferguson Road and Walsh Road. From here the route transitions from bored tunnel to cut and cover via a portal structure. The second station along the route is provided in this portal serving Dublin City University (DCU) and surrounding residential areas. The metro continues under Griffith Avenue/Collins Avenue junction with Ballymun Road to Ballymun Village where the next station is located opposite the Civic Centre.

From here, the metro begins to rise exiting the cut and cover section to an at-grade station located on the western side of Northwood Business Park in open space between the Naul Road and the Old Ballymun Road. From here the metro rises on a viaduct to run elevated over the M50 before returning to at-grade running through Dardistown where the next station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the final station provided in the Airport at the Ground Transportation Hub.

6.3.2.4 Route Options B6

Route Option B6 is presented in **Figure 6.36** with corresponding initial concept scheme summary information presented in **Table 6.38**.

Figure 6.36: Route Option B6

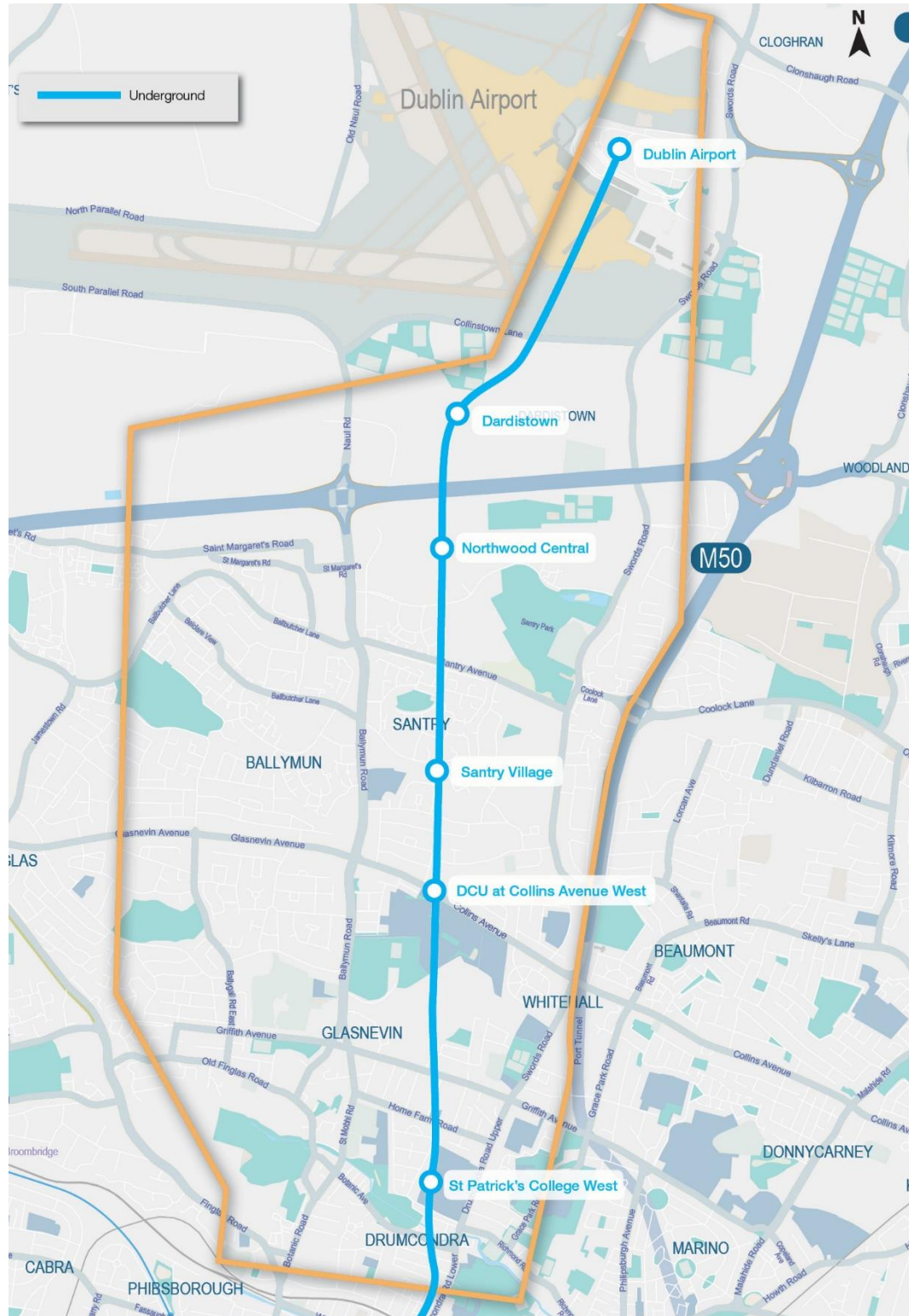


Table 6.38: Option B6 Summary

Route Length	7.5km
Alignment Type	Fully underground (TBM) from Drumcondra to the Airport
Station Locations / Type	<ul style="list-style-type: none"> • St. Pat's College West – Underground, top down construction • DCU – Underground, top down construction • Santry Village – Underground, top down construction • Northwood – Underground, top down construction • Dardistown – At-Grade • Airport – Underground, top down construction

Route Option B6 runs from Drumcondra northwards in a bored tunnel with a station provided at St. Pat's College in an area of playing fields behind St. Patrick's College. From there the route continues north to DCU with a station provided at the main entrance to DCU on Collins Avenue. It then continues north to the third station in residential areas to the west of Santry Village under Shangan Road. The next station is provided in Northwood in open space to the east of Gulliver's Retail Park. From here the metro travels under the M50 to Dardistown and proceeds north to the final station provided in the Airport at the Ground Transportation Hub.

6.3.2.5 Route Options B8

Route Option B8 is presented in **Figure 6.37** with corresponding initial concept scheme summary information presented in **Table 6.39**.

Figure 6.37: Route Option B8

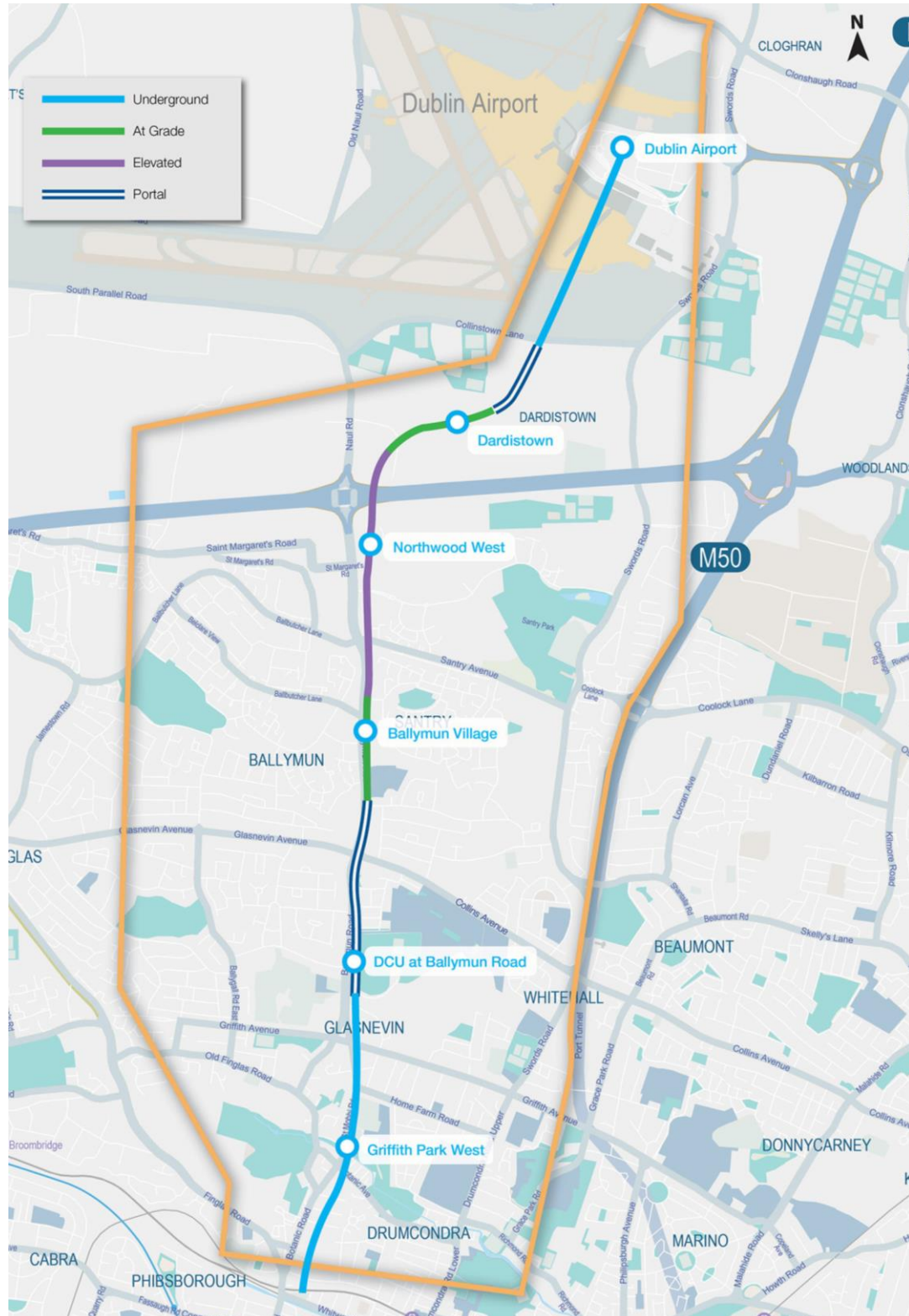


Table 6.39: Option B8 Summary

Route Length	7.7km
Alignment Type	Underground (TBM) from Whitworth to DCU At-Grade from DCU to Santry Avenue Elevated from Santry Avenue to North of the M50 At-Grade from North of the M50 to the Airport Perimeter Road Underground (TBM) from the Airport Perimeter Road to the Airport
Station Locations / Type	<ul style="list-style-type: none"> • Griffith Park West – Underground, top down construction • DCU – Underground, top down construction • Ballymun Village– At-Grade • Northwood – Elevated • Dardistown – At-Grade • Airport – Underground, top down construction

Route Option B8 runs from Whitworth northwards in a bored tunnel with a station provided at Griffith Park West in an of green playing fields to the north west of Griffith Park adjacent to Whitehall College of Further Education. From here the route continues to Ballymun Road where it transitions from tunnel to at-grade running via a portal structure. The second station along the route is provided in this portal serving Dublin City University (DCU) and surrounding residential areas. The metro continues under Griffith Avenue/Collins Avenue junction with Ballymun Road before reaching at-grade running along the median of the R108 to Ballymun Village where the next station is located opposite the Civic Centre. From here, the metro begins to rise to an elevated viaduct to cross Santry Avenue with an elevated station provided on the western side of Northwood Business Park in open space between the Naul Road and the Old Ballymun Road. From here the metro stays elevated over the M50 before returning to at-grade running through Dardistown where the next station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the final station provided in the Airport at the Ground Transportation Hub.

6.3.2.6 Route Options B10

Route Option B10 is presented in **Figure 6.38** with corresponding initial concept scheme summary information presented in **Table 6.40**.

Figure 6.38: Route Option B10

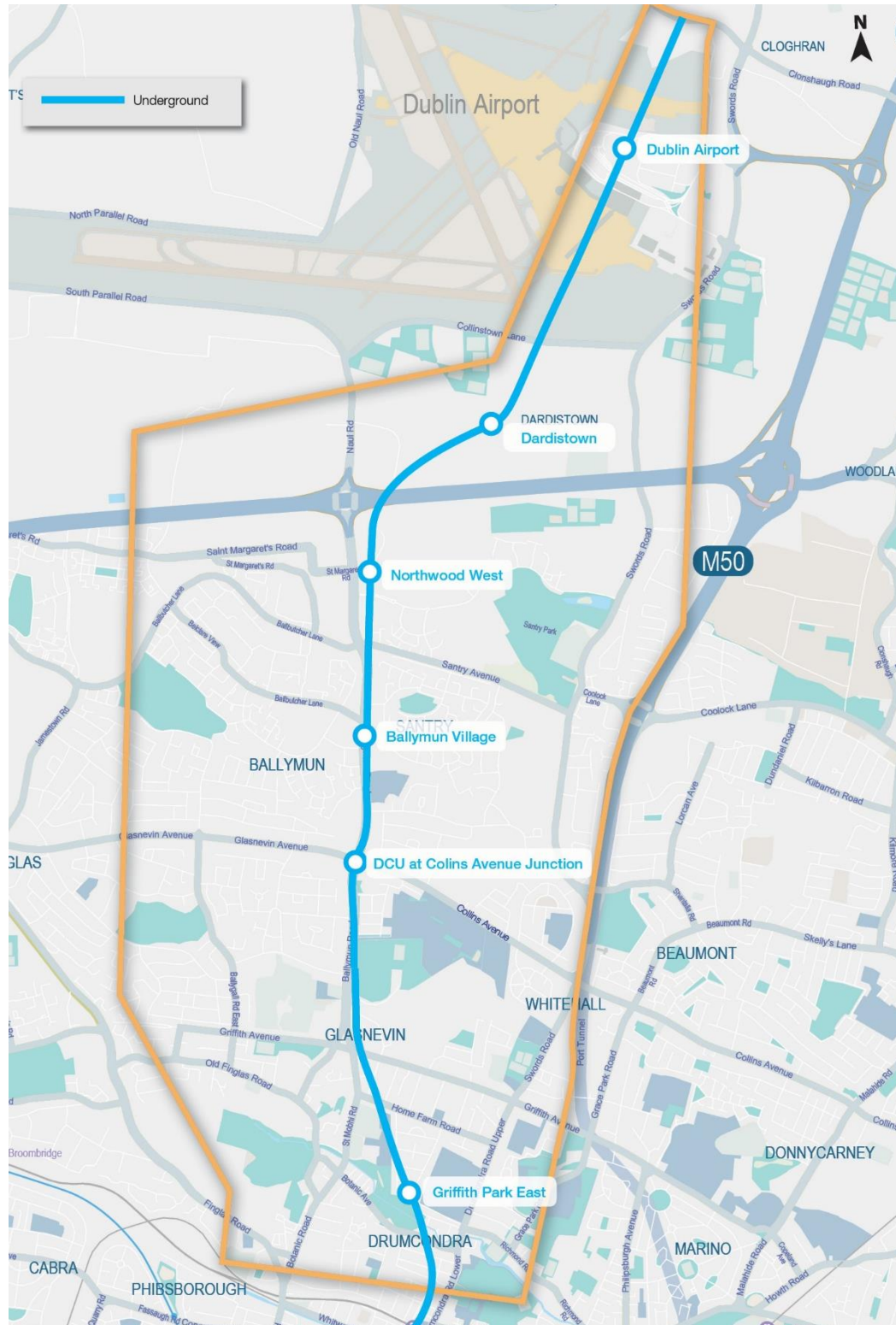


Table 6.40: Option B10 Summary

Route Length	7.7km
Alignment Type	Fully underground (TBM) from Drumcondra to the Airport
Station Locations / Type	<ul style="list-style-type: none"> • Griffith Park East (St. Patricks College West MSZ) – Underground, top down construction • DCU at Collins Avenue Junction – Underground, top down construction • Ballymun Village – Underground, top down construction • Northwood – Underground, top down construction • Dardistown – Underground, top down construction • Airport – Underground, top down construction

Route Option B10 runs from Drumcondra northwards in a bored tunnel with a station provided at Griffith Park East at the junction of Millmount Avenue, Millbourne Avenue, Ferguson Road and Walsh Road. From here the route continues to Ballymun Road where the second station is located at the Ballymun Road/Collins Avenue junction serving Dublin City University (DCU) and surrounding residential areas. The metro continues along Ballymun Road to Ballymun Village where the next station is located opposite the Civic Centre. From here, the metro stays in tunnel to an underground station located on the western side of Northwood Business Park in open space between the Naul Road and the Old Ballymun Road. From here the metro travels under the M50 through Dardistown where the next station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the final station provided in the Airport at the Ground Transportation Hub.

6.3.2.7 Route Options B12

Route Option B12 is presented in **Figure 6.39** with corresponding initial concept scheme summary information presented in **Table 6.41**.

Figure 6.39: Route Option B12

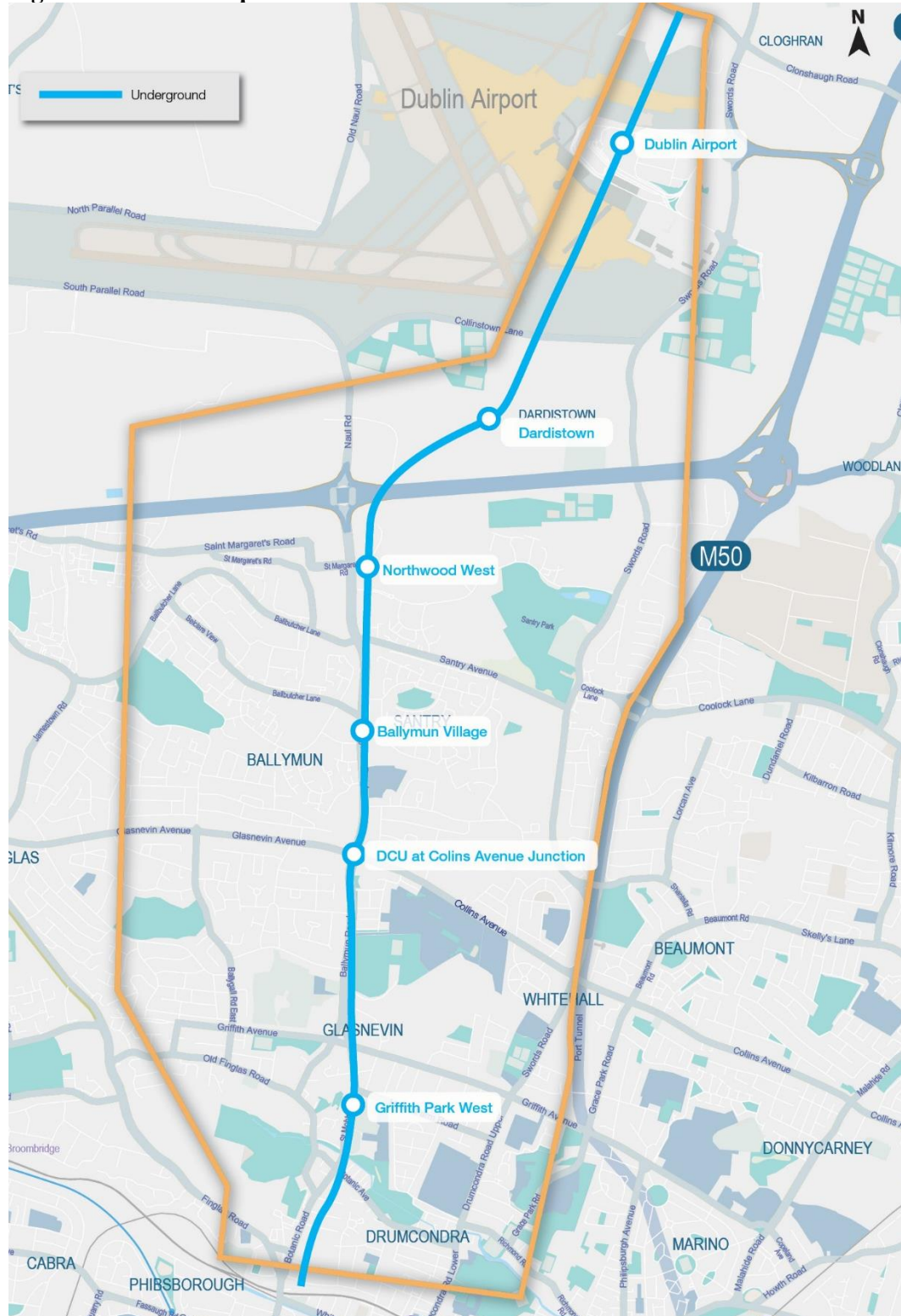


Table 6.41: Option B12 Summary

Route Length	7.5km
Alignment Type	Fully underground (TBM) from Whitworth to the Airport
Station Locations / Type	<ul style="list-style-type: none"> • Griffith Park West – Underground, top down construction • DCU Collins Avenue Junction – Underground, top down construction • Ballymun Village – Underground, top down construction • Northwood – Underground, top down construction • Dardistown – Underground, top down construction • Airport – Underground, top down construction

Route Option B12 runs from Whitworth northwards in a bored tunnel with a station provided at Griffith Park West in an area of green playing fields in the grounds of the Na Fianna GAA Club. From here the route continues to Ballymun Road where the second station is located at the Ballymun Road/Collins Avenue junction serving Dublin City University (DCU) and surrounding residential areas. The metro continues along Ballymun Road to Ballymun Village where the next station is located opposite the Civic Centre. From here, the metro stays in tunnel to an underground station located on the western side of Northwood Business Park in open space between the Naul Road and the Old Ballymun Road. From here the metro travels under the M50 through Dardistown where the next station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the final station provided in the Airport at the Ground Transportation Hub.

6.3.2.8 Route Options B13

Route Option B13 is presented in **Figure 6.40** with corresponding initial concept scheme summary information presented in **Table 6.42**.

Figure 6.40: Route Option B13

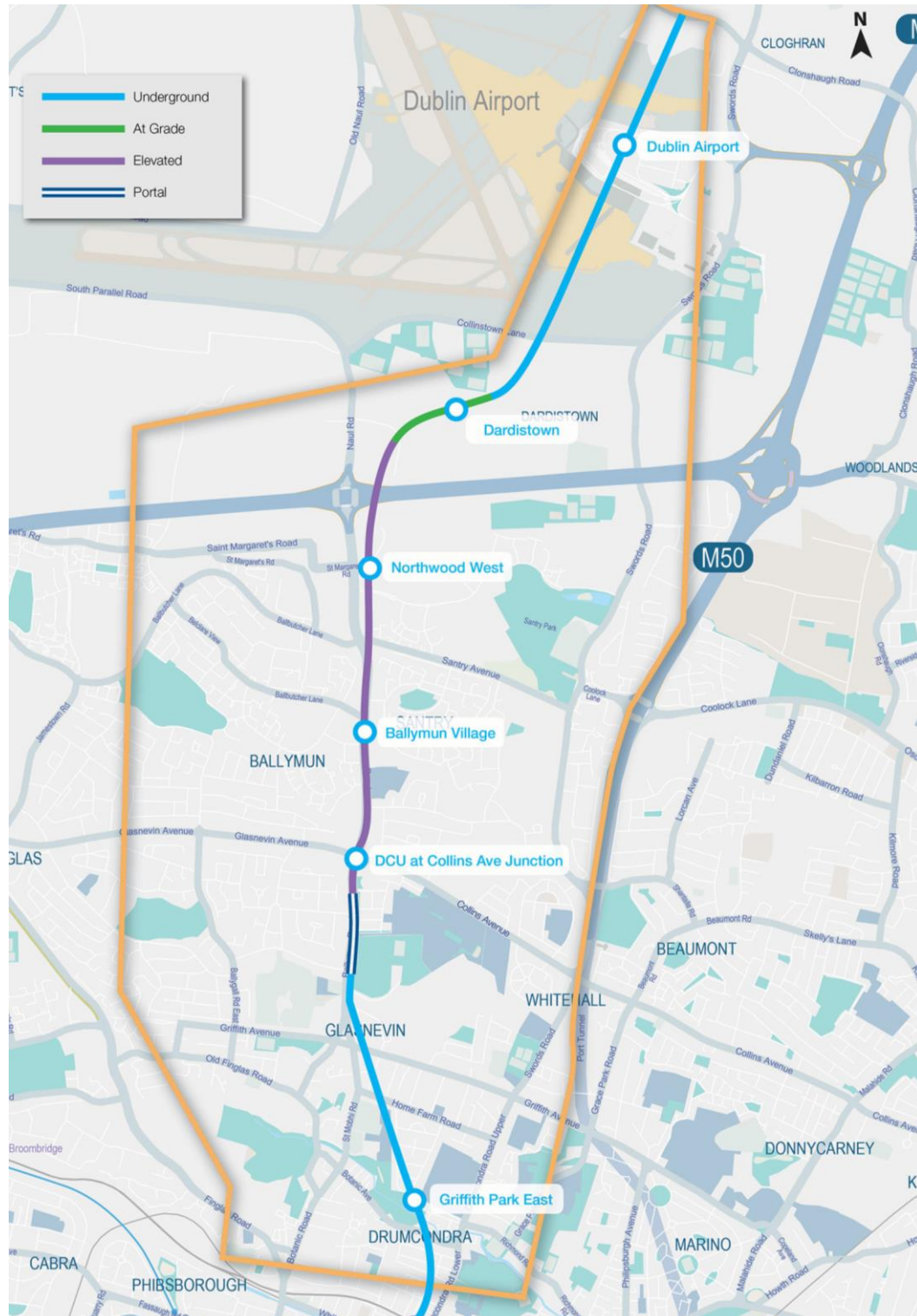


Table 6.42: Option B13 Summary

Route Length	8.0km
Alignment Type	Underground (TBM) from Drumcondra to DCU Elevated from DCU to North of the M50 At-Grade from North of the M50 to the Airport Perimeter Road Underground (TBM) from the Airport Perimeter Road to the Airport
Station Locations / Type	<ul style="list-style-type: none"> • Griffith Park East (St. Patricks College West MSZ) – Underground, top down construction • DCU – Elevated • Ballymun Village – Elevated • Northwood – Elevated • Dardistown – At-Grade • Airport – Underground, top down construction

Route Option B13 runs from Drumcondra northwards in a bored tunnel with a station provided at Griffith Park East at the junction of Millmount Avenue, Millbourne Avenue, Ferguson Road and Walsh Road. From here the route continues to Ballymun Road where it transitions from tunnel to elevated via a portal structure located in the median of the road. The second station along the route is provided at the elevated viaduct at the junction of the Ballymun Road and Collins Avenue, serving Dublin City University (DCU) and surrounding residential areas. The metro continues running elevated along the median of the Ballymun Road to Ballymun Village where the next station is located opposite the Civic Centre. The next station is then located on the western side of Northwood Business Park in open space between the Naul Road and the Old Ballymun Road. From here the metro continues over the M50 before returning to at-grade running through Dardistown where the next station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the final station provided in the Airport at the Ground Transportation Hub.

6.3.2.9 Route Options B14

Route Option B14 is presented in **Figure 6.41** with corresponding initial concept scheme summary information presented in **Table 6.43**.

Figure 6.41: Route Option B14

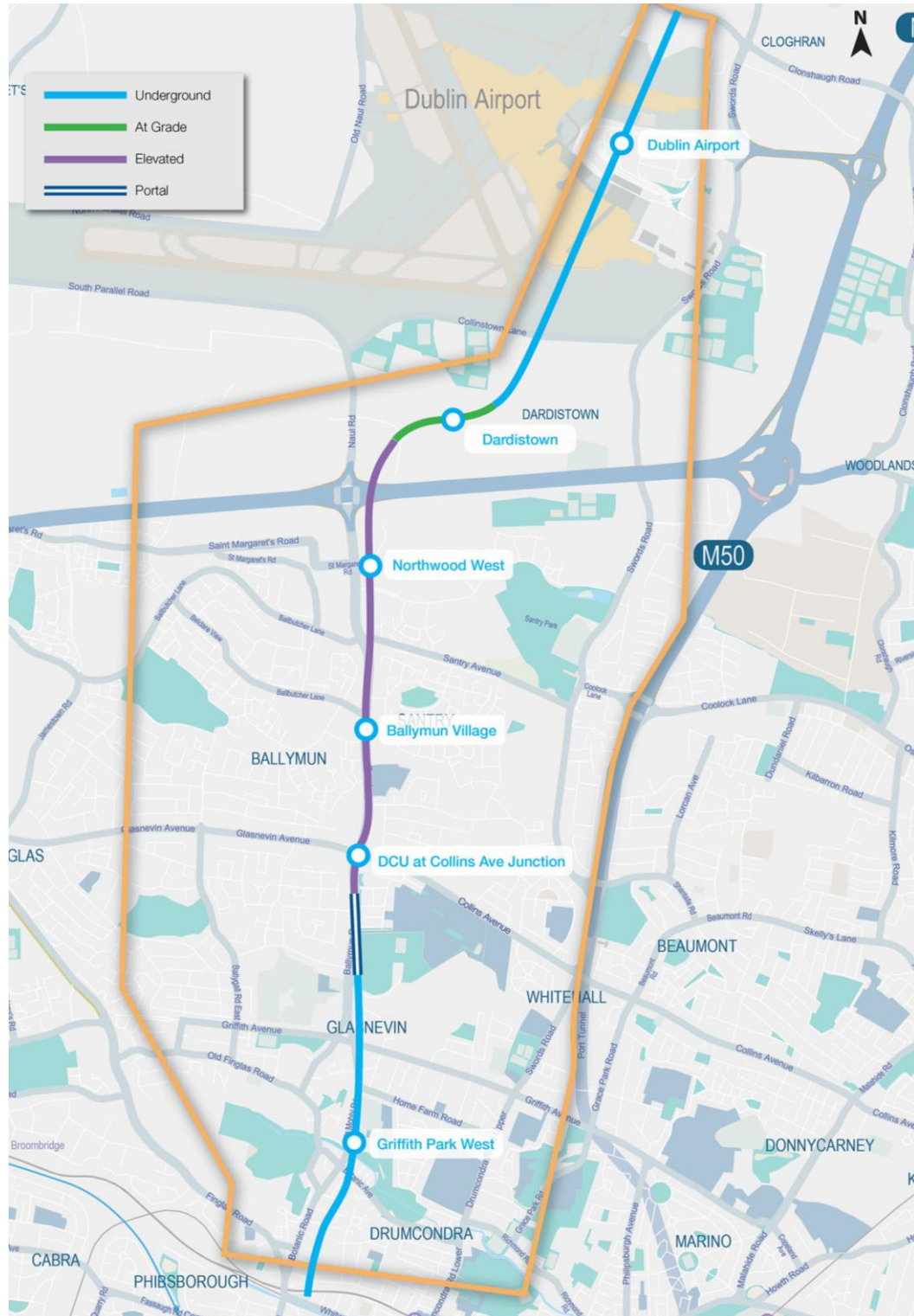


Table 6.43: Option B14 Summary

Route Length	7.8km
Alignment Type	Underground (TBM) from Whitworth to DCU Elevated from DCU to North of the M50 At-Grade from North of the M50 to the Airport Perimeter Road Underground (TBM) from the Airport Perimeter Road to the Airport
Station Locations / Type	<ul style="list-style-type: none"> • Griffith Park West – Underground, top down construction • DCU – Elevated • Ballymun Village – Elevated • Northwood – Elevated • Dardistown – At-Grade • Airport – Underground, top down construction

Route Option B14 runs from Whitworth northwards in a bored tunnel with a station provided at Griffith Park West in an area of green playing fields in the grounds of the Na Fianna GAA Club. From here the route continues to Ballymun Road where it transitions from tunnel to elevated via a portal structure located in the median of the road. The second station along the route is provided at the elevated viaduct at the junction of the Ballymun Road and Collins Avenue, serving Dublin City University (DCU) and surrounding residential areas. The metro continues running elevated along the median of the Ballymun Road to Ballymun Village where the next station is located opposite the Civic Centre. The next station is then located on the western side of Northwood Business Park in open space between the Naul Road and the Old Ballymun Road. From here the metro continues over the M50 before returning to at-grade running through Dardistown where the next station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the final station provided in the Airport at the Ground Transportation Hub.

6.4 Study Area C

6.4.1 Preliminary Assessment

Table 6.44 to **Table 6.51** present a summary of the Preliminary Assessment for Study Area C.

Table 6.44: Route Option C0

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area C. Opportunity for integration with bus and future BRT.	This route option represents Old Metro North and Optimised Metro North.	Pass
Potential Trip Demand	Potential trip demand of approximately 40,250 trips/24hr is forecast for the area within a 1km walk catchment of the 4 stations proposed on this route (10,000 trips/24hr/station).	This route option provides a route along the eastern side of Study Area C serving key trip attractors in the area. This route option is located entirely within the Metro Economic Corridor, as designated in the Fingal County Development Plan.	
Key Trip Attractors	-Airside Retail Park -Pavilions Shopping Centre -Swords Business Park -Swords Village -Swords Castle -Estuary Strategic Park & Ride -Future development lands to the east of the R132 (Barrysparks LAP lands)	Although this route option would have a lower potential overall trip demand than other options, it does provide opportunity for above ground running in the median of the R132.	
Directness	5.8km This route option serves the eastern side of Study Area B along the alignment of the R132.	For these reasons, this route option is progressed to the next assessment stage.	

Figure 6.42: Route Option C0

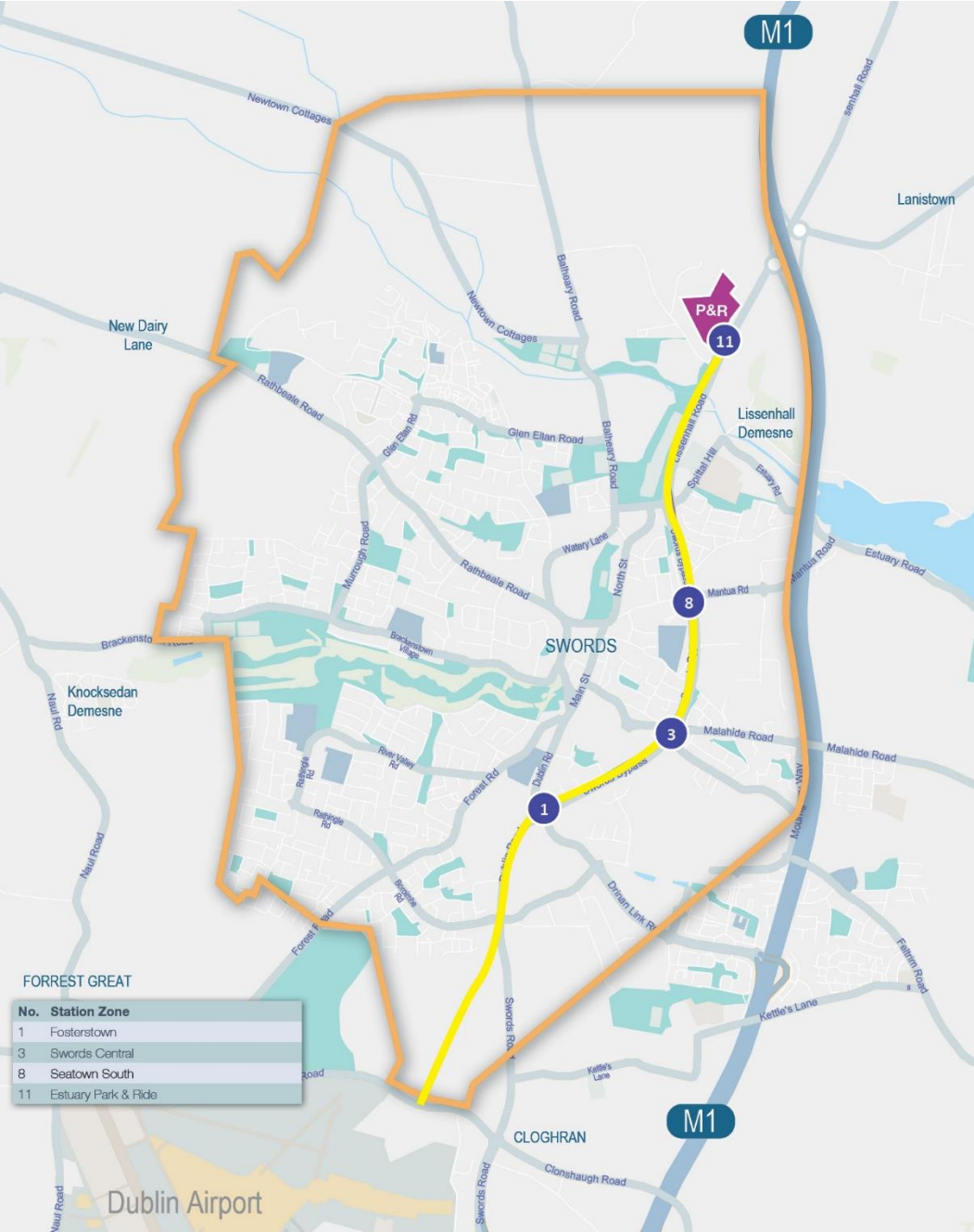


Table 6.45: Route Option C1

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area C. Opportunity for integration with bus and future BRT.	<p>This route option provides a route along the eastern side of Study Area C serving key trip attractors in the area.</p> <p>This route option is also located entirely within the Metro Economic Corridor, although some station locations differ from Option A0, resulting in a potential lower overall trip demand up to the 2035 assessment year in the ERM. The option provides opportunity for above ground running in the median of the R132.</p> <p>For these reasons, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 40,250 trips/24hr is forecast for the area within a 1km walk catchment of the 4 stations proposed on this route (10,000 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Airside Retail Park -Pavilions Shopping Centre -Swords Business Park -Swords Village -Swords Castle -Estuary Strategic Park & Ride -Future development lands to the east of the R132 (Barrysparks LAP lands) 		
Directness	<p>5.8km</p> <p>This route option serves the eastern side of Study Area B along the alignment of the R132</p>		

Figure 6.43: Route Option C1

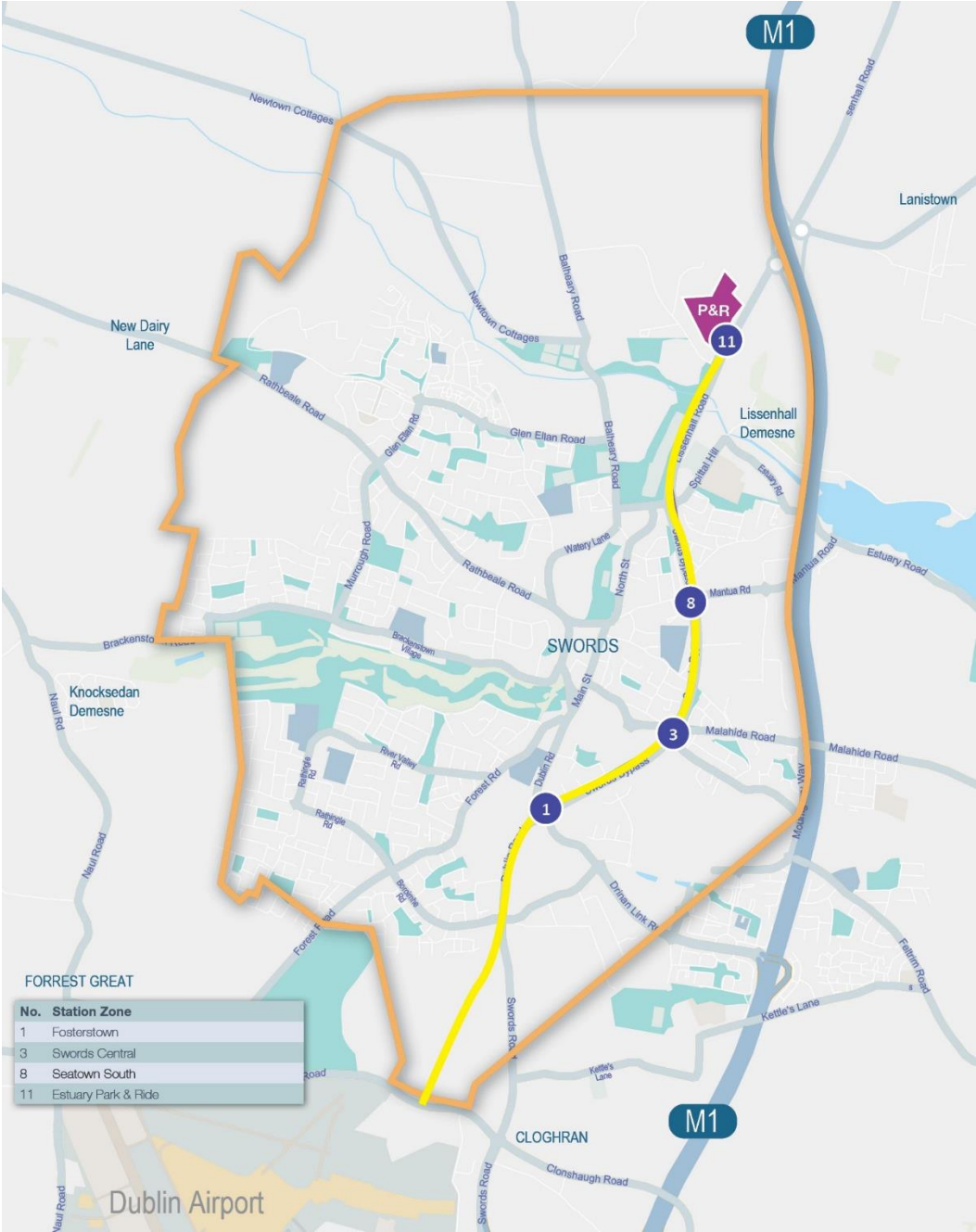


Table 6.46: Route Option C2

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area C. Opportunity for integration with bus and future BRT.	<p>This route option provides a route through the centre of Study Area C serving key trip attractors in the area and the centre of Swords Village. Additionally, this route option would serve the Barrysparks development lands. Although this option misses a section of the Metro Economic Corridor along the R132, based on information extracted from the ERM, it does have the greatest demand of all options in Study Area C up to the 2035 assessment period. However, this option would be provided fully at-grade and would result in significant impact on Swords Village. Furthermore, the urban nature of Swords Main Street would result in a requirement for metro trams to run at considerably lower speeds in this area meaning journey times would also be longer. As such a tunnel option is considered more appropriate along this alignment (C11). For these reasons, this route option is not progressed to the next assessment stage.</p>	Fail
Potential Trip Demand	Potential trip demand of approximately 46,000 trips/24hr is forecast for the area within a 1km walk catchment of the 4 stations proposed on this route (11,500 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Airside Retail Park -Pavilions Shopping Centre -Swords Castle -Swords Village -Estuary Strategic Park & Ride 		
Directness	<p>5.5km</p> <p>This route option consists of a direct alignment through the centre of the study area along Swords Main Street.</p>		

Figure 6.44: Route Option C2

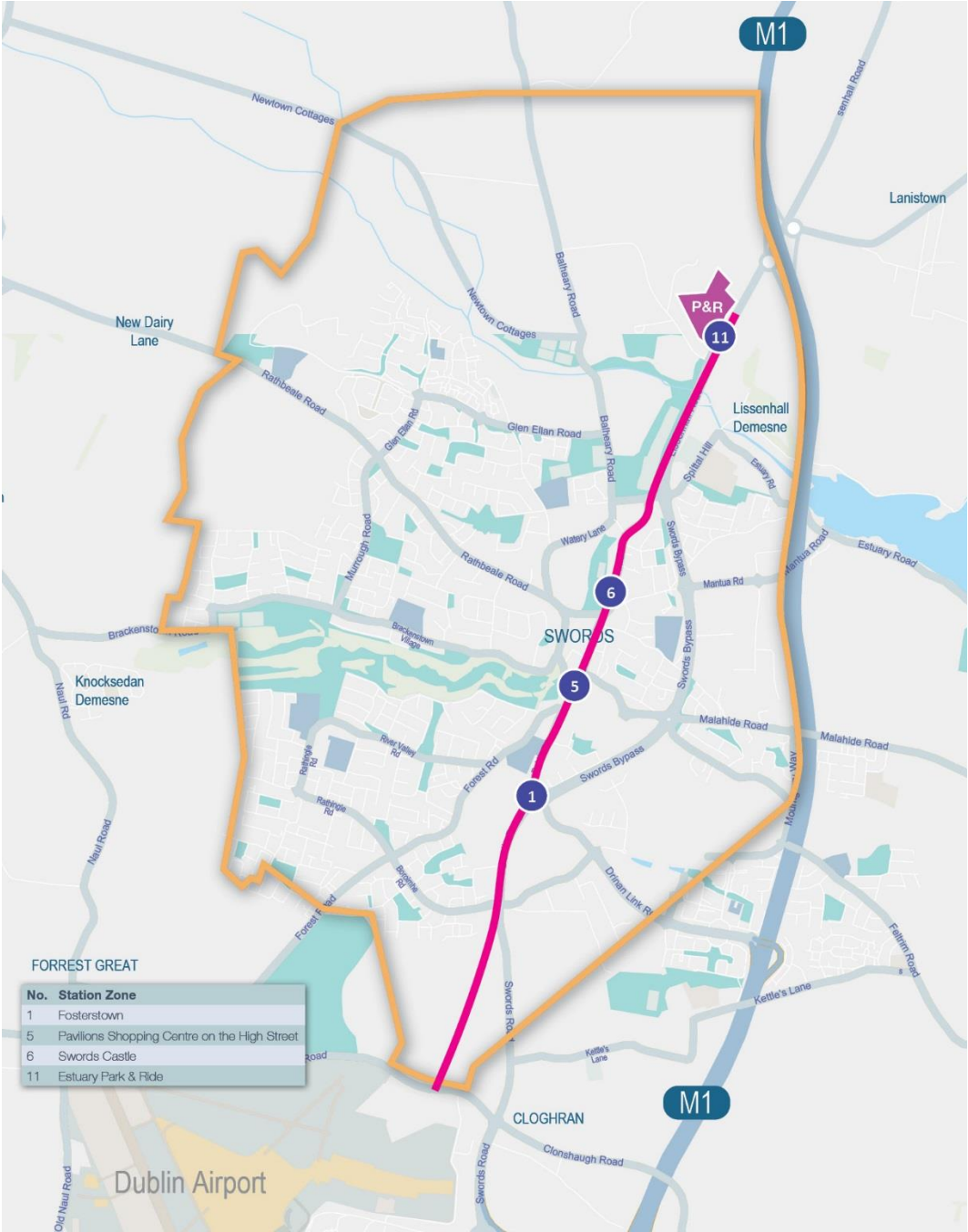


Table 6.47: Route Option C3

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area C. Opportunity for integration with bus and future BRT.	<p>This route option represents a variation of Old Metro North and Optimised Metro North which runs underground (cut and cover) between Pinnock Hill and Malahide Road Roundabouts.</p> <p>This route option provides a route along the eastern side of Study Area C serving key trip attractors in the area. Although this route option would have a lower potential overall trip demand than other options up to 2035, is located entirely within the Metro Economic Corridor and is therefore likely to attract longer term patronage from development within these lands. It does provide opportunity for above ground running in the median of the R132, with the main difference between this Option and C0 being an extended section of cut and cover tunnel south of the R132/Malahide Road junction to better improve accessibility to and from the metro from adjacent zoned high-density development lands.</p> <p>For these reasons, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 40,250 trips/24hr is forecast for the area within a 1km walk catchment of the 4 stations proposed on this route (10,000 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Airside Retail Park -Pavilions Shopping Centre -Swords Business Park -Swords Village -Swords Castle -Estuary Strategic Park & Ride -Future development lands to the east of the R132 (Barrysparks LAP lands) 		
Directness	<p>5.8km</p> <p>This route option serves the eastern side of Study Area B along the alignment of the R132.</p>		

Figure 6.45: Route Option C3

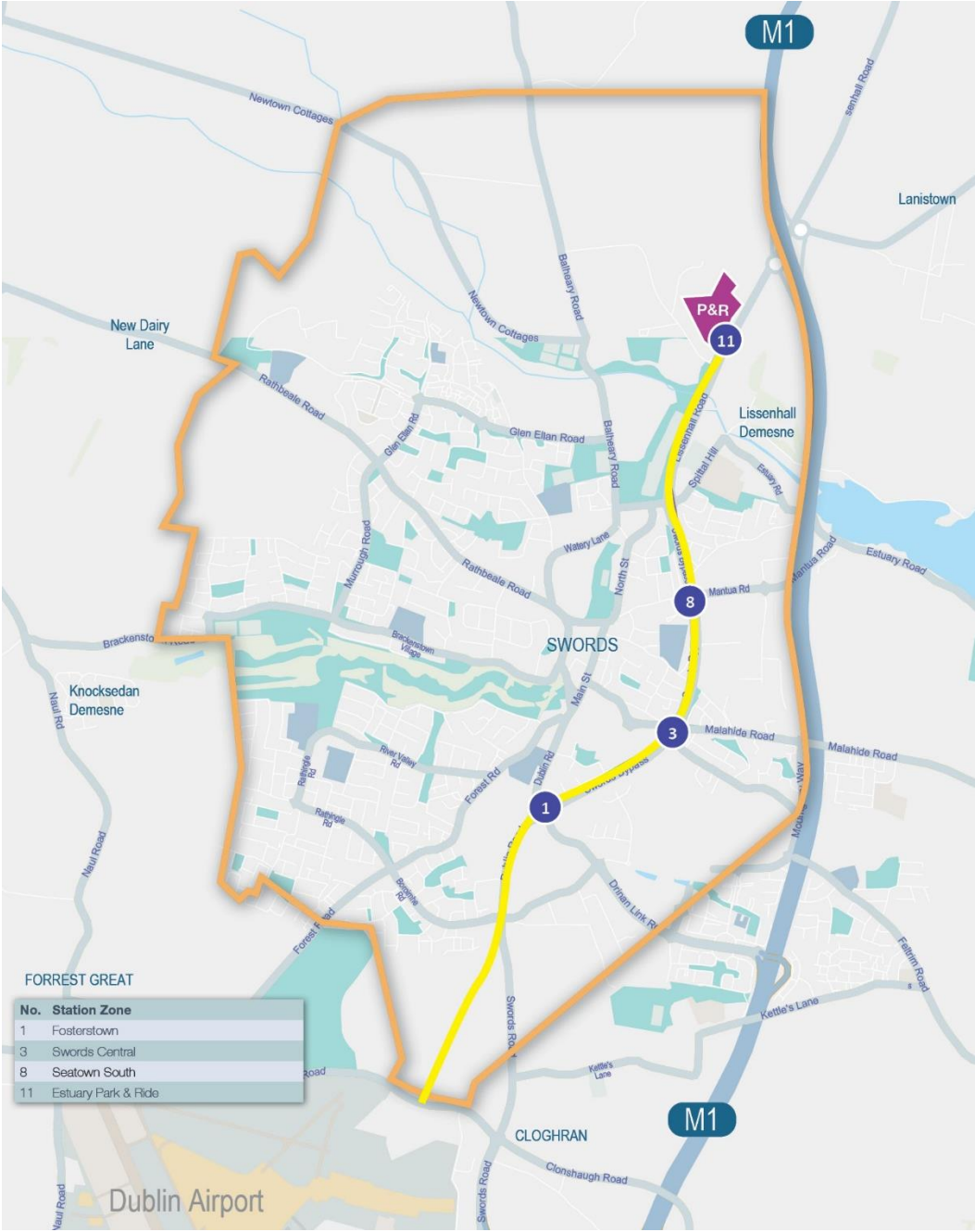


Table 6.48: Route Option C4

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area C. Opportunity for integration with bus and future BRT.	<p>This route option represents a further variant of Options C0 and C3, with an extended section of elevated running along the R132 between Pinnock Hill and Estuary Roundabouts.</p> <p>This route option provides a route along the eastern side of Study Area C serving key trip attractors in the area. Again, this option is located entirely within the Metro Economic Corridor and, while travel demand within its catchment is relatively lower than some other options up to 2035, the option is likely to attract longer term patronage from development within the MEC.</p> <p>For these reasons, this route option is progressed to the next assessment stage.</p>	Pass
Potential Trip Demand	Potential trip demand of approximately 40,250 trips/24hr is forecast for the area within a 1km walk catchment of the 4 stations proposed on this route (10,000 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Airside Retail Park -Pavilions Shopping Centre -Swords Business Park -Swords Village -Swords Castle -Estuary Strategic Park & Ride -Future development lands to the east of the R132 (Barrysparks LAP lands) 		
Directness	<p>5.8km</p> <p>This route option serves the eastern side of Study Area B along the alignment of the R132.</p>		

Figure 6.46: Route Option C4

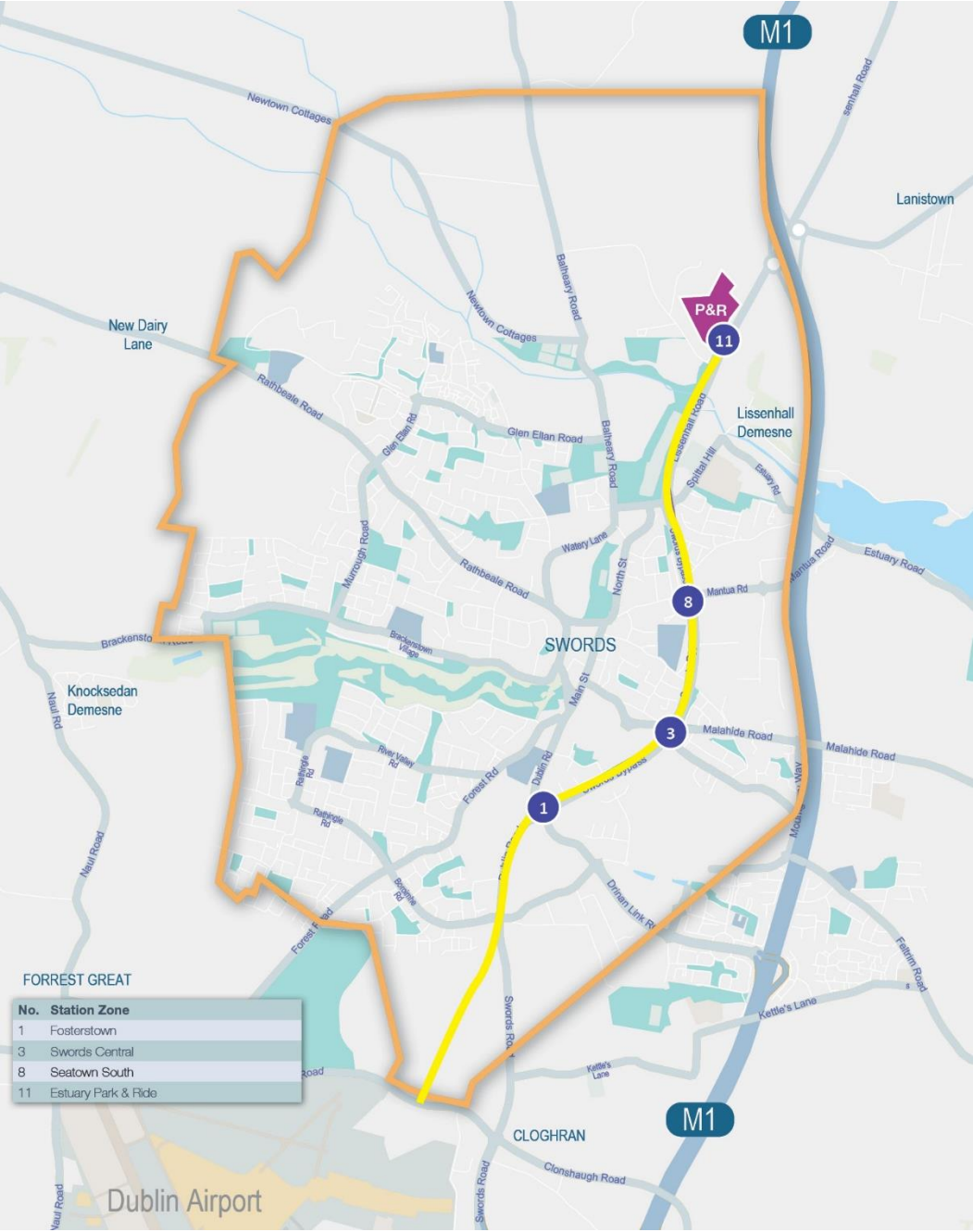


Table 6.49: Route Option C5

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area C. Opportunity for integration with bus and future BRT.	This route option provides a route along the western side of Study Area C through established residential neighbourhoods. While this route would have a high potential trip demand, it would not serve key trip attractors within and to the east of Swords Village. Furthermore, this route option would not support the Metro Economic Corridor and the planned growth of Swords to the east of the R132. For these reasons, this route option is not considered any further.	Fail
Potential Trip Demand	Potential trip demand of approximately 44,250 trips/24hr is forecast for the area within a 1km walk catchment of the 5 stations proposed on this route (8,850 trips/24hr/station).		
Key Trip Attractors	-Swords Castle -Western side of Swords Village -Strategic Park & Ride		
Directness	5.9km This route option serves the western side of Study Area B along the alignment of the R132.		

Figure 6.47: Route Option C5



Table 6.50: Route Option C6

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area C. Opportunity for integration with bus and future BRT.	<p>This route option provides a route through the centre of Study Area C serving key trip attractors in the area and the centre of Swords Village. This route option would have a lower potential trip demand than other options in Study Area C. This option would be provided at-grade as far as Swords Pavilions High Street before transitioning to a tunnel as far as Estuary.</p> <p>For these reasons, this route option is progressed to the next assessment stage.</p>	Fail
Potential Trip Demand	Potential trip demand of approximately 51,250 trips/24hr is forecast for the area within a 1km walk catchment of the 5 stations proposed on this route (10,250 trips/24hr/station).		
Key Trip Attractors	<ul style="list-style-type: none"> -Airside Retail Park -Pavilions Shopping Centre -Swords Business Park -Swords Village -Swords Castle -Estuary Strategic Park & Ride -Future development lands to the east of the R132 (Barrysparks LAP lands) 		
Directness	<p>5.9km</p> <p>This route option serves the western side of Study Area B along the alignment of the R132.</p>		

Figure 6.48: Route Option C6

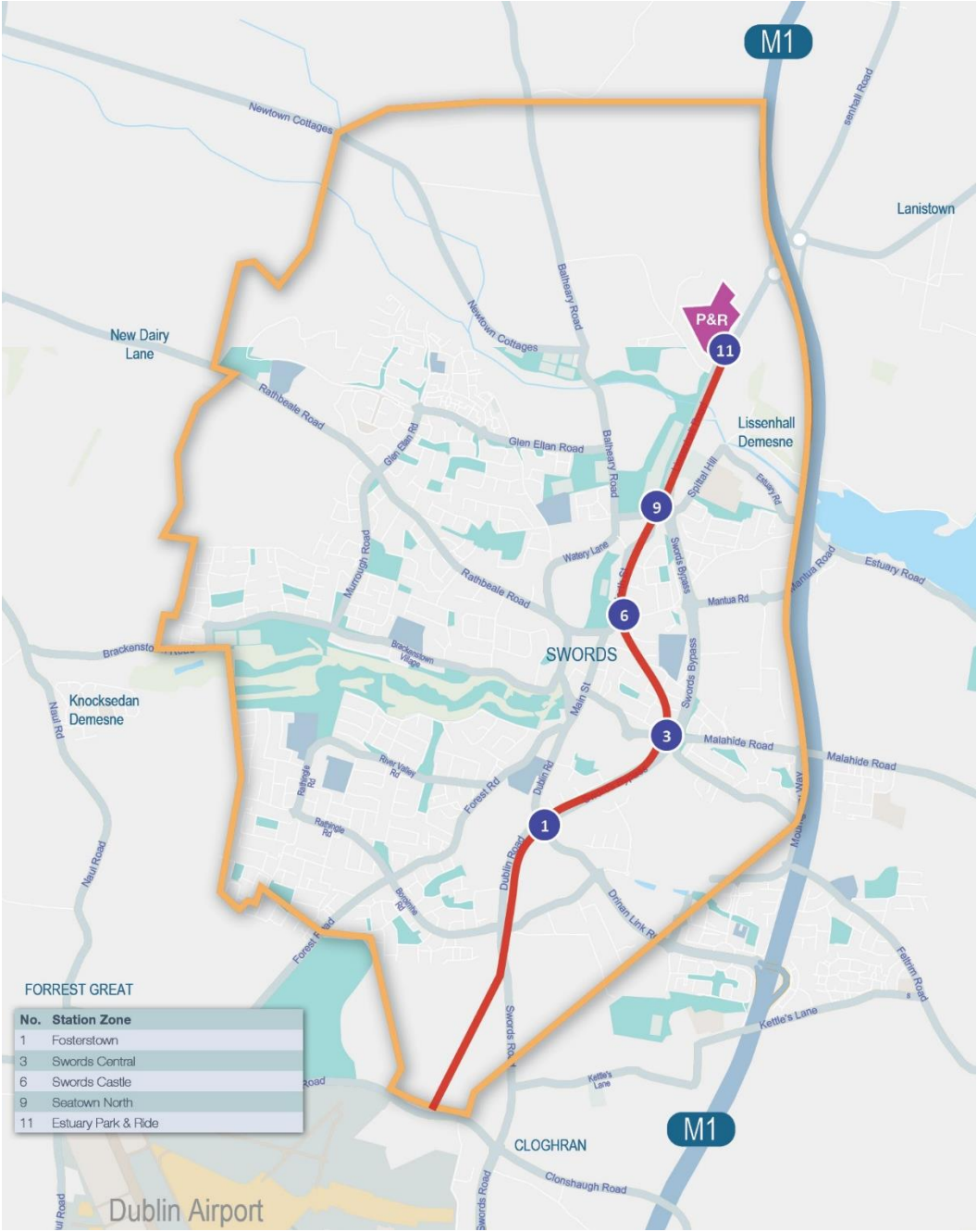
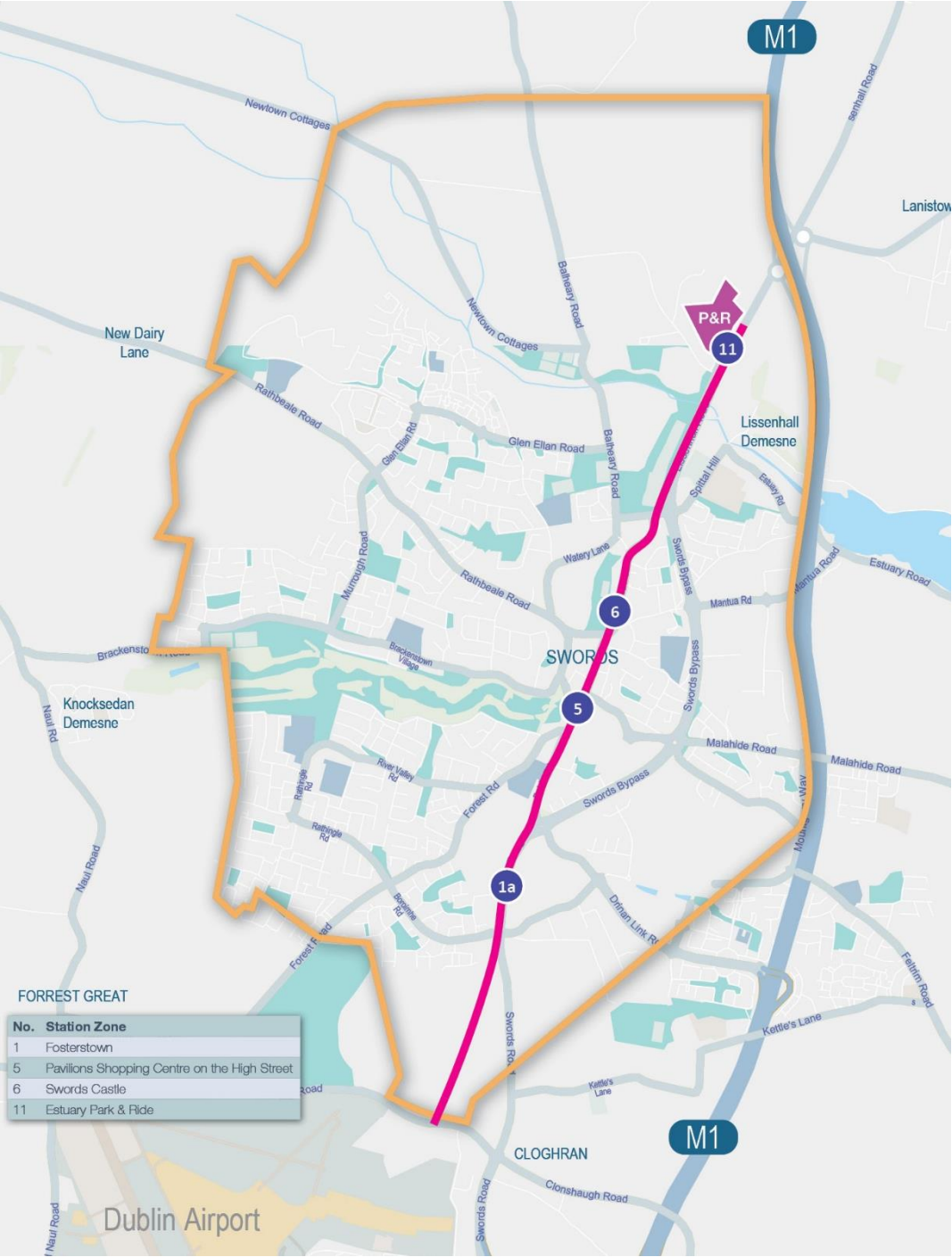


Table 6.51: Route Option C11

Criteria	Qualitative Assessment	Summary	Pass/ Fail
Potential for interchange	There is no potential for interchange with Luas or Heavy Rail in Study Area C. Opportunity for integration with bus and future BRT.	This route option provides a route through the centre of Study Area C serving key trip attractors in the area and the centre of Swords Village. This route option would have a lower potential trip demand than other options in Study Area C. This option would be provided underground as far as green field space to the north of Castlegrange Green where is transitions to run at-grade as far as Estuary. For these reasons, this route option is progressed to the next assessment stage.	Pass
Potential Trip Demand	Potential trip demand of approximately 46,000 trips/24hr is forecast for the area within a 1km walk catchment of the 4 stations proposed on this route (11,500 trips/24hr/station).		
Key Trip Attractors	-Airside Retail Park -Pavilions Shopping Centre -Swords Village -Swords Castle -Estuary Strategic Park & Ride		
Directness	5.5km This route option consists of a direct alignment through the centre of the study area along Swords Main Street.		

Figure 6.49: Route Option C11



6.4.2 Assessment Options

Following completion of the Preliminary Assessment, a total of 5 Assessment Options within Study Area C were carried forward to the Stage 1 MCA process. The assessment options are summarised in and discussed in further detail in the following sections and **Appendix 6.1, Volume 2**, with initial high level concept alignment and station location plans presented in **Volume 3**.

Table 6.52: Study Area C Assessment Options Summary

Route Option	Potential Metro Station Zones Served	Vertical Alignment
C0	Fosterstown – Swords Central – Seatown – Estuary Park & Ride	<p>Fully Segregated Alignment:</p> <p>At-grade from Naul Road to Rathingle Road</p> <p>Cut-and-cover under R132/Rathingle Road Junction</p> <p>At-grade along R132 from Rathingle Road to Pinnock Hill Roundabout</p> <p>Elevated over Pinnock Hill Roundabout at the Dublin Road/R132 Junction</p> <p>At-grade along R132 from Pinnock Hill Roundabout to Malahide Road Roundabout</p> <p>Cut-and-cover under Malahide Road Roundabout</p> <p>At-grade along R132 between Malahide Road Roundabout and Seatown Roundabout</p> <p>Elevated from Seatown Roundabout to just north of Castlegrange Road</p> <p>At-grade from Castlegrange Road to Estuary</p>
C1	Fosterstown – Swords Central – Seatown – Estuary Park & Ride	At-grade along entire route (non-segregated)
C3	Fosterstown – Swords Central – Seatown – Estuary Park & Ride	<p>Fully Segregated Alignment:</p> <p>At-grade from Naul Road to Rathingle Road</p> <p>Cut-and-cover under R132/Rathingle Road Junction</p> <p>At-grade along R132 from Rathingle Road to just south of Pinnock Hill Roundabout</p> <p>Elevated just south of Pinnock Hill Roundabout to just south of the Malahide Road Roundabout</p> <p>Cut-and-cover under Malahide Road Roundabout</p> <p>At-grade along R132 between Malahide Road Roundabout and Seatown Roundabout</p>

Route Option	Potential Metro Station Zones Served	Vertical Alignment
		Elevated from Seatown Roundabout to just north of Castlegrange Road At-grade from Castlegrange Road to Estuary
C4	Fosterstown – Swords Central – Seatown – Estuary Park & Ride	At-grade from Naul Road to Rathingle Road Cut-and-cover under R132/Rathingle Road Junction At-grade along R132 from Rathingle Road to Pinnock Hill Roundabout Elevated over Pinnock Hill Roundabout to just north of Castlegrange Road At-grade from Castlegrange Road to Estuary
C11	Fosterstown – Pavilions Shopping Centre – North Street Estuary Park & Ride	Underground as far as Castlegrange Road At-grade from Castlegrange Road to Estuary

6.4.2.1 Route Options C0

Route Option C0 is presented in **Figure 6.50** with corresponding initial concept scheme summary information presented in **Table 6.53**.

Figure 6.50: Route Option C0

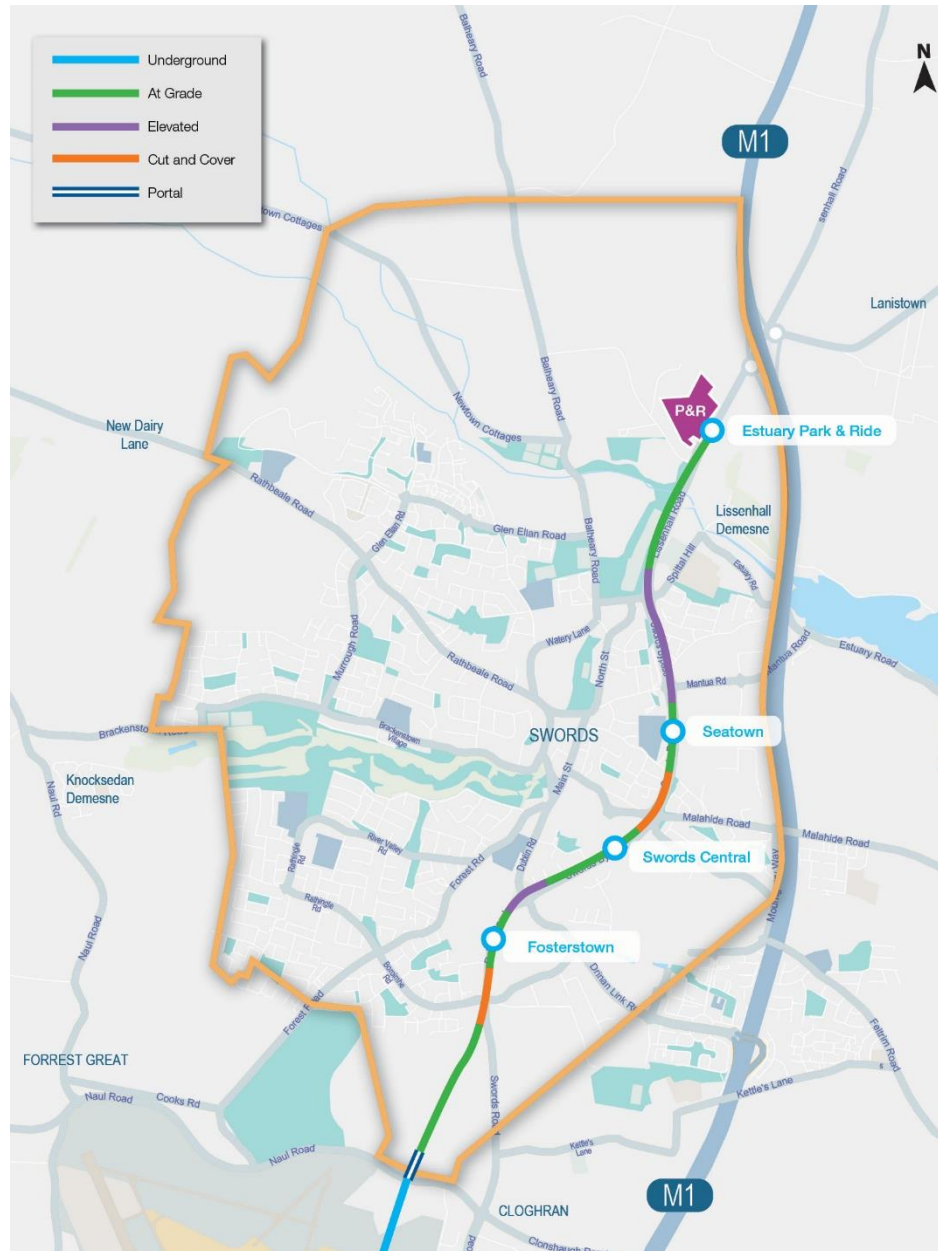


Table 6.53: Option C0 Summary

Route Length	5.8km
Alignment Type	Underground (TBM) from the Airport to north of the Naul Road At-grade from Naul Road to Rathingle Road Cut-and-cover under R132/Rathingle Road Junction At-grade along R132 from Rathingle Road to Pinnock Hill Roundabout Elevated over Pinnock Hill Roundabout at the Dublin Road/R132 Junction At-grade along R132 from Pinnock Hill Roundabout to Malahide Road Roundabout Cut-and-cover under Malahide Road Roundabout At-grade along R132 between Malahide Road Roundabout and Seatown Roundabout Elevated from Seatown Roundabout to just north of Castlegrange Road At-grade from Castlegrange Road to Estuary
Station Locations / Type	<ul style="list-style-type: none"> ● Fosterstown – At-Grade ● Swords Central – At-Grade ● Seatown – At-Grade ● Estuary – At-Grade

Route Option C0 runs in tunnel from the Dublin Airport station to a portal located in green belt lands north of the Naul Road. From here it runs at-grade in a segregated corridor before entering an underpass under the junction of the R132 with Nevinstown Lane/L2300.

An at-grade station is then provided in lands to the north side of Airside Retail Park. The route then rises on to a viaduct to run elevated over the Pinnock Hill Roundabout. It then returns to at-grade running in a segregated corridor along the median of the R132 with the next station, Swords Central, provided at-grade between the Pavilions Shopping Centre to the west and the Barrysparks Development lands to the east.

From here the route enters an underpass under the Malahide Roundabout before returning to at-grade running as far as the next station to be provided at Seatown at the entrance to the Swords Business Park. It then returns to a viaduct to run over the Seatown Roundabout and stays elevated running along the median until it passes the Estuary Roundabout where it returns to at-grade running along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

6.4.2.2 Route Options C1

Route Option C1 is presented in **Figure 6.51** with corresponding initial concept scheme summary information presented in **Table 6.54**.

Figure 6.51: Route Option C1

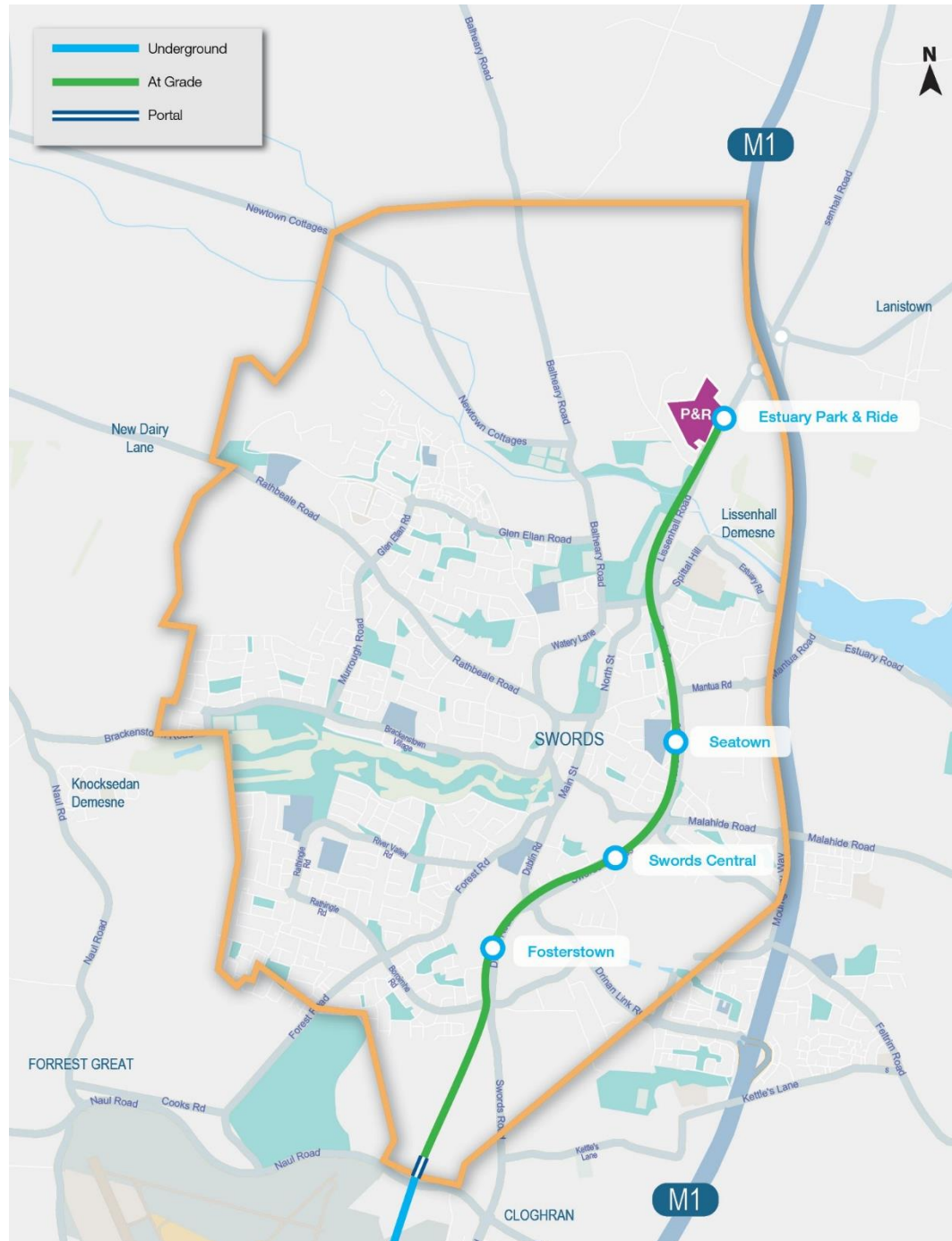


Table 6.54: Option C1 Summary

Route Length	5.8km
Alignment Type	Underground (TBM) from the Airport to north of the Naul Road At-Grade from the Naul Road to the Estuary Park & Ride along the R132 median
Station Locations / Type	<ul style="list-style-type: none"> • Airside Retail Park – At-Grade • Pavilions Shopping Centre – At-Grade • Swords Business Park – At-Grade • Estuary – At-Grade

Route Option C1 runs in tunnel from the Dublin Airport station to a portal located in green belt lands north of the Naul Road. From here it runs at-grade in a non-segregated corridor before joining the R132 at a signalised junction which will replace the Pinnock Hill Roundabout.

An at-grade station is then provided in lands to the north side of Airside Retail Park. The route then continues to run at-grade along the median of the R132 to the next station, Pavilions Shopping Centre opposite the Barrysparks Development lands to the east.

From here the route enters crosses through the signalised junctions which replace the Malahide Road and Seatown Road Roundabouts continuing at-grade to the next station to be provided at Swords Business Park. It then continues through the last signalised junctions which replaces the Estuary Roundabout where it transitions to run along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

6.4.2.3 Route Options C3

Route Option C3 is presented in **Figure 6.52** with corresponding initial concept scheme summary information presented in **Table 6.55**.

Figure 6.52: Route Option C3



Table 6.55: Option C3 Summary

Route Length	5.8km
Alignment Type	Underground (TBM) from the Airport to north of the Naul Road At-grade from Naul Road to Rathingle Road Cut-and-cover under R132/Rathingle Road Junction At-grade along R132 from Rathingle Road to just south of Pinnock Hill Roundabout Elevated just south of Pinnock Hill Roundabout to just south of the Malahide Road Roundabout Cut-and-cover under Malahide Road Roundabout At-grade along R132 between Malahide Road Roundabout and Seatown Roundabout Elevated from Seatown Roundabout to just north of Castlegrange Road At-grade from Castlegrange Road to Estuary
Station Locations / Type	<ul style="list-style-type: none"> ● Fosterstown – At-Grade ● Swords Central – Underground, top down construction ● Seatown – At-Grade ● Estuary – At-Grade

Route Option C3 runs in tunnel from the Dublin Airport station to a portal located in green belt lands north of the Naul Road. From here it runs at-grade in a segregated corridor before entering an underpass under the junction of the R132 with Nevinstown Lane/L2300. An at-grade station is then provided in lands to the north side of Airside Retail Park. The route then rises on to a viaduct to run elevated over the Pinnock Hill Roundabout. After this roundabout, the alignment drops to enter an underpass structure under the median between the Pavilions Shopping Centre to the west and the Barrysparks Development lands to the east where the next station, Swords Central, is provided.

From here the route stays in the underpass under the Malahide Roundabout before returning to at-grade running as far as the next station to be provided at Seatown at the entrance to the Swords Business Park. It then returns to a viaduct to run over the Seatown Roundabout and stays elevated running along the median until it passes the Estuary Roundabout where it returns to at-grade running along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

6.4.2.4 Route Options C4

Route Option C4 is presented in **Figure 6.53** with corresponding initial concept scheme summary information presented in **Table 6.56**.

Figure 6.53: Route Option C4

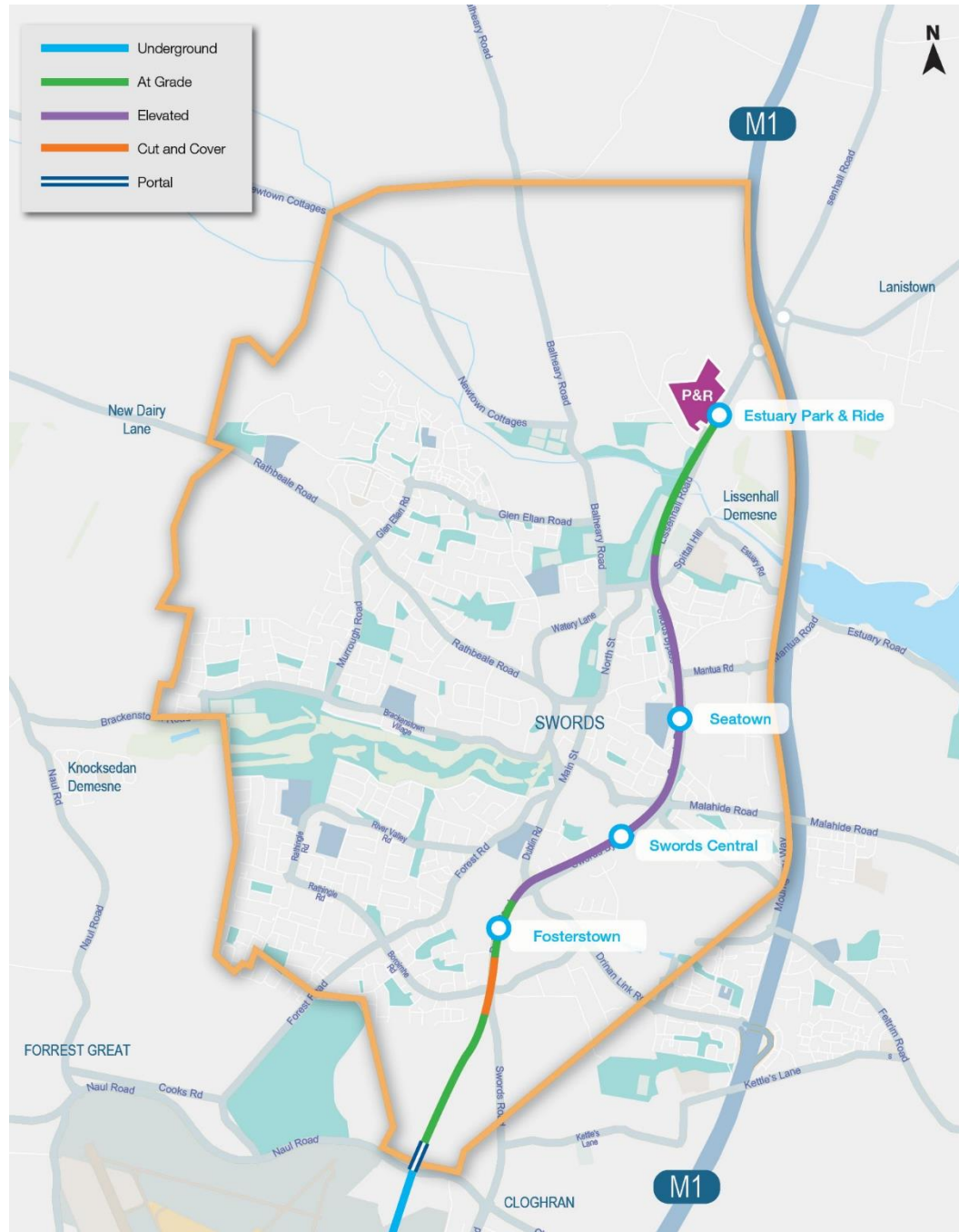


Table 6.56: Option C4 Summary

Route Length	5.8km
Alignment Type	Underground (TBM) from the Airport to north of the Naul Road At-grade from Naul Road to Rathingle Road Cut-and-cover under R132/Rathingle Road Junction At-grade along R132 from Rathingle Road to Pinnock Hill Roundabout Elevated over Pinnock Hill Roundabout to just north of Castlegrange Road At-grade from Castlegrange Road to Estuary
Station Locations / Type	<ul style="list-style-type: none"> ● Fosterstown – At-Grade ● Swords Central – Elevated ● Seatown – Elevated ● Estuary – At-Grade

Route Option C4 runs in tunnel from the Dublin Airport station to a portal located in green belt lands north of the Naul Road. From here it runs at-grade in a segregated corridor before entering an underpass under the junction of the R132 with Nevinstown Lane/L2300. An at-grade station is then provided in lands to the north side of Airside Retail Park. The route then rises on to a viaduct to run elevated over the Pinnock Hill Roundabout. It stays elevated along the median of the R132 with the next station, Swords Central, is provided between the Pavilions Shopping Centre to the west and the Barrysparks Development lands to the east.

Staying on elevated viaduct it then continues to the next station at Seatown at the entrance to the Swords Business Park before crossing over the Seatown and Estuary Roundabouts where it returns to at-grade running along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

6.4.2.5 Route Options C11

Route Option C11 is presented in **Figure 6.54** with corresponding initial concept scheme summary information presented in **Table 6.57**.

Figure 6.54: Route Option C11

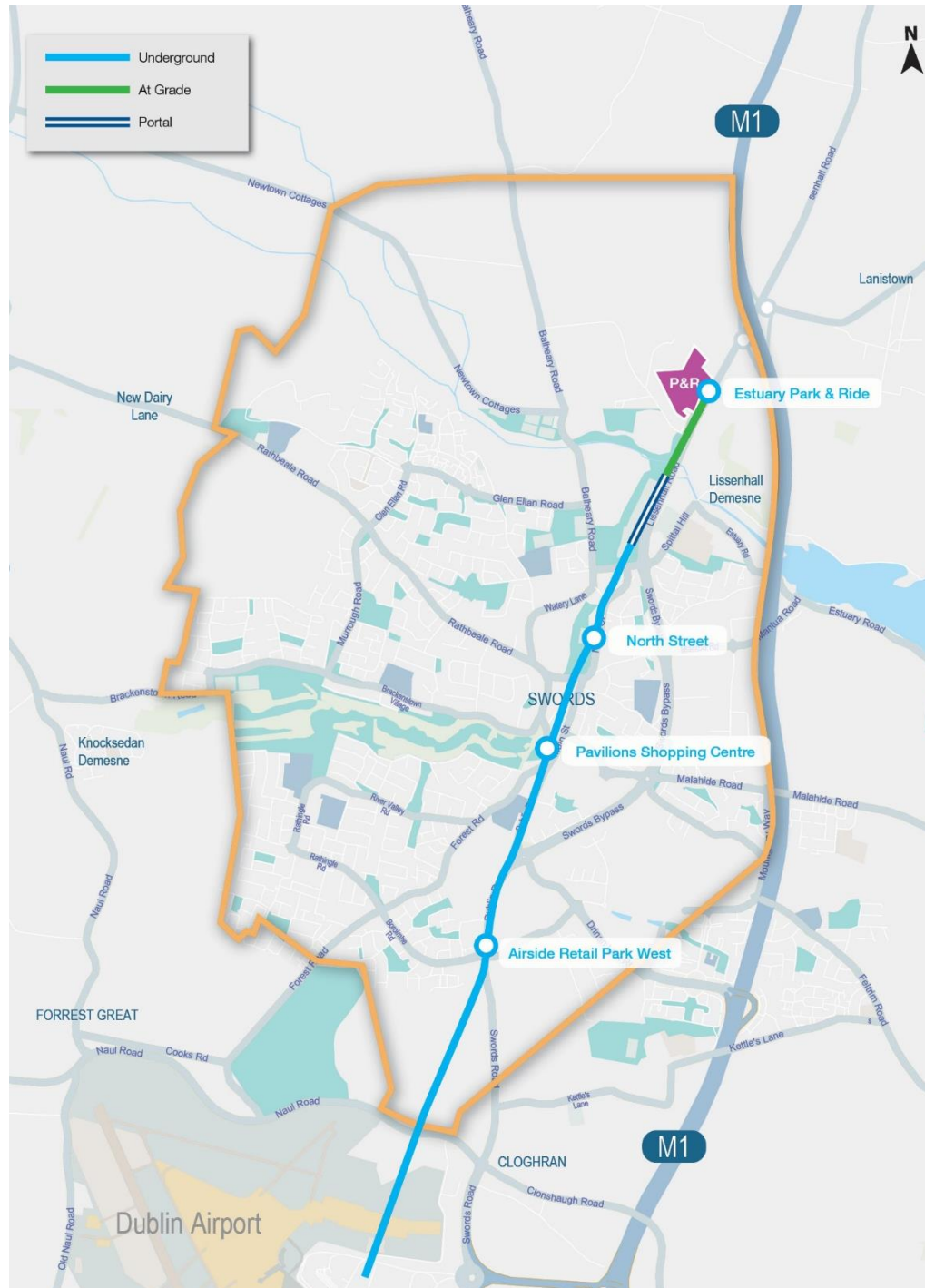


Table 6.57: Option C11 Summary

Route Length	5.5km
Alignment Type	Underground (TBM) from the Airport to playing fields north of the R125 Castlegrange Green At-Grade to the Estuary Park & Ride alongside the R132
Station Locations / Type	<ul style="list-style-type: none"> • Airside Retail Park – Underground, top down construction • Pavilions Shopping Centre – Underground, top down construction • North Street (Swords Castle MSZ) – Underground, top down construction • Estuary – At-Grade

Route Option C11 runs in tunnel from the Dublin Airport station to a portal located in green belt lands north of the Castlegrange Green. Intermediate stations are provided underground using top down construction at Airside Retail Park West on the northern side of the junction of the R132 and Nevinstown Road, in Swords Village in the car park behind the Lord Major pub and on the western side of North Street directly north of the Credit Union. It transitions to segregated at-grade running along the western side of the R132 from Castlegrange Green to the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

7 Stage 1 Multi-Criteria Analysis

7.1 Introduction

This chapter presents a summary of the Stage 1 MCA undertaken for the Assessment Options within each Study Area section identified from the Preliminary Assessment process. The Stage 1 MCA follows the methodology set out in **Section 2.6**.

The detailed route options summary tables for each Study Area sub section is presented in **Appendix 7.1, Volume 2**.

The output from this stage in the assessment process is a recommendation on route Assessment Options within each Study Area sub section to be taken forward for consideration as part of the Stage 2 MCA process.

7.2 Study Area A - City Centre

The relative ranking of Study Area A route options against the scheme assessment sub-criteria is summarised in **Table 7.1**.

Table 7.1: Study Area A Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	A0 (OMN)	A1	A2	A4	A8	A14
Economy	Capital Cost						
	Transport Reliability						
	Journey Time						
	Station Catchment Transport Demand						
Integration	Land Use Policy Integration						
	Public Transport Integration						
	Integration with Other Modes						
Accessibility & Social Inclusion	Key Trip Attractors						

Assessment Criteria	Assessment Sub-Criteria	A0 (OMN)	A1	A2	A4	A8	A14
	Deprived Geographic Areas						
Environment	Biodiversity						
	Landscape & Visual						
	Archaeology, Architecture and Cultural Heritage						
	Soils & Geology						

Economy

A0 represents the most expensive option as it is the longest route considered, and has the most number of stations of any option. While this results in the best option in terms of overall catchment, it also increases journey times. Option A4 would cost less to construct but would serve a smaller potential trip demand. A2 would be the next most expensive to construct but would serve one of the highest potential trip demands. Option A1 is the cheapest option considered and serves a reasonably comparable catchment with shorter journey times. A14 is comparably cost effective but serves a good catchment. Option A8 is also comparatively cost effective but serves the lowest catchment of all options.

Integration

Land Use Policy Integration is not considered as significant a differentiator in Study Area A, as all route options have similar potential to integrate with existing and future development proposals within the core city centre area and would therefore significantly contribute to supporting the land-use policy and the core strategy of the Dublin City Development Plan.

Public Transport Integration is however considered a key criterion to differentiate between route options in Study Area A. In this regard, Options A2 and A4 provide opportunity for interchange with DART, Heavy Rail and Luas Cross City and Green lines and as such rank higher than other options. By contrast, while Options A1, A0 and A14 provide opportunity for interchange with Luas Cross City, they do not provide any opportunity for interchange with DART and as such comparatively rank lower.

Integration with other modes is not considered a differentiator in Study Area A as all routes are underground and fully segregated and therefore have no impact on pedestrians, cyclists or traffic.

Accessibility & Social Inclusion

In terms of Key Trip Attractors, Options A0, A2, A4 and A14 serve a similar number of key trip attractors and are comparably higher than Options A1 and A8. Deprived Geographic Areas is not a differentiator in Study Area A.

Environment

Option A2 scores well across all sub criteria and is considered to be the best option in terms of minimising potential environmental impacts. Option A1 and A8 also score well but there is more risk of impact on Archaeology, Architecture and Cultural Heritage, and Landscape and Visual. Option A4 would score comparatively worse under all environmental considerations except Soils and Geology. Option A14 scores well under Biodiversity and Soils and Geology but would have significant impacts in terms of Landscape and Visual. Option A0 would have similar impacts in terms of Landscape and Visual and score comparatively worse than other options with the exception of Soils and Geology.

Assessment Summary

A summary of the assessment and relative ranking of route options against the main assessment criteria is presented in **Table 7.2**.

Table 7.2: Study Area A Assessment Summary (Main Criteria)

Assessment Criteria	A0 (OMN)	A1	A2	A4	A8	A14
Economy						
Integration						
Accessibility & Social Inclusion						
Environment						

The assessment shows that A0, Original Metro North, compares poorly to other options considered, primarily due to cost. While Option A1 offers a good option in terms of economy, it compares poorly under all other criteria. Option A8 compares slightly worse than the best options in terms of Economy, and particularly so in terms of potential trip demand. Furthermore, it serves less Key Trip Attractors than other route options and as such compares poorly under Accessibility and Social Inclusion. While A14 scores well in terms of economy and Accessibility and Social Inclusion it does not integrate as well with the wider public transport network and has more impacts on environmental considerations.

Based on the assessment undertaken, on balance, Route Option A2 appears to offer more benefits over other options for the following reasons:

- It can be delivered at a low cost compared to other options;
- It serves a high potential trip demand;
- It integrates well with the existing and future public transport network, providing opportunity for interchange with all other modes;
- It serves a large number of key trip attractors; and
- It has the least potential impact on the environment compared to other options.

Route option A2 connects to Study Area B at Drumcondra Rail station. While Route Option A4 is slightly more expensive to construct, it provides an alternative connection to Study Area B at a potential new station at Whitworth. Route Option A4 delivers similar benefits to A2 across, however it has slightly more potential environmental impact. Overall, Route Option A4 is also considered to be a good option in Study Area A.

Both of these route options however follow a broadly similar route corridor within Study Area 1, with the primary variant being the interchange location with rail at either Drumcondra or Whitworth. In order to compare and assess a variant corridor in terms of detailed demand and economic appraisal at Stage 2 MCA, a third option along a more central corridor is also brought forward from Study Area A. While Route Option A14 serves slightly more key trip attractors, Route Option A1 is the cheapest of the options considered and would serve a greater potential trip demand than A14. Furthermore, Option A14 would have a significant impact on Landscape and Visual. As such, A1 also emerges from the Stage 1 MCA process.

For this reason, **Route Options A1, A2 and A4** were progressed to the Stage 2 MCA for further, more detailed consideration.

7.3 Study Area B – Ballymun/Airport

The relative ranking of Study Area B route options against the scheme assessment sub-criteria is summarised in **Table 7.3**.

Table 7.3: Study Area B Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	B0 (OMN)	B2	B5	B6	B8	B10	B12	B13	B14
Economy	Capital Cost									
	Transport Reliability									
	Journey Time									
	Station Catchment Transport Demand									
Integration	Land Use Policy Integration									
	Public Transport Integration									
	Integration with Other Modes									
Accessibility & Social Inclusion	Key Trip Attractors									
	Deprived Geographic Areas									

Assessment Criteria	Assessment Sub-Criteria	B0 (OMN)	B2	B5	B6	B8	B10	B12	B13	B14
Environment	Biodiversity									
	Landscape & Visual									
	Archaeology, Architecture and Cultural Heritage									
	Soils & Geology									

Economy

In terms of Economy, Option B5 would cost the most to construct owing to the significant works required to undertake cut and cover construction and associated reinstatement and public realm works through Ballymun Village. With the exception of option B6 which would cost slightly more, all other options would cost a similar amount to construct. Of these options, B2, B5, B10, B12 and B13 would serve the greatest potential trip demand. Overall, while there are some differences in journey times between options, this is not considered a major differentiator for the Assessment Options within this study area. As all options would be fully segregated, journey time reliability is assumed to be neutral.

Generally, there is relatively little comparative difference in travel demand likely to be served between options and associated station locations, with Options B0, B6, B8 and B14 serving slightly smaller catchments.

Integration

Generally, integration is not a major differentiator between route options considered in Study Area B. Route Option B6 however compares less favourably to other options as it serves a corridor that is between Ballymun and Santry. As such, it misses opportunities to integrate with the existing bus network and misses areas identified for higher density development, including more centrally within Ballymun. In terms of integration with other modes, options which include at-grade running (B2 and B8), would form a barrier to pedestrian movement and require changes to the traffic management regime and as such are considered to impact the most on other modes. Options B6, B10 and B12 are fully underground and as such would integrate best with other modes.

Overall, Options B10 and B12 are considered to perform the best in terms of integration.

Accessibility & Social Inclusion

There is relatively little differentiation between routes in terms of serving key trip attractors, with the exception of Option B6, owing to its route further to the east of Ballymun Village centre. Deprived Geographic Areas is not a differentiator in Study Area B.

Environment

Biodiversity is not considered to be a differentiator in Study Area B. In terms of Landscape and Visual, Route Option B2 and B8 are considered to have the greatest impact due to the visual effect on Ballymun Road by virtue of running at-grade and the need to physically segregate to meet the scheme operating objectives. Similarly, options B13 and B14 are considered to have a significant impact on Landscape and Visual due to the provision of an elevated structure in an established residential and commercial area. Option B5 which combines a tunnel and cut and cover option, as well as elevated is also considered to have significant impact. Full TBM Route Options B6, B10 and B12 are considered to have the least impact in terms of Landscape and Visual.

Under the Archaeology, Architecture and Cultural Heritage sub-criterion, Route Options B0, B2, B5, B8, B13 and B14 rank poorest as they all have potential to directly impact on sites of archaeological, architectural and cultural heritage significance. Full TBM options B6, B10 and B12 are considered more favourable options in terms of this criteria as there is the potential to reveal subsurface archaeology at top-down station locations only rather than along the entire route.

In terms of Soils & Geology (Ground Movement) full TBM Route Options B6, B10 and B12, have comparatively higher risk of ground movement and as such receive the lowest comparable rankings. Options B2 and B8 which run at-grade, as well as elevated B14 are considered to be the most favourable under this sub-criterion.

Assessment Summary

A summary of the assessment and relative ranking of route options against the main assessment criteria is presented in **Table 7.4**.

Table 7.4: Study Area B Assessment Summary (Main Criteria)

Assessment Criteria	B0 (OMN)	B2	B5	B6	B8	B10	B12	B13	B14
Economy	Yellow	Green	Yellow	Yellow	Yellow	Green	Green	Green	Yellow
Integration	Green	Yellow	Green	Yellow	Yellow	Green	Green	Green	Green
Accessibility & Social Inclusion	Green	Green	Green	Yellow	Green	Green	Green	Green	Green
Environment	Yellow	Red	Red	Green	Red	Green	Green	Red	Red

Options B2, B5, B10 and B13 are effectively scheme option variants along the same general route, with the differences between each option being the vertical alignment arrangement. Of these options, B2 and B13 in particular rank poorly in terms of Environment, primarily because of visual impact through Ballymun Village. B5 has less impact on the environment but would cost significantly more to construct and as such scores poorly under economy. B10 scores well across all criteria and as such is the preferred option along this route.

Similarly, Route Options B8, B12 and B14 run along the same route through Study Area B. B8 and B14 compare poorly against Economy and Environment, largely due to smaller potential trip demand and the impact in terms of landscape and visual. B12 by comparison, scores well across all criteria.

Although Route Option B6 scores well under Environment, it is comparatively poor in terms of Economy, Integration, Accessibility, and Social Inclusion.

Based on the assessment undertaken, Route Options B10 and B12 appear to offer more benefits over other options for the following reasons:

- They are comparatively cost efficient;
- They serve high potential trip demand areas with efficient journey times;
- They integrate well with the existing and future transport network;
- They serve a large number of key trip attractors; and
- They have less impact on the environment compared to other options.

As is the case in Study Area A, Route Options B10 and B12 broadly follow, and are considered the best option, through the central Ballymun area, with the difference being the interchange tie-in location at either Drumcondra or Whitworth. In order to compare and assess a variant corridor in terms of detailed demand and economic appraisal at Stage 2 MCA, Route Option B6, which follows a more direct route from Drumcondra, also emerges from the Stage 1 MCA process.

For the reasons outlined above, **Route Options B6, B10 and B12** were progressed to the Stage 2 MCA for further, more detailed consideration.

7.4 Study Area C – Swords

The relative ranking of Study Area C route options against the scheme assessment sub-criteria is summarised in **Table 7.5**.

Table 7.5: Study Area C Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	C0 (OMN)	C1	C3	C4	C11
Economy	Capital Cost					
	Transport Reliability					
	Journey Time					
	Station Catchment Transport Demand					
Integration	Land Use Policy Integration					
	Public Transport Integration					
	Integration with Other Modes					
Accessibility & Social Inclusion	Key Trip Attractors					

Assessment Criteria	Assessment Sub-Criteria	C0 (OMN)	C1	C3	C4	C11
	Deprived Geographic Areas					
Environment	Biodiversity					
	Landscape & Visual					
	Archaeology, Architecture and Cultural Heritage					
	Soils & Geology					

Economy

In terms of Economy, Route Option C1 would be the cheapest option. However, this option is not fully segregated from other modes and as such journey time and transport reliability is severely compromised compared to other options.

Option C0 is the next cheapest with more benefits in terms of transport reliability as it is fully segregated. C4 would offer good reliable journey times but would cost slightly more than other options to construct and would serve a slightly smaller potential trip demand. C3 would attract similar benefits to C0 and C4 but would be more expensive to construct. C11 would cost the most to construct but would serve a slightly better potential trip demand of all options considered.

Integration

Land-use and policy integration is considered to be a key differentiator in Study Area C due to the significant emphasis put on growth in Swords in various statutory regional and local planning documents, in addition to the reliance of the delivery of a metro service to unlock this potential growth. All of the route options within Study Area C serve significant zoned future development lands within the Metro Economic Corridor, but not to the same extent. This primarily comes down to the difference between route options, which would serve the existing Swords town centre versus those along the R132 in the immediate vicinity of Swords.

With this in mind, route options along the R132 (C0, C1, C3 and C4) are considered more favourable as they would better serve the future high-density development lands, as zoned in the County Development Plan around the planned Swords Metro Quarter centred on the R132, immediately south of the Malahide Road junction. This includes the adopted Barrysparks LAP, the development of which is directly linked to the delivery of NMN. By comparison, routes along Swords Main Street serve an established Village area which is low density.

Furthermore, while all options, other than Option C0 (in line with the Original Metro North Proposal), are likely to require some modifications to adopted LAP's in terms of integration with future development, options along the Swords Main Street route are likely to require significant, potentially material, changes to both the County Development Plan and adopted LAP's to facilitate.

Public Transport Integration is considered to be relatively neutral for Assessment Options within Study Area C as it is assumed that there will be a requirement for bus service reorganisation to be compatible with NMN associated with any option selected.

Accessibility & Social Inclusion

In terms of Accessibility and Social there is little to differentiate routes in terms of key trip attractors. Similarly, Deprived Geographic Areas is not a differentiator in Study Area C.

Environment

Under Environment, Biodiversity is not considered to be a differentiator in Study Area C. Option C0 is seen to score well across all sub-criteria. C1 scores well in terms of Soils and Geology but not in terms of other criteria. All other options score well in terms of Landscape and Visual but poorly against Archaeology, Architecture and Cultural Heritage. C11 does not score well in terms of Soils and Geology as this option is in tunnel and there is more potential for ground movement.

Assessment Summary

A summary of the assessment and relative ranking of route options against the main assessment criteria is presented in **Table 7.6**.

Table 7.6: Study Area C, Assessment Options Assessment Summary (Main Criteria)

Assessment Criteria	C0 (OMN)	C1	C3	C4	C11
Economy					
Integration					
Accessibility & Social Inclusion					
Environment					

The assessment shows that options C1, C3 and C11 all compare poorly across a number of criteria with options C0 and C4 scoring well across more criteria.

At a corridor level, Option C11 along Swords Main Street is not considered to have the same potential to support regional and local growth objectives for Swords and environs.

Options along the R132 route by comparison, which are fully within the designated Metro Economic Corridor can better initially support, and subsequently benefit from, in terms of patronage, strategic land-use development objectives.

Considering the Options along the R132 route (options C0, C1, C3 and C4), Option C1 is the cheapest option and the one that best replicates the 'Optimised Metro North' recommendation arising from the NTA's Fingal/North Dublin Transport Study. Relatively cheaper initial capital cost benefits are however considered to be countered-balanced longer term by its lack of journey time reliability as it does not deliver full route segregation.

In order to achieve segregated metro level of service, Option C0 along the R132 would require segregation from traffic, together with general pedestrian movement across the metro line.

While this may be acceptable along the R132 in its current context, a permanent barrier along the R132 introduces future restrictions in the planned development of a more urban form along this corridor, particularly in the vicinity of the proposed Swords Metro Quarter.

By contrast, C4 also runs along the R132 but runs on an elevated structure in the median for most of its length. This maintains the potential to develop access routes across the R132 for all modes of transport while at the same time allowing development of the adjacent lands and maintaining the potential for the R132 to be developed into a street including the potential to simplify vehicular access arrangements to adjoining development lands. C3 would also be similar to C4, achieving slightly improved accessibility to the Metro within the planned Swords Metro Quarter area, but at a considerable additional capital cost.

As C4 has the potential to future proof the metro in terms of capacity and level of service provision in terms of full route segregation, whilst also integrating with land use plans, and is cost comparable, it is deemed the optimum R132 option.

Based on the assessment undertaken, Route Option C4 appears to offer more benefits over other options on the R132 corridor within the Study Area for the following reasons:

- It can be delivered at a low cost;
- It provides good transport reliability and journey times through provision of full segregation from other modes;
- It provides a consistent vertical alignment which does not require multiple changes in elevation and thus improves the quality of the journey;
- It integrates best with the existing and future proposals along the R132, in particular development proposals within the Swords Metro Quarter area including proposals at Barrysparks LAP and Swords Pavilions; and

- It compares favourably of the potential to minimise impact on the environment.

In order to compare and assess a variant corridor in terms of detailed demand and economic appraisal at Stage 2 MCA, Route Option C11, which follows the Swords Main Street Corridor, also emerges from the Stage 1 MCA process.

For this reason, **Route Options C11 and C4** were progressed to the Stage 2 MCA for further, more detailed consideration.

7.5 End-to-End Routes Description

Following the Stage 1 MCA, the recommended route options from each study area section are then collated to provide ‘end-to-end’ scheme route options, which are taken forward to the Stage 2 MCA. A total of 10 end-to-end route options were assessed at this stage. These options are described in the following sections.

7.5.1 Option 1

The first end-to-end assessment option considered for assessment under MCA2 is made up of A1-B6-C4 which are described in detail in **Appendix 6.1, Volume 2**.

The alignment is presented below in **Figure 7.1** with corresponding concept scheme summary information presented in **Table 7.7**.

Figure 7.1: Option 1 – A1-B6-C4 Summary

Table 7.7: Option 1 – A1-B6-C4 Summary

Route Length	17.2km
Alignment Type	<p>TBM from the Green Line Tie-in to north of the Naul Road via Drumcondra Station.</p> <p>At-Grade from the Naul Road to the R132 at the junction with Nevinstown Lane / L2300</p> <p>Underpass under the R132</p> <p>At-Grade to Pinnock Hill Roundabout</p> <p>Elevated from Pinnock Hill Roundabout to north of Estuary Roundabout</p> <p>At-Grade to Estuary Park & Ride alongside the R132</p>
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • College Green – Underground, mined construction • O’Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction • St. Pat’s College West – Underground, top down construction • DCU at Collins Avenue West – Underground, top down construction • Santry Village – Underground, top down construction • Northwood Central – Underground, top down construction • Dardistown - Underground, top down construction • Dublin Airport – Underground, top down construction • Fosterstown – At-Grade • Swords Central – Elevated • Seatown – Elevated • Estuary Park & Ride – At-Grade

Option 1 starts at Charlemont Station, at the Green Line Tie In, in the vicinity of the existing Luas Stop at Charlemont which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the station at College Green on College Street between Trinity College and the Bank of Ireland building. From here, it continues north to the station at O’Connell Street and onwards to the station at Mater Hospital before reaching the station at Drumcondra.

It then runs from Drumcondra northwards in a bored tunnel with a station provided at St. Pat’s College before continuing north to DCU with a station provided at the entrance to DCU on Collins Avenue. It then continues north to the station in residential areas to the west of Santry Village. The next station is provided on the eastern side of Northwood Business Park. From here the metro travels under the M50 to Dardistown and proceeds north to the station provided in the Airport at the Ground Transportation Hub.

From here it then runs in tunnel from the Dublin Airport station to a portal located in green belt lands north of the Naul Road. From here it runs at-grade in a

segregated corridor before entering an underpass under the junction of the R132 with Nevinstown Lane / L2300. An at-grade station, Fosterstown, is then provided in lands to the north side of Airside Retail Park. The route then rises on to a viaduct to run elevated over the Pinnock Hill Roundabout.

It stays elevated along the median of the R132 where the station, Swords Central, is provided between the Pavilions Shopping Centre to the west and the Barrysparks Development lands to the east.

Staying on elevated viaduct it then continues to the next station at Seatown at the entrance to the Swords Business Park before crossing over the Seatown and Estuary Roundabouts where it returns to at-grade running along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

7.5.2 Option 2

The second end-to-end assessment option considered for assessment under MCA2 is made up of A1-B6-C11 which are described in detail in **Appendix 6.1, Volume.**

The alignment is presented below in **Figure 7.2** with corresponding concept scheme summary information presented in **Table 7.8.**

Figure 7.2: Option 2 – A1-B6-C11

Table 7.8: Option 2 – A1-B6-C11 Summary

Route Length	16.9km
Alignment Type	TBM from the Green Line Tie-in to north of Swords Village in playing fields adjacent to the R132 At-Grade to Estuary Park & Ride alongside the R132
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont - Underground, top down construction • College Green – Underground, mined construction • O’Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction • St. Pat’s College West – Underground, top down construction • DCU at Collins Avenue West – Underground, top down construction • Santry Village – Underground, top down construction • Northwood Central – Underground, top down construction • Dardistown - Underground, top down construction • Dublin Airport – Underground, top down construction • Airside Retails Park West – Underground, top down construction • Pavilions Shopping Centre– Underground, top down construction • North Street – Underground, top down construction • Estuary Park & Ride – At-Grade

Option 2 starts at Charlemont Station, at the Green Line Tie In, in the vicinity of the existing Luas Stop at Charlemont which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the station at College Green on College Street between Trinity College and the Bank of Ireland building. From here, it continues north to the station at O’Connell Street and onwards to the station at Mater Hospital before reaching the station at Drumcondra.

It then runs from Drumcondra northwards in a bored tunnel with a station provided at St. Pat’s College before continuing north to DCU with a station provided at the entrance to DCU on Collins Avenue. It then continues north to the station in residential areas to the west of Santry Village. The next station is provided on the eastern side of Northwood Business Park. From here the metro travels under the M50 to Dardistown and proceeds north to the station provided in the Airport at the Ground Transportation Hub.

From here it then runs in tunnel from the Dublin Airport station to a portal located in playing fields north of Swords Village adjacent to the R132. It then runs at-grade along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

7.5.3 Option 3

The third end-to-end assessment option considered for assessment under MCA2 is made up of A1-B10-C4 which are described in detail in **Appendix 6.1, Volume**.

The alignment is presented below in **Figure 7.3** with corresponding concept scheme summary information presented in **Table 7.9**.

Figure 7.3: Option 3 – A1-B10-C4



Table 7.9: Option 3 – A1-B10-C4 Summary

Route Length	17.5km
Alignment Type	<p>TBM from the Green Line Tie-in to north of the Naul Road via Drumcondra Station.</p> <p>At-Grade from the Naul Road to the R132 at the junction with Nevinstown Lane / L2300</p> <p>Underpass under the R132</p> <p>At-Grade to Pinnock Hill Roundabout</p> <p>Elevated from Pinnock Hill Roundabout to north of Estuary Roundabout</p> <p>At-Grade to Estuary Park & Ride alongside the R132</p>
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • College Green – Underground, mined construction • O’Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction • Griffith Park East – Underground, top down construction • DCU at Collins Avenue Junction – Underground, top down construction • Ballymun Village – Underground, top down construction • Northwood West – Underground, top down construction • Dardistown – Underground, top down construction • Dublin Airport – Underground, top down construction • Fosterstown – At-Grade • Swords Central – Elevated • Seatown – Elevated • Estuary Park & Ride – At-Grade

Option 3 starts at Charlemont Station, at the Green Line Tie In, in the vicinity of the existing Luas Stop at Charlemont which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the station at College Green on College Street between Trinity College and the Bank of Ireland building. From here, it continues north to the station at O’Connell Street and onwards to the station at Mater Hospital before reaching the station at Drumcondra.

It then runs from Drumcondra northwards in a bored tunnel with a station provided at Griffith Park East before continuing to Ballymun Road where the station is located serving Dublin City University (DCU) and surrounding residential areas. The metro continues under Griffith Avenue/Collins Avenue junction with Ballymun Road to Ballymun Village where the next station is located. From here, the metro stays in tunnel to an underground station located on the western side of Northwood Business Park. From here the metro travels under the M50 through Dardistown where the station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the station provided in the Airport at the Ground Transportation Hub.

From here it then runs in tunnel from the Dublin Airport station to a portal located in green belt lands north of the Naul Road.

From here it runs at-grade in a segregated corridor before entering an underpass under the junction of the R132 with Nevinstown Lane / L2300. An at-grade station, Fosterstown is then provided in lands to the north side of Airside Retail Park. The route then rises on to a viaduct to run elevated over the Pinnock Hill Roundabout.

It stays elevated along the median of the R132 where the station, Swords Central, is provided between the Pavilions Shopping Centre to the west and the Barrysparks Development lands to the east.

Staying on elevated viaduct it then continues to the next station at Seatown at the entrance to the Swords Business Park before crossing over the Seatown and Estuary Roundabouts where it returns to at-grade running along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

7.5.4 Option 4

The fourth end-to-end assessment option considered for assessment under MCA2 is made up of A1-B10-C11 which are described in detail in **Appendix 6.1, Volume**.

The alignment is presented below in **Figure 7.4** with corresponding concept scheme summary information presented in **Table 7.10**.

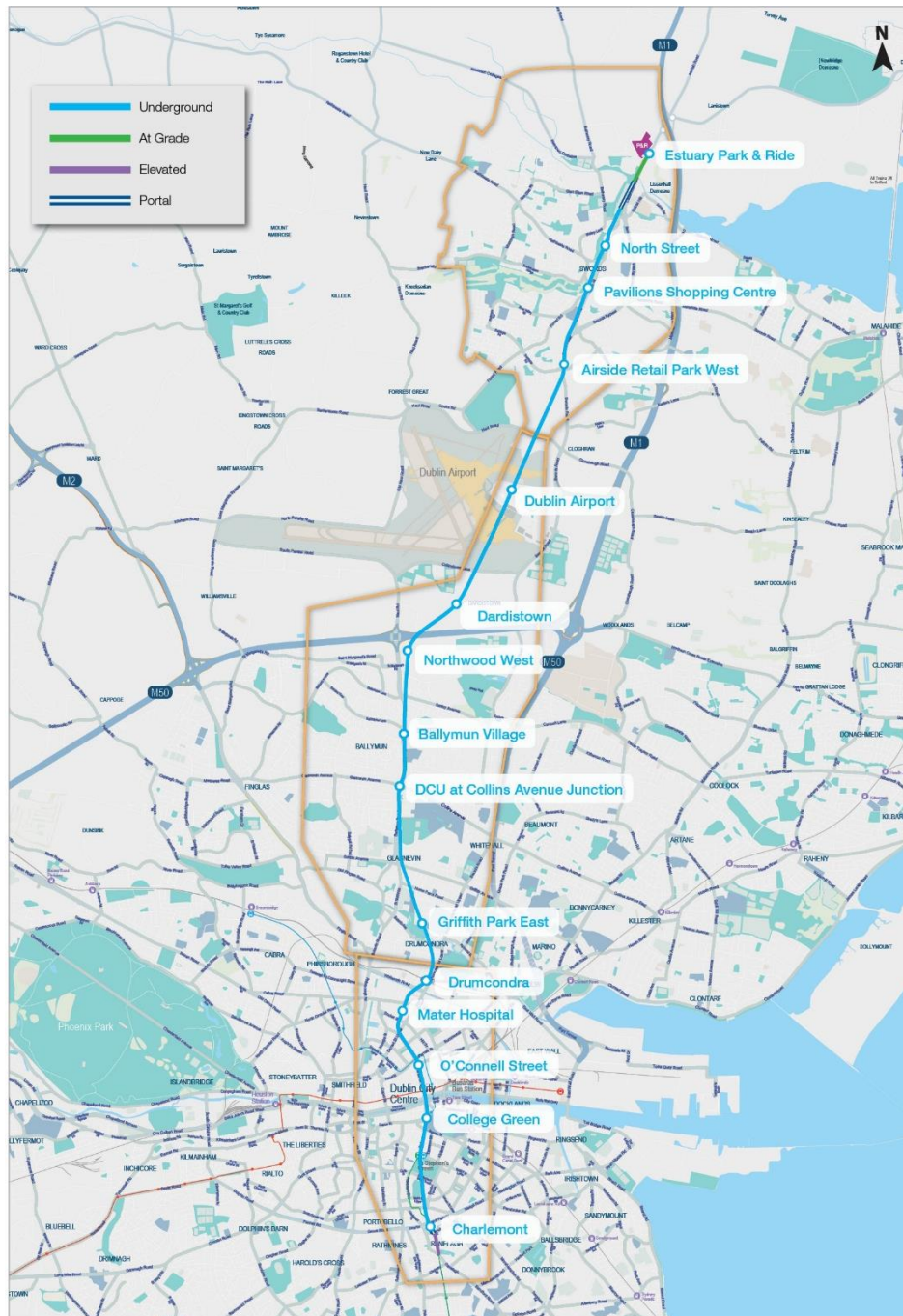
Figure 7.4: Option 4 – A1-B10-C11

Table 7.10: Option 4 – A1-B10-C11 Summary

Route Length	17.2km
Alignment Type	TBM from the Green Line Tie-in to north of Swords Village in playing fields adjacent to the R132 At-Grade to Estuary Park & Ride alongside the R132
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont - Underground, top down construction • College Green – Underground, mined construction • O’Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction • Griffith Park East – Underground, top down construction • DCU at Collins Avenue Junction – Underground, top down construction • Ballymun Village – Underground, top down construction • Northwood West – Underground, top down construction • Dardistown – Underground, top down construction • Dublin Airport – Underground, top down construction • Airside Retails Park West – Underground, top down construction • Pavilions Shopping Centre – Underground, top down construction • North Street – Underground, top down construction • Estuary Park & Ride – At-Grade

Option 4 starts at Charlemont Station, at the Green Line Tie In, in the vicinity of the existing Luas Stop at Charlemont which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the station at College Green on College Street between Trinity College and the Bank of Ireland building. From here, it continues north to the station at O’Connell Street and onwards to the station at Mater Hospital before reaching the station at Drumcondra.

It then runs from Drumcondra northwards in a bored tunnel with a station provided at Griffith Park East before continuing to Ballymun Road where the station is located serving Dublin City University (DCU) and surrounding residential areas. The metro continues under Griffith Avenue/Collins Avenue junction with Ballymun Road to Ballymun Village where the station is located. From here, the metro stays in tunnel to an underground station located on the western side of Northwood Business Park. From here the metro travels under the M50 through Dardistown where the station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the station provided in the Airport at the Ground Transportation Hub.

From here it then runs in tunnel from the Dublin Airport station to a portal located in playing fields north of Swords Village adjacent to the R132. It then runs at-grade along the western side of the R132 as far as the final station at the Estuary

Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

7.5.5 Option 5

The fifth end-to-end assessment option considered for assessment under MCA2 is made up of A2-B6-C4 which are described in detail in **Appendix 6.1, Volume 2**.

The alignment is presented below in **Figure 7.5** with corresponding concept scheme summary information presented in **Table 7.11**.

Figure 7.5: Option 5 – A2-B6-C4

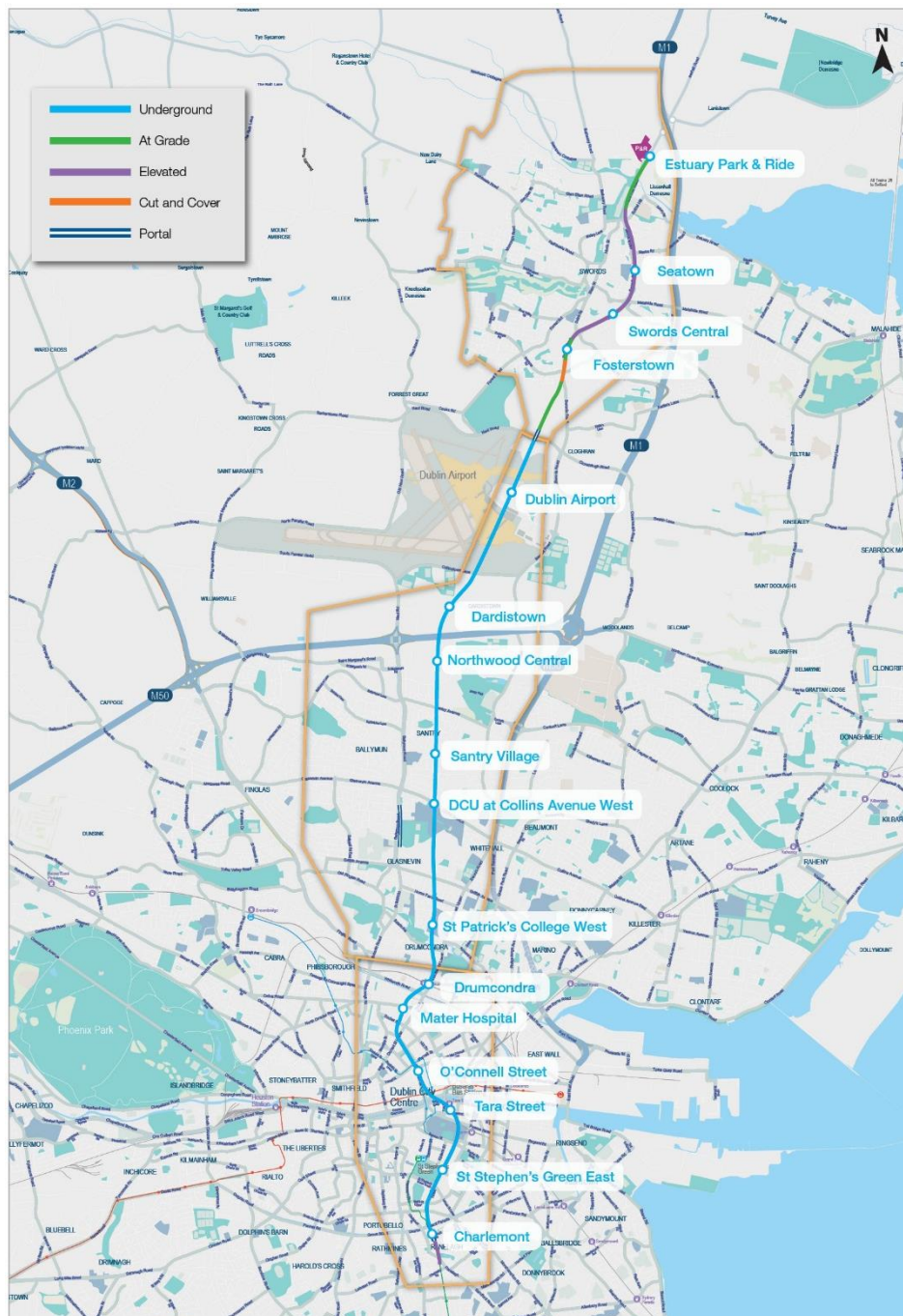


Table 7.11: Option 5 - A2-B6-C4 Summary

Route Length	17.6km
Alignment Type	<p>TBM from the Green Line Tie-in to north of the Naul Road via Drumcondra Station.</p> <p>At-Grade from the Naul Road to the R132 at the junction with Nevinstown Lane / L2300</p> <p>Underpass under the R132</p> <p>At-Grade to Pinnock Hill Roundabout</p> <p>Elevated from Pinnock Hill Roundabout to north of Estuary Roundabout</p> <p>At-Grade to Estuary Park & Ride alongside the R132</p>
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • St. Stephen's Green East – Underground, top down construction • Tara Street – Underground, top down construction • O'Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction • St. Pat's College West – Underground, top down construction • DCU at Collins Avenue West – Underground, top down construction • Santry Village – Underground, top down construction • Northwood Central – Underground, top down construction • Dardistown – Underground, top down construction • Dublin Airport – Underground, top down construction • Fosterstown – At-Grade • Swords Central – Elevated • Seatown – Elevated • Estuary Park & Ride – At-Grade

Option 5 starts at Charlemont Station, at the Green Line Tie In, in the vicinity of the existing Luas Stop at Charlemont which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the station on the eastern side of St. Stephens Green. From here it continues north to the station adjacent to the existing DART station at Tara before crossing under the River Liffey and running northwards to the station at O'Connell Street and onwards to the station at Mater Hospital before arriving at Drumcondra.

It then runs from Drumcondra northwards in a bored tunnel with a station provided at St. Pat's College before continuing north to DCU with a station provided at the entrance to DCU on Collins Avenue. It then continues north to the station in residential areas to the west of Santry Village. The next station is provided on the eastern side of Northwood Business Park. From here the metro travels under the M50 to Dardistown and proceeds north to the station provided in the Airport at the Ground Transportation Hub.

From here it then runs in tunnel from the Dublin Airport station to a portal located in green belt lands north of the Naul Road. From here it runs at-grade in a segregated corridor before entering an underpass under the junction of the R132 with Nevinstown Lane / L2300. An at-grade station, Fosterstown is then provided in lands to the north side of Airside Retail Park.

The route then rises on to a viaduct to run elevated over the Pinnock Hill Roundabout. It stays elevated along the median of the R132 where the station, Swords Central, is provided between the Pavilions Shopping Centre to the west and the Barrysparks Development lands to the east.

Staying on elevated viaduct it then continues to the station at Seatown at the entrance to the Swords Business Park before crossing over the Seatown and Estuary Roundabouts where it returns to at-grade running along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

7.5.6 Option 6

The sixth end-to-end assessment option considered for assessment under MCA2 is made up of A2-B6-C11 which are described in detail in **Appendix 6.1, Volume 2**.

The alignment is presented below in **Figure 7.6** with corresponding concept scheme summary information presented in **Table 7.12**.

Figure 7.6: Option 6 – A2-B6-C11

Table 7.12: Option 6 - A2-B6-C11 Summary

Route Length	17.1km
Alignment Type	TBM from the Green Line Tie-in to north of Swords Village in playing fields adjacent to the R132 At-Grade to Estuary Park & Ride alongside the R132
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont - Underground, top down construction • St. Stephen's Green East – Underground, top down construction • Tara Street – Underground, top down construction • O'Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction • St. Pat's College West – Underground, top down construction • DCU at Collins Avenue West – Underground, top down construction • Santry Village – Underground, top down construction • Northwood Central – Underground, top down construction • Dardistown - Underground, top down construction • Dublin Airport – Underground, top down construction • Airside Retails Park West – Underground, top down construction • Pavilions Shopping Centre– Underground, top down construction • North Street – Underground, top down construction • Estuary Park & Ride – At-Grade

Option 6 starts at Charlemont Station, at the Green Line Tie In, in the vicinity of the existing Luas Stop at Charlemont which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the station on the eastern side of St. Stephens Green. From here it continues north to the station adjacent to the existing DART station at Tara before crossing under the River Liffey and running northwards to the station at O'Connell Street and onwards to the station at Mater Hospital before arriving at Drumcondra.

It then runs from Drumcondra northwards in a bored tunnel with a station provided at St. Pat's College before continuing north to DCU with a station provided at the entrance to DCU on Collins Avenue. It then continues north to the station in residential areas to the west of Santry Village. The next station is provided on the eastern side of Northwood Business Park. From here the metro travels under the M50 to Dardistown and proceeds north to the station provided in the Airport at the Ground Transportation Hub.

From here it then runs in tunnel from the Dublin Airport station to a portal located in playing fields north of Swords Village adjacent to the R132. It then runs at-grade along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

7.5.7 Option 7

The seventh end-to-end assessment option considered for assessment under MCA2 is made up of A2-B10-C4, which are described in detail in **Appendix 6.1, Volume 2**.

The alignment is presented below in **Figure 7.7** with corresponding concept scheme summary information presented in **Table 7.13**.

Figure 7.7: Option 7 – A2-B10-C4



Table 7.13: Option 7 - A2-B10-C4 Summary

Route Length	17.6km
Alignment Type	<p>TBM from the Green Line Tie-in to north of the Naul Road via Drumcondra Station.</p> <p>At-Grade from the Naul Road to the R132 at the junction with Nevinstown Lane / L2300</p> <p>Underpass under the R132</p> <p>At-Grade to Pinnock Hill Roundabout</p> <p>Elevated from Pinnock Hill Roundabout to north of Estuary Roundabout</p> <p>At-Grade to Estuary Park & Ride alongside the R132</p>
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • St. Stephen's Green East – Underground, top down construction • Tara Street – Underground, top down construction • O'Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction • Griffith Park East – Underground, top down construction • DCU at Collins Avenue Junction – Underground, top down construction • Ballymun Village – Underground, top down construction • Northwood West – Underground, top down construction • Dardistown – Underground, top down construction • Dublin Airport – Underground, top down construction • Fosterstown – At-Grade • Swords Central – Elevated • Seatown – Elevated • Estuary Park & Ride – At-Grade

Option 7 starts at Charlemont Station, at the Green Line Tie In, in the vicinity of the existing Luas Stop at Charlemont which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the station on the eastern side of St. Stephens Green. From here it continues north to the station adjacent to the existing DART station at Tara before crossing under the River Liffey and running northwards to the station at O'Connell Street and onwards to the station at Mater Hospital before arriving at Drumcondra.

It then runs from Drumcondra northwards in a bored tunnel with a station provided at Griffith Park East before continuing to Ballymun Road where the next station is located serving Dublin City University (DCU) and surrounding residential areas. The metro continues under Griffith Avenue/Collins Avenue junction with Ballymun Road to Ballymun Village where the next station is located. From here, the metro stays in tunnel to an underground station located on the western side of Northwood Business Park. From here the metro travels under the M50 through Dardistown where the next station is provided.

It then returns to tunnel via a portal south of the Airport perimeter road with the station provided in the Airport at the Ground Transportation Hub.

From here it then runs in tunnel from the Dublin Airport station to a portal located in green belt lands north of the Naul Road. From here it runs at-grade in a segregated corridor before entering an underpass under the junction of the R132 with Nevinstown Lane / L2300. An at-grade station, Fosterstown is then provided in lands to the north side of Airside Retail Park. The route then rises on to a viaduct to run elevated over the Pinnock Hill Roundabout. It stays elevated along the median of the R132 where the station, Swords Central, is provided between the Pavilions Shopping Centre to the west and the Barrysparks Development lands to the east.

Staying on elevated viaduct it then continues to the station at Seatown at the entrance to the Swords Business Park before crossing over the Seatown and Estuary Roundabouts where it returns to at-grade running along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

7.5.8 Option 8

The eight end-to-end assessment option considered for assessment under MCA2 is made up of A2-B10-C11 which are described in detail in **Appendix 6.1, Volume 2**.

The alignment is presented below in **Figure 7.8** with corresponding concept scheme summary information presented in **Table 7.14**.

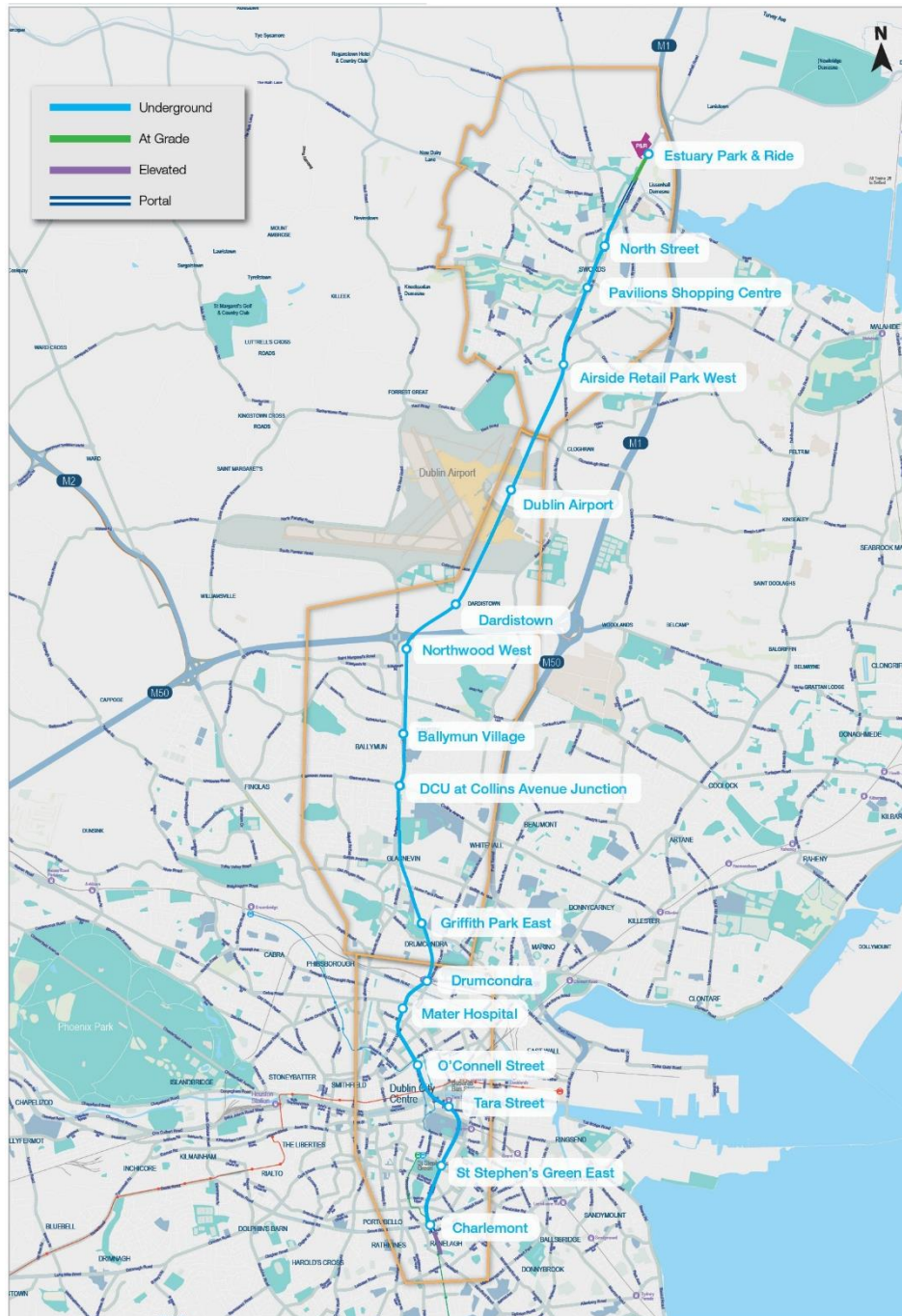
Figure 7.8: Option 8 – A2-B10-C11

Table 7.14: Option 8 - A2-B10-C11 Summary

Route Length	17.3km
Alignment Type	TBM from the Green Line Tie-in to north of Swords Village in playing fields adjacent to the R132 At-Grade to Estuary Park & Ride alongside the R132
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • St. Stephen's Green East – Underground, top down construction • Tara Street – Underground, top down construction • O'Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Drumcondra – Underground, top down construction • Griffith Park East – Underground, top down construction • DCU at Collins Avenue Junction – Underground, top down construction • Ballymun Village – Underground, top down construction • Northwood West – Underground, top down construction • Dardistown – Underground, top down construction • Dublin Airport – Underground, top down construction • Airside Retails Park West – Underground, top down construction • Pavilions Shopping Centre – Underground, top down construction • North Street – Underground, top down construction • Estuary Park & Ride – At-Grade

Option 8 starts at Charlemont Station, at the Green Line Tie In, in the vicinity of the existing Luas Stop at Charlemont which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the station on the eastern side of St. Stephens Green. From here it continues north to the station adjacent to the existing DART station at Tara before crossing under the River Liffey and running northwards to the station at O'Connell Street and onwards to the station at Mater Hospital before arriving at Drumcondra.

It then runs from Drumcondra northwards in a bored tunnel with a station provided at Griffith Park East before continuing to Ballymun Road where the next station is located serving Dublin City University (DCU) and surrounding residential areas. The metro continues under Griffith Avenue/Collins Avenue junction with Ballymun Road to Ballymun Village where the next station is located. From here, the metro stays in tunnel to an underground station located on the western side of Northwood Business Park. From here the metro travels under the M50 through Dardistown where the next station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the station provided in the Airport at the Ground Transportation Hub.

From here it then runs in tunnel from the Dublin Airport station to a portal located in playing fields north of Swords Village adjacent to the R132. It then runs at-grade along the western side of the R132 as far as the final station at the Estuary

Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

7.5.9 Option 9

The ninth end-to-end assessment option considered for assessment under MCA2 is made up of A4-B12-C4 which are described in detail in **Appendix 6.1, Volume 2**.

The alignment is presented below in **Figure 7.9** with corresponding concept scheme summary information presented in **Table 7.15**.

Figure 7.9: Option 9 – A4-B12-C4

Table 7.15: Option 9 - A4-B12-C4 Summary

Route Length	17.7km
Alignment Type	<p>TBM from the Green Line Tie-in to north of the Naul Road via Whitworth Station.</p> <p>At-Grade from the Naul Road to the R132 at the junction with Nevinstown Lane / L2300</p> <p>Underpass under the R132</p> <p>At-Grade to Pinnock Hill Roundabout</p> <p>Elevated from Pinnock Hill Roundabout to north of Estuary Roundabout</p> <p>At-Grade to Estuary Park & Ride alongside the R132</p>
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • St. Stephen's Green East – Underground, top down construction • Tara Street – Underground, top down construction • O'Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Whitworth – Underground, top down construction • Griffith Park West – Underground, top down construction • DCU at Collins Avenue Junction – Underground, top down construction • Ballymun Village – Underground, top down construction • Northwood West – Underground, top down construction • Dardistown – Underground, top down construction • Dublin Airport – Underground, top down construction • Fosterstown – At-Grade • Swords Central – Elevated • Seatown – Elevated • Estuary Park & Ride – At-Grade

Option 9 starts at Charlemont Station, at the Green Line Tie In, in the vicinity of the existing Luas Stop at Charlemont which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the station on the eastern side of St. Stephens Green. From here it continues north to the station adjacent to the existing DART station at Tara before crossing under the River Liffey and running northwards to the station at O'Connell Street and onwards to the station at the Mater Hospital before arriving at Whitworth.

It then runs from Whitworth northwards in a bored tunnel with a station provided at Griffith Park West before continuing to Ballymun Road where the station is located serving Dublin City University (DCU) and surrounding residential areas. The metro continues under Griffith Avenue/Collins Avenue junction with Ballymun Road to Ballymun Village where the next station is located. From here, the metro stays in tunnel to an underground station located on the western side of Northwood Business Park. From here the metro travels under the M50 through

Dardistown where the next station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the station provided in the Airport at the Ground Transportation Hub.

From here it then runs in tunnel from the Dublin Airport station to a portal located in green belt lands north of the Naul Road.

From here it runs at-grade in a segregated corridor before entering an underpass under the junction of the R132 with Nevinstown Lane / L2300. An at-grade station, Fosterstown is then provided in lands to the north side of Airside Retail Park. The route then rises on to a viaduct to run elevated over the Pinnock Hill Roundabout. It stays elevated along the median of the R132 where the station, Swords Central, is provided between the Pavilions Shopping Centre to the west and the Barrysparks Development lands to the east.

Staying on elevated viaduct it then continues to the station at Seatown at the entrance to the Swords Business Park before crossing over the Seatown and Estuary Roundabouts where it returns to at-grade running along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

7.5.10 Option 10

The tenth end-to-end assessment option considered for assessment under MCA2 is made up of A4-B12-C11 which are described in detail in **Appendix 6.1, Volume 2**.

The alignment is presented below in **Figure 7.10** with corresponding concept scheme summary information presented in **Table 7.16**.

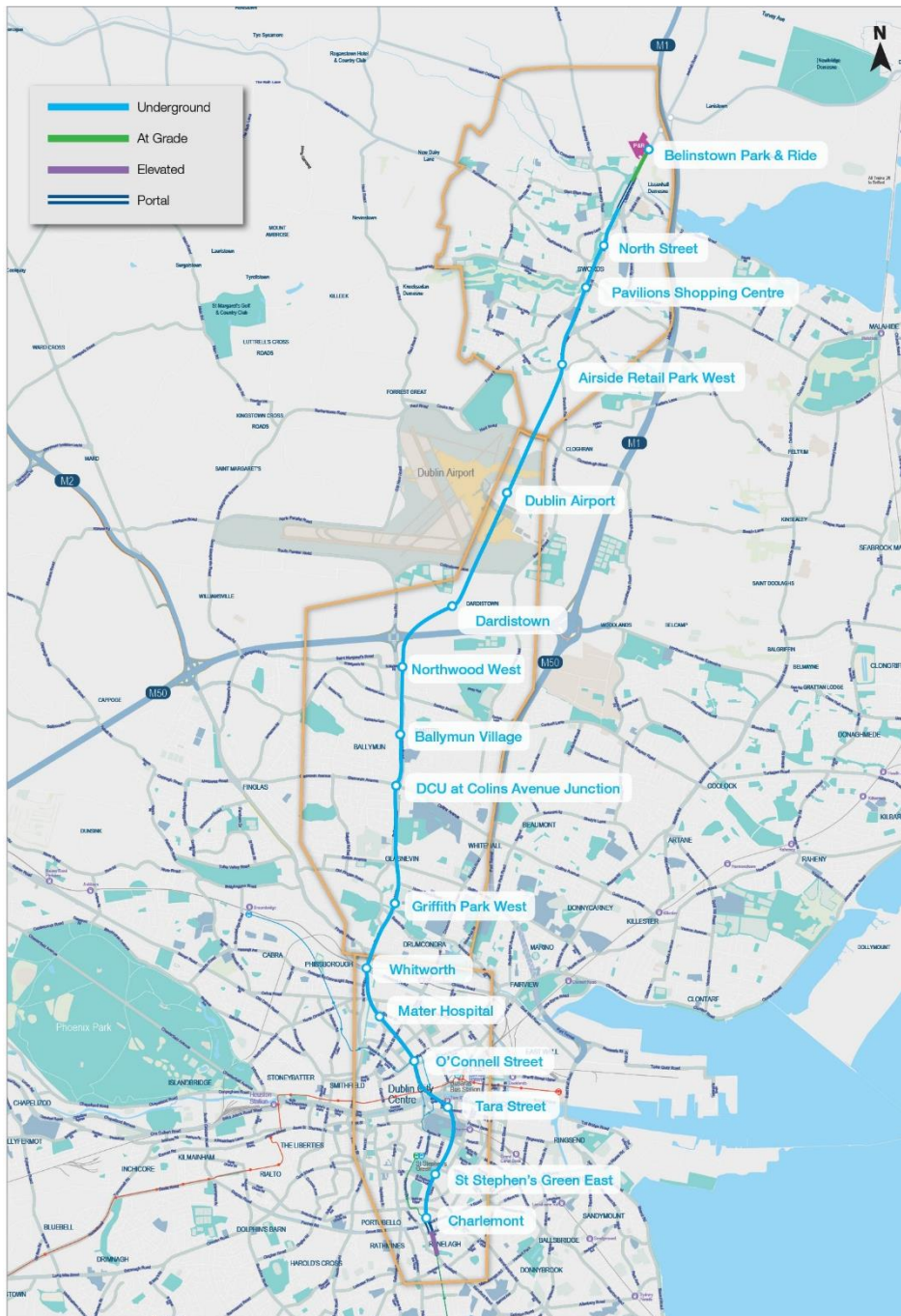
Figure 7.10: Option 10 – A4-B12-C11

Table 7.16: Option 10 - A4-B12-C11 Summary

Route Length	17.4km
Alignment Type	TBM from the Green Line Tie-in to north of Swords Village in playing fields adjacent to the R132 At-Grade to Estuary Park & Ride alongside the R132
Station Locations / Type	<ul style="list-style-type: none"> • Charlemont – Underground, top down construction • St. Stephen's Green East – Underground, top down construction • Tara Street – Underground, top down construction • O'Connell Street – Underground, top down construction • Mater Hospital – Underground, top down construction • Whitworth – Underground, top down construction • Griffith Park West – Underground, top down construction • DCU at Collins Avenue Junction – Underground, top down construction • Ballymun Village – Underground, top down construction • Northwood West – Underground, top down construction • Dardistown – Underground, top down construction • Dublin Airport – Underground, top down construction • Airside Retails Park West – Underground, top down construction • Pavilions Shopping Centre – Underground, top down construction • North Street – Underground, top down construction • Estuary Park & Ride – At-Grade

Option 10 starts at Charlemont Station, at the Green Line Tie In, in the vicinity of the existing Luas Stop at Charlemont which is elevated above the Grand Canal. It transitions to a tunnel via a portal at this location, travelling north eastwards to the station on the eastern side of St. Stephens Green. From here it continues north to the station adjacent to the existing DART station at Tara before crossing under the River Liffey and running northwards to the station at O'Connell Street and onwards to the station at the Mater Hospital before arriving at Whitworth.

It then runs from Whitworth northwards in a bored tunnel with a station provided at Griffith Park West before continuing to Ballymun Road where the station is located serving Dublin City University (DCU) and surrounding residential areas. The metro continues under Griffith Avenue/Collins Avenue junction with Ballymun Road to Ballymun Village where the station is located. From here, the metro stays in tunnel to an underground station located on the western side of Northwood Business Park. From here the metro travels under the M50 through Dardistown where the station is provided. It then returns to tunnel via a portal south of the Airport perimeter road with the station provided in the Airport at the Ground Transportation Hub.

From here it then runs in tunnel from the Dublin Airport station to a portal located in playing fields north of Swords Village adjacent to the R132. It then runs at-grade along the western side of the R132 as far as the final station at the Estuary Park and Ride in lands to the west of the R132 north of the Broad Meadow River in close proximity to Junction 4, Lissenhall on the M1.

8 Stage 2 Multi-Criteria Analysis

8.1 Introduction

This chapter presents a summary of the Stage 2 MCA undertaken for the ten end-to-end assessment options brought forward from Stage 1 MCA as presented in **Section 7.5**.

The Stage 2 MCA follows the methodology set out in **Section 2.7**.

A key component of the Stage 2 MCA process is output from the testing of end-to-end route options within the ERM for the assumed year of opening, 2027. Full detail of this, is presented in the appended ‘NMN Transport Modelling Report’ (**Appendix 8.1, Volume 2**), and summarised in this report. The detailed end-to-end assessment options summary tables for the ten options is presented in **Appendix 8.2, Volume 2**.

A qualitative appraisal of, and conclusions from the whole route options assessment is provided in this chapter, highlighting the key issues considered in determining the emerging preferred route. It should be noted that a balanced approach is taken when assessing the preferred route. While all criteria are considered in undertaking the assessment, a lower ranking on one criterion, for example, will not necessarily mean that the route is not suitable.

The output from this stage in the assessment process is a recommendation on the emerging preferred route for NMN.

8.2 Stage 2 MCA - 'Sub-Criteria' Results

The relative ranking of the end-to-end route options against each sub-criterion is summarised in **Table 8.1**.

Table 8.1: Assessment Stage 2 MCA Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	Option 1 (A1-B6-C4)	Option 2 (A1-B6-C11)	Option 3 (A1-B10-C4)	Option 4 (A1-B10-C11)	Option 5 (A2-B6-C4)	Option 6 (A2-B6-C11)	Option 7 (A2-B10-C4)	Option 8 (A2-B10-C11)	Option 9 (A4-B12-C4)	Option 10 (A4-B12-C11)
Economy	Benefit Cost Ratio (BCR)	Yellow	Red	Red	Red	Green	Green	Yellow	Yellow	Green	Green
	Total Cost	Green	Green	Green	Green	Yellow	Red	Yellow	Red	Green	Yellow
	Patronage	Red	Red	Red	Yellow	Yellow	Green	Green	Green	Green	Green
	Journey Time	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Integration	Land Use Policy Integration	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Green	Yellow	Green	Yellow
	Public Transport Integration	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Yellow	Green	Yellow
Accessibility & Social Inclusion	Key Trip Attractors	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Green	Green	Green
Environment	Landscape & Visual	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Green	Yellow	Yellow
	Archaeology, Architecture and Cultural Heritage	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Green	Yellow	Yellow
	Soils and Geology	Green	Yellow	Green	Yellow	Green	Yellow	Green	Yellow	Green	Yellow

The criteria considered are assessed under sub-criteria as follows:

Economy - BCR, Total Cost and Patronage are considered to be key differentiators. The BCR is the ratio between the Economic Benefits of the scheme and the Present Value of the Total Costs. The Economic Benefits of the scheme include the level of transport demand/patronage for NMN and the time saving benefit that the metro will provide.

There is only 1 minute 42 seconds difference between the shortest and longest journey time for the ten options, which will not deter a person from choosing to use the metro service on a particular option, hence the journey time assessment is considered comparable across the options. However, it does influence the benefits

accrued, as collective journey time saving for all passengers is considered, and the BCR captures this differentiation.

Integration – The extent to which route options support existing and planned land-use policy and public transport integration raise some differences.

Accessibility & Social Inclusion – There are variances in the extent to which route options would serve key trip attractors within each of the study area sub-sections: and

Environment – Route options vary in the extent to which potential environmental impacts may arise, primarily in terms of landscape and visual impact and on Archaeology, Architecture and Cultural Heritage. While there are also quantifiable differences in potential impact on receptors in terms of Soils and Geology, these are not considered to be as significant as it is assumed that potential impacts will be mitigated to acceptable guideline levels.

These key differentiating criteria for each route option are discussed in more detail in subsequent sections.

8.2.1 Option 1

Option 1 (A1-B6-C4) serves Charlemont, College Green, O' Connell Street, Mater Hospital, Drumcondra, St. Patrick's College West, DCU at Collins Avenue West, Santry Village, Northwood Central, Dardistown, Dublin Airport, Fosterstown, Swords Central, Seatown and Estuary Park & Ride as shown on **Figure 8.1**.

Figure 8.1: Option 1 (A1-B6-C4)

8.2.1.1 Economy

The main economic parameters derived for Option 1 and how they compare to other route options are summarised in **Table 8.2**.

Table 8.2: Option 1 Economy Summary

Economy				
Sub-criterion:	BCR	Total Cost (€ Million)	Patronage (24 hour NMN boarding)	Journey Time (minutes)
Result:	2.09	€4,197	124,484	25.95
Compared to other 9 Options:				
Economy Result	Some disadvantages over other options			

The BCR and Patronage is unfavourable, however the Total Cost is highly favourable for Option 1, compared to other options. The journey time is among the fastest of all ten options and therefore represents a time saving for patronage on this end-to-end option. Overall, Option 1 is considered to have some disadvantages over other options in the economic assessment.

8.2.1.2 Integration

Integration on the overall route is a combination of an assessment of how the route option supports existing and planned land-use policy and an assessment of how well the route options integrates with public transport.

Integration with Land Use Policy varies along the length of the option as it moves through the Study Area. It is not considered a differentiator when compared with other options across the breadth of Study Area A as all options provide an opportunity for consolidation and regeneration within the city centre area. However, in Study Area B, Option 1 serves existing lower density residential developments in Santry with less potential for higher density developments along the corridor. By contrast, options serving Ballymun Main Street, which comprises vacant lands in public ownership, provide more opportunity to deliver high-density development to facilitate strategic development of the Ballymun area. In Study Area C, Option 1 directly serves the Metro Economic Corridor in line with the Fingal County Development plan, which generally runs along the R132. The Barrysparks LAP has also been developed based on the Metro Economic Corridor.

In terms of Public Transport (PT) Integration, Option 1 is among the lowest number of transfers with other PT modes (8,900 transfers), during the AM peak period which is primarily due to the lack of interchange with DART in the city centre. Option 1 interchanges with the heavy rail line at Drumcondra only and there is no direct interchange with DART services. Option 1 serves Santry and will not interchange directly with buses running along the Ballymun Road, which is identified as a core bus corridor in the GDA Transport Strategy. In the Swords area, Option 1 serves the R132 and has the potential to provide opportunity for

direct interchange with bus services running along the R132 which is identified as a core bus corridor in the GDA Transport Strategy. Furthermore, the R132 is a wide road with potential for improved bus priority measures.

There is also potential to incorporate a well-integrated metro/bus interchange, near Swords Pavilions Shopping Centre and Barrysparks LAP lands. By contrast, other options which serve Swords Main Street have limited opportunity to provide bus priority measures due to space restrictions or would require significant interventions with subsequent impact on the streetscape and town centre environment.

Therefore, overall Option 1 is considered to have some disadvantages from an Integration perspective over other options due to less favourable integration with land use policy in the central area and lack of integration with the DART network in the city centre and bus network in the central area.

8.2.1.3 Accessibility & Social Inclusion

In terms of Key Trip Attractors, Option 1 traverses the shortest direct line through the city centre and central portion of the Study Area. As a result, it serves less key trip attractors than other options in the city centre. Of particular note, St. Stephen's Green is not served in the city centre and Whitehall College of Further Education, Griffith Park and National Botanic Gardens is not served in the central study area.

Therefore, Option 1 is considered to have some disadvantages over other options from an Accessibility and Social Inclusion perspective due to serving less Key Trip Attractors in the city centre and central study areas.

8.2.1.4 Environment

In terms of potential impact on Landscape and Visual, Option 1 has the potential for direct impact on key spaces and views in the city centre. As with other route options through Study Area B, Option 1 is not considered to have any potential for differentiating impacts under this criterion. Within Study Area C in the Swords area, Option 1 is not considered to have any potential for differentiating impacts under this criterion. In overall terms, therefore Option 1 is considered to have some disadvantages over other options from a Landscape and Visual perspective due to the potential impacts in Study Area A.

In terms of potential impact on Archaeology, Architecture and Cultural Heritage, Option 1 has potential for impact on architectural heritage assets of national significance in Study Area A. The risk of identifying significant archaeological deposits in this area is also very high. As with other route options through Study Area B, Option 1 is not considered to have any potential for differentiating impacts under this criterion as the route is in tunnel, with the potential for impact limited to the station locations. Within Study Area C, in the Swords area, Option 1 follows the R132 on an elevated structure which has known sites of archaeological importance from the work on the previous metro project. The tunnelled option has not been subject to an equivalent level of archaeological testing, and therefore has potential for archaeological and cultural heritage

impacts due to its physical proximity to Swords Castle demesne along Swords Main Street. Therefore, within Study Area C in the Swords area, Option 1 is not considered to have any potential for differentiating impacts under this criterion as both options through Swords have benefits/disbenefits. In overall terms, therefore Option 1 is considered to have some disadvantages over other options from an Archaeology, Architecture and Cultural Heritage perspective due to the potential impacts in Study Area A.

In terms of Soils and Geology (Ground Movement), the fact that Option 1 is elevated in the Swords area has a reduced potential for ground movement on a quantifiable basis when compared with routes that are entirely in tunnel. Therefore, Option 1 is considered to have some advantages over other options, which are entirely in tunnel.

In Summary, for Option 1 from an Environmental perspective, Landscape and Visual and Archaeology, Architecture and Cultural Heritage has some disadvantages over other options and Soils and Geology has some advantages over other options. Therefore, overall Option 1 is considered to have some disadvantages over other options.

8.2.2 Option 2

Option 2 (A1-B6-C11) serves Charlemont, College Green, O'Connell Street, Mater Hospital, Drumcondra, St. Patrick's College West, DCU at Collins Avenue West, Santry Village, Northwood Central, Dardistown, Dublin Airport, Airside Retail Park West, Pavilions Shopping Centre, North Street and Estuary Park & Ride as shown on **Figure 8.2**.

Figure 8.2: Option 2 (A1-B6-C11)

8.2.2.1 Economy

The main economic parameters derived for Option 2 and how they compare to other route options are summarised in **Table 8.3**.

Table 8.3: Option 2 Economy Summary

Economy				
Sub-criterion:	BCR	Total Cost (€ Million)	Patronage (24 hour NMN boarding)	Journey Time (minutes)
Result:	2.05	€4,302	128,653	25.68
Compared to other 9 Options:				
Economy Result	Significant disadvantages over other options			

The Total Cost is favourable for Option 2, however, the BCR and Patronage is unfavourable compared to other options. The journey time is the fastest of all ten options and therefore presents a time saving for patronage on this end-to-end option. Overall, Option 2 is considered to have significant disadvantages over other options in the economic assessment.

8.2.2.2 Integration

Integration on the overall route is a combination of an assessment of how the route option supports existing and planned land-use policy and an assessment of how well the route options integrates with public transport.

Integration with Land Use Policy varies along the length of the option as it moves through the Study Area. It is not considered a differentiator when compared with other options across the breadth of Study Area A as all options provide an opportunity for consolidation and regeneration within the city centre area. However, in Study Area B, Option 2 serves existing lower density residential developments in Santry with less potential for higher density developments along the corridor. By contrast, options serving Ballymun Main Street, which comprises vacant lands in public ownership, provide more opportunity to deliver high-density development to facilitate strategic development of the Ballymun area. In Study Area C, Option 2 serves Swords Main Street which is already largely developed with low density retail offering along its length. As such, there would be little opportunity for further growth immediately along this route in the future unless significant changes are made to the County Development Plan, with the opportunity for site assembly to change density provision, likely to be more challenging in the short to medium term.

In terms of Public Transport Integration, Option 2 has the lowest number of transfers with other PT modes (8,800 transfers), during the AM peak period which is primarily due to the lack of interchange with DART in the city centre. Option 2 interchanges with the heavy rail line at Drumcondra only and there is no direct

interchange with DART services. Option 2 serves Santry and will not interchange directly with buses running along the Ballymun Road, which is identified as a core bus corridor in the GDA Transport Strategy.

In the Swords area, Option 2 serves the Swords Main Street where there is limited opportunity to provide bus priority measures due to space restrictions or would require significant interventions with subsequent impact on the streetscape and town centre environment. These improvements to bus priority would be required on Swords Main Street/North Street to ensure high reliability of bus journey times and to provide more attractive interchange between bus and metro.

Therefore, overall Option 2 is considered to have some disadvantages from an Integration perspective over other options due to less favourable integration with land use policy in the central and Swords areas and lack of integration with the DART network in the city centre and bus network in the central and Swords areas.

8.2.2.3 Accessibility & Social Inclusion

In terms of Key Trip Attractors, Option 2 traverses the shortest direct line through the city centre and central portion of the Study Area. As a result, it serves less key trip attractors than other options in the city centre. Of particular note, St. Stephen's Green is not served in the city centre and Whitehall College of Further Education, Griffith Park and National Botanic Gardens is not served in the central study area.

Therefore, Option 2 is considered to have some disadvantages over other options from an Accessibility and Social Inclusion perspective due to serving less Key Trip Attractors in the city centre and central study areas.

8.2.2.4 Environment

In terms of potential impact on Landscape and Visual, Option 2 has the potential for direct impact on key spaces and views in the city centre. As with other route options through Study Area B, Option 2 is not considered to have any potential for differentiating impacts under this criterion. Within Study Area C in the Swords area, Option 2 is not considered to have any potential for differentiating impacts under this criterion. In overall terms, therefore Option 2 is considered to have some disadvantages over other options from a Landscape and Visual perspective due to the potential impacts in Study Area A.

In terms of potential impact on Archaeology, Architecture and Cultural Heritage, Option 2 has potential for impact on architectural heritage assets of national significance in Study Area A. The risk of identifying significant archaeological deposits in this area is also very high. As with other route options through Study Area B, Option 2 is not considered to have any potential for differentiating impacts under this criterion as the route is in tunnel, with the potential for impact limited to the station locations. Within Study Area C in the Swords area, Option 2 follows the tunnelled option underneath Swords High Street. The tunnelled option has not been subject to the same level of archaeological testing as was the R132 from the work on the previous metro project, and has potential for archaeological and cultural heritage impacts due to its physical proximity to Swords Castle

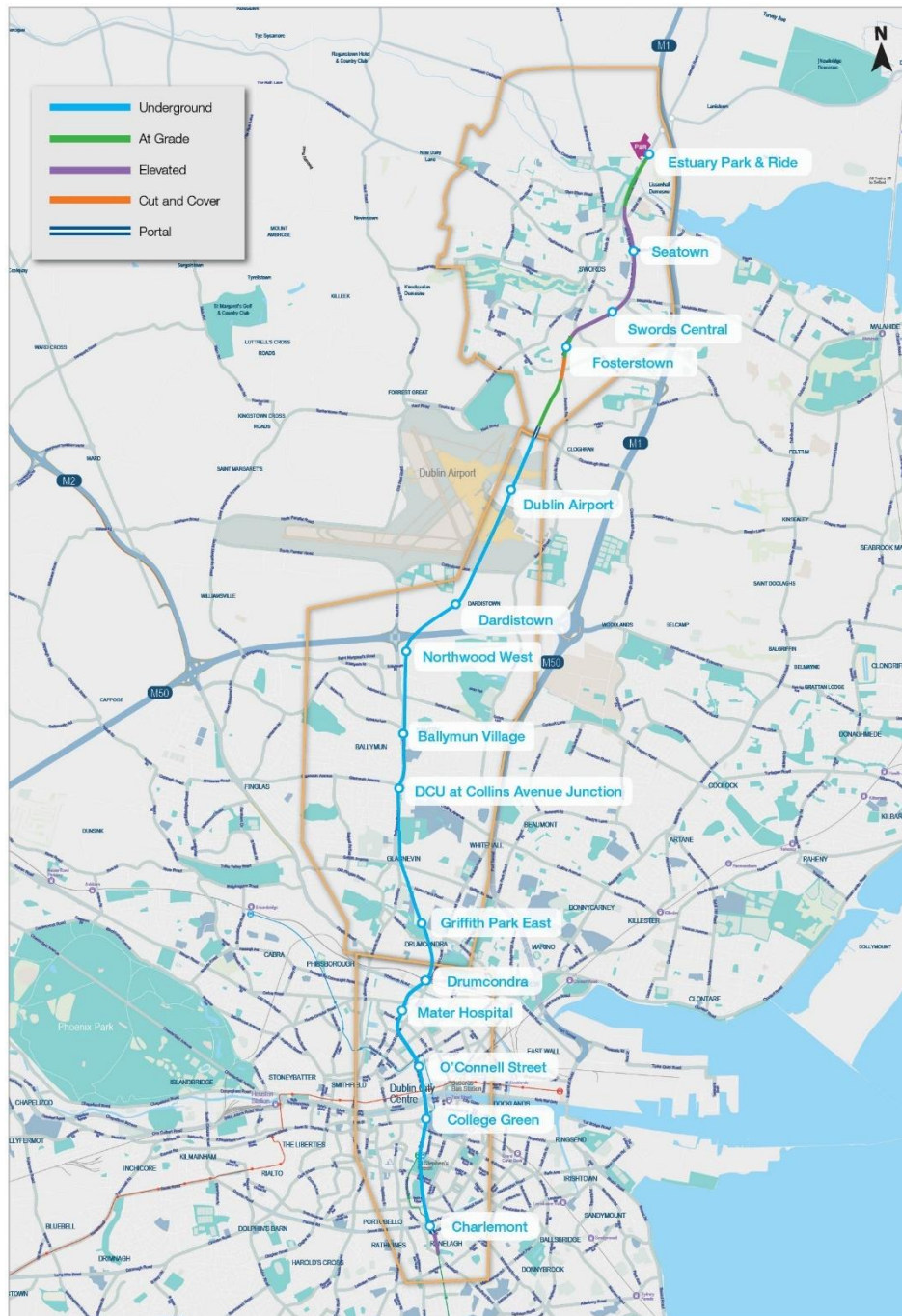
demesne along Swords Main Street. Therefore, within Study Area C in the Swords area, Option 2 is not considered to have any potential for differentiating impacts under this criterion as both options through Study Area C have benefits/disbenefits. In overall terms, therefore Option 2 is considered to have some disadvantages over other options from an Archaeology, Architecture and Cultural Heritage perspective due to the potential impacts in Study Area A.

In terms of Soils and Geology (Ground Movement), the fact that Option 2 is in tunnel in the Swords area has an increased potential for ground movement on a quantifiable basis when compared with routes that are not in tunnel in Study Area C. Therefore, Option 2 is considered to have some disadvantages over other options, which are not entirely in tunnel.

In Summary, for Option 2 from an Environmental perspective, Landscape and Visual, Archaeology, Architecture and Cultural Heritage and Soils and Geology has some disadvantages over other options. Therefore, overall Option 2 is considered to have some disadvantages over other options.

8.2.3 Option 3

Option 3 (A1-B10-C4) serves Charlemont, College Green, O'Connell Street, Mater Hospital, Drumcondra, Griffith Park East, DCU at Collins Avenue Junction, Ballymun Village, Northwood West, Dardistown, Dublin Airport, Fosterstown, Swords Central, Seatown and Estuary Park & Ride as shown on **Figure 8.3**.

Figure 8.3: Option 3 (A1-B10-C4)

8.2.3.1 Economy

The main economic parameters derived for Option 3 and how they compare to other route options are summarised in **Table 8.4**.

Table 8.4: Option 3 Economy Summary

Economy				
Sub-criterion:	BCR	Total Cost (€ Million)	Patronage (24 hour NMN boarding)	Journey Time (minutes)
Result:	2.00	€4,173	127,398	26.28
Compared to other 9 Options:				
Economy Result	Significant disadvantages over other options			

The BCR and Patronage is highly unfavourable for Option 3, however, the Total Cost is highly favourable compared to other options. The journey time is the fourth fastest of all ten options and therefore represents a moderate time saving for patronage on this end-to-end option. Overall, Option 3 is considered to have significant disadvantages over other options in the economic assessment.

8.2.3.2 Integration

Integration on the overall route is a combination of an assessment of how the route option supports existing and planned land-use policy and an assessment of how well the route options integrates with public transport.

Integration with Land Use Policy varies along the length of the option as it moves through the Study Area. It is not considered a differentiator when compared with other options across the breadth of Study Area A as all options provide an opportunity for consolidation and regeneration within the city centre area. However, in Study Area B, Option 3 serves Ballymun Main Street which comprises vacant lands in public ownership and provides more opportunity to deliver high-density development to facilitate strategic development of the Ballymun area. By contrast, options serving existing lower density residential developments in Santry provide less potential for higher density developments along the corridor. In Study Area C, Option 3 directly serves the Metro Economic Corridor in line with the Fingal County Development plan, which generally runs along the R132. The Barrysparks LAP has also been developed based on the Metro Economic Corridor.

In terms of Public Transport Integration, Option 3 is among the lowest number of transfers with other PT modes (9,100 transfers), during the AM peak period which is primarily due to the lack of interchange with DART in the city centre. Option 3 interchanges with the heavy rail line at Drumcondra only and there is no direct interchange with DART services. Option 3 serves Ballymun Road, which is identified as a core bus corridor in the GDA Transport Strategy. By contrast, other options which serve Santry will not interchange directly with buses running along the Ballymun Road. In the Swords area, Option 3 serves the R132 and has the

potential to provide opportunity for direct interchange with bus services running along the R132 which is identified as a core bus corridor in the GDA Transport Strategy. Furthermore, the R132 is a wide road with potential for improved bus priority measures.

There is also potential to incorporate a well-integrated metro/bus interchange, near Swords Pavilions Shopping Centre and Barrysparks LAP lands. By contrast, other options which serve Swords Main Street have limited opportunity to provide bus priority measures due to space restrictions or would require significant interventions with subsequent impact on the streetscape and town centre environment.

Therefore, overall Option 3 is considered to have some disadvantages over other options in terms of Integration due to the disadvantages assessed under Public Transport Integration as a result of lack of integration with the DART network in the city centre, whilst acknowledging that it has some advantages over other options in terms of Integration with Land Use Policy in the central and Swords area.

8.2.3.3 Accessibility & Social Inclusion

In terms of Key Trip Attractors, Option 3 traverses the shortest direct line through the city centre. As a result, it serves less key trip attractors than other options in the city centre. Of particular note, St. Stephen's Green is not served in the city centre.

Therefore, Option 3 is considered to have some disadvantages over other options from an Accessibility and Social Inclusion perspective due to serving less Key Trip Attractors in the city centre.

8.2.3.4 Environment

In terms of potential impact on Landscape and Visual, Option 3 has the potential for direct impact on key spaces and views in the city centre. As with other route options through Study Area B, Option 3 is not considered to have any potential for differentiating impacts under this criterion. Within Study Area C in the Swords area, Option 3 is not considered to have any potential for differentiating impacts under this criterion. In overall terms, therefore Option 3 is considered to have some disadvantages over other options from a Landscape and Visual perspective due to the potential impacts in Study Area A.

In terms of potential impact on Archaeology, Architecture and Cultural Heritage, Option 3 has potential for impact on architectural heritage assets of national significance in Study Area A. The risk of identifying significant archaeological deposits in this area is also very high. As with other route options through Study Area B, Option 3 is not considered to have any potential for differentiating impacts under this criterion as the route is in tunnel, with the potential for impact limited to the station locations. Within Study Area C, in the Swords area, Option 3 follows the R132 on an elevated structure which has known sites of archaeological importance from the work on the previous metro project. The tunnelled option has not been subject to an equivalent level of archaeological

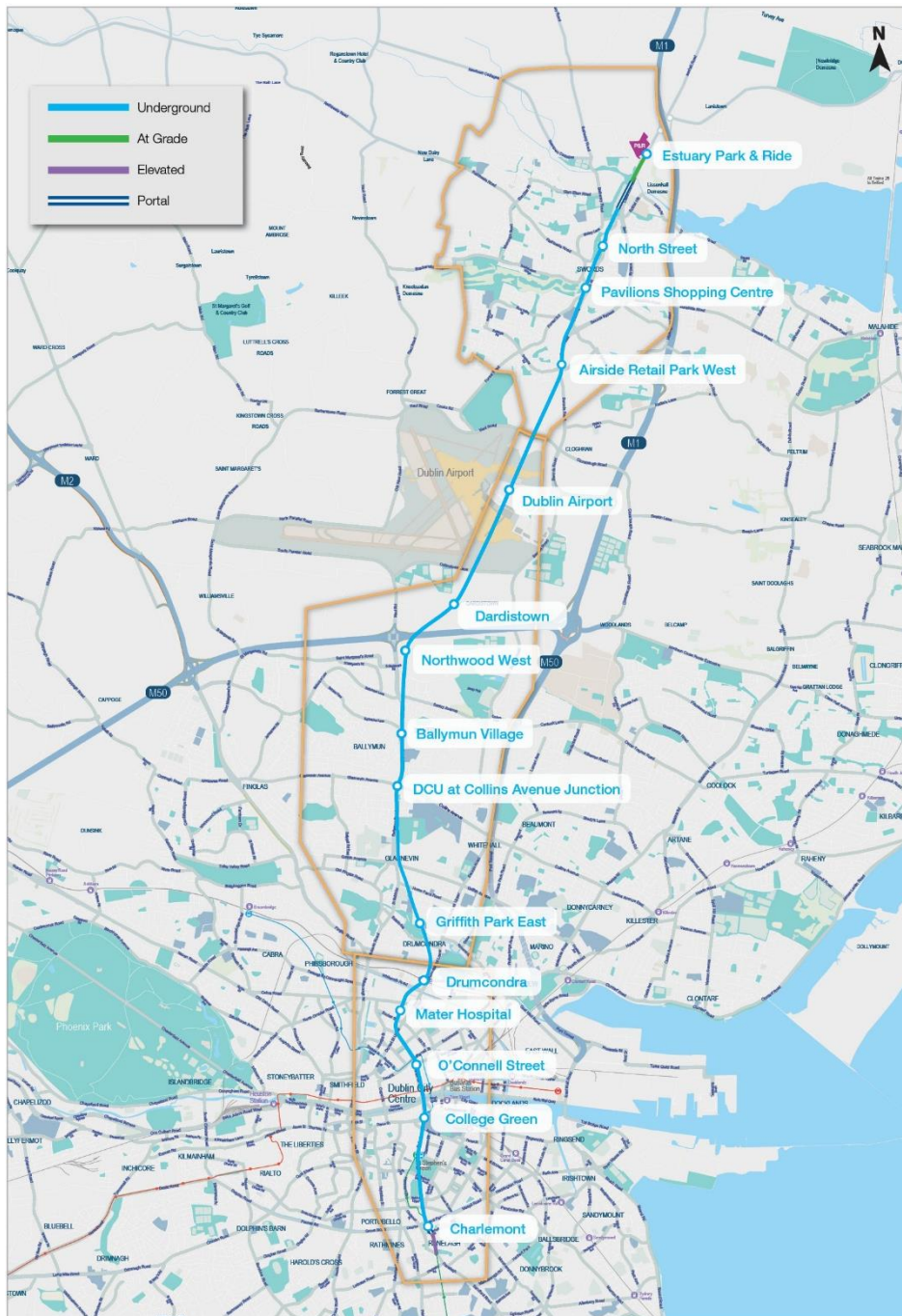
testing, and therefore has potential for archaeological and cultural heritage impacts due to its physical proximity to Swords Castle demesne along Swords Main Street. Therefore, within Study Area C, Option 3 is not considered to have any potential for differentiating impacts under this criterion in the Swords area as both options through Swords have benefits/disbenefits. In overall terms, therefore Option 3 is considered to have some disadvantages over other options from an Archaeology, Architecture and Cultural Heritage perspective due to the potential impacts in Study Area A.

In terms of Soils and Geology (Ground Movement), the fact that Option 3 is elevated in the Swords area has a reduced potential for ground movement on a quantifiable basis when compared with routes that are entirely in tunnel. Therefore, Option 3 is considered to have some advantages over other options, which are entirely in tunnel.

In Summary, for Option 3 from an Environmental perspective, Landscape and Visual and Archaeology, Architecture and Cultural Heritage has some disadvantages over other options and Soils and Geology has some advantages over other options. Therefore, overall Option 3 is considered to have some disadvantages over other options.

8.2.4 Option 4

Option 4 (A1-B10-C11) serves Charlemont, College Green, O'Connell Street, Mater Hospital, Drumcondra, Griffith Park East, DCU at Collins Avenue Junction, Ballymun Village, Northwood West, Dardistown, Dublin Airport, Airside Retail Park West, Pavilions Shopping Centre, North Street and Estuary Park & Ride as shown on **Figure 8.4**.

Figure 8.4: Option 4 (A1-B10-C11)

8.2.4.1 Economy

The main economic parameters derived for Option 4 and how they compare to other route options are summarised in **Table 8.5**.

Table 8.5: Option 4 Economy Summary

Economy				
Sub-criterion:	BCR	Total Cost (€ Million)	Patronage (24 hour NMN boarding)	Journey Time (minutes)
Result:	2.03	€4,280	132,296	26.02
Compared to other 9 Options:				
Economy Result	Significant disadvantages over other options			

The BCR and Patronage is unfavourable for Option 4, however the Total Cost is favourable compared to other options. The journey time is among the fastest of all ten options and therefore represents a time saving for patronage on this end-to-end option. Overall, Option 4 is considered to have significant disadvantages over other options in the economic assessment.

8.2.4.2 Integration

Integration on the overall route is a combination of an assessment of how the route option supports existing and planned land-use policy and an assessment of how well the route options integrates with public transport.

Integration with Land Use Policy varies along the length of the option as it moves through the Study Area. It is not considered a differentiator when compared with other options across the breadth of Study Area A as all options provide an opportunity for consolidation and regeneration within the city centre area. However, in Study Area B, Option 4 serves Ballymun Main Street which comprises vacant lands in public ownership and provides more opportunity to deliver high-density development to facilitate strategic development of the Ballymun area. By contrast, options serving existing lower density residential developments in Santry provide less potential for higher density developments along the corridor. In Study Area C, Option 4 serves Swords Main Street which is already largely developed with low density retail offering along its length. As such, there would be little opportunity for further growth immediately along this route in the future unless significant changes are made to the County Development Plan, with the opportunity for site assembly to change density provision, likely to be more challenging in the short to medium term.

In terms of Public Transport Integration, Option 4 is among the lowest number of transfers with other PT modes (9,000 transfers), during the AM peak period which is primarily due to the lack of interchange with DART in the city centre. Option 4 interchanges with the heavy rail line at Drumcondra only and there is no direct interchange with DART services. Option 4 serves Ballymun Road, which is identified as a core bus corridor in the GDA Transport Strategy. By contrast, other

options which serve Santry will not interchange directly with buses running along the Ballymun Road.

In the Swords area, Option 4 serves the Swords Main Street where there is limited opportunity to provide bus priority measures due to space restrictions or would require significant interventions with subsequent impact on the streetscape and town centre environment. These improvements to bus priority would be required on Swords Main Street/North Street to ensure high reliability of bus journey times and to provide more attractive interchange between bus and metro.

Therefore, overall Option 4 is considered to have some disadvantages over other options in terms of Integration due to less favourable integration with Land Use Policy in the Swords area and less favourable Public Transport Integration due to lack of integration with the DART network in the city centre and bus network in the Swords area.

8.2.4.3 Accessibility & Social Inclusion

In terms of Key Trip Attractors, Option 4 traverses the shortest direct line through the city centre and central portion of the Study Area. As a result, it serves less key trip attractors than other options in the city centre. Of particular note, St. Stephen's Green is not served in the city centre.

Therefore, Option 4 is considered to have some disadvantages over other options from an Accessibility and Social Inclusion perspective due to serving less Key Trip Attractors in the city centre.

8.2.4.4 Environment

In terms of potential impact on Landscape and Visual, Option 4 has the potential for direct impact on key spaces and views in the city centre. As with other route options through Study Area B, Option 4 is not considered to have any potential for differentiating impacts under this criterion. Within Study Area C, Option 4 is not considered to have any potential for differentiating impacts under this criterion in the Swords area. In overall terms, therefore Option 4 is considered to have some disadvantages over other options from a Landscape and Visual perspective due to the potential impacts in Study Area A.

In terms of potential impact on Archaeology, Architecture and Cultural Heritage, Option 4 has potential for impact on architectural heritage assets of national significance in Study Area A. The risk of identifying significant archaeological deposits in this area is also very high. As with other route options through Study Area B, Option 4 is not considered to have any potential for differentiating impacts under this criterion as the route is in tunnel, with the potential for impact limited to the station locations. Within Study Area C, in the Swords area, Option 4 follows the tunnelled option underneath Swords High Street. The tunnelled option has not been subject to the same level of archaeological testing as was the R132 from the work on the previous metro project, and has potential for archaeological and cultural heritage impacts due to its physical proximity to Swords Castle demesne along Swords Main Street. Therefore, within Study Area C, Option 4 is not considered to have any potential for differentiating impacts under this criterion.

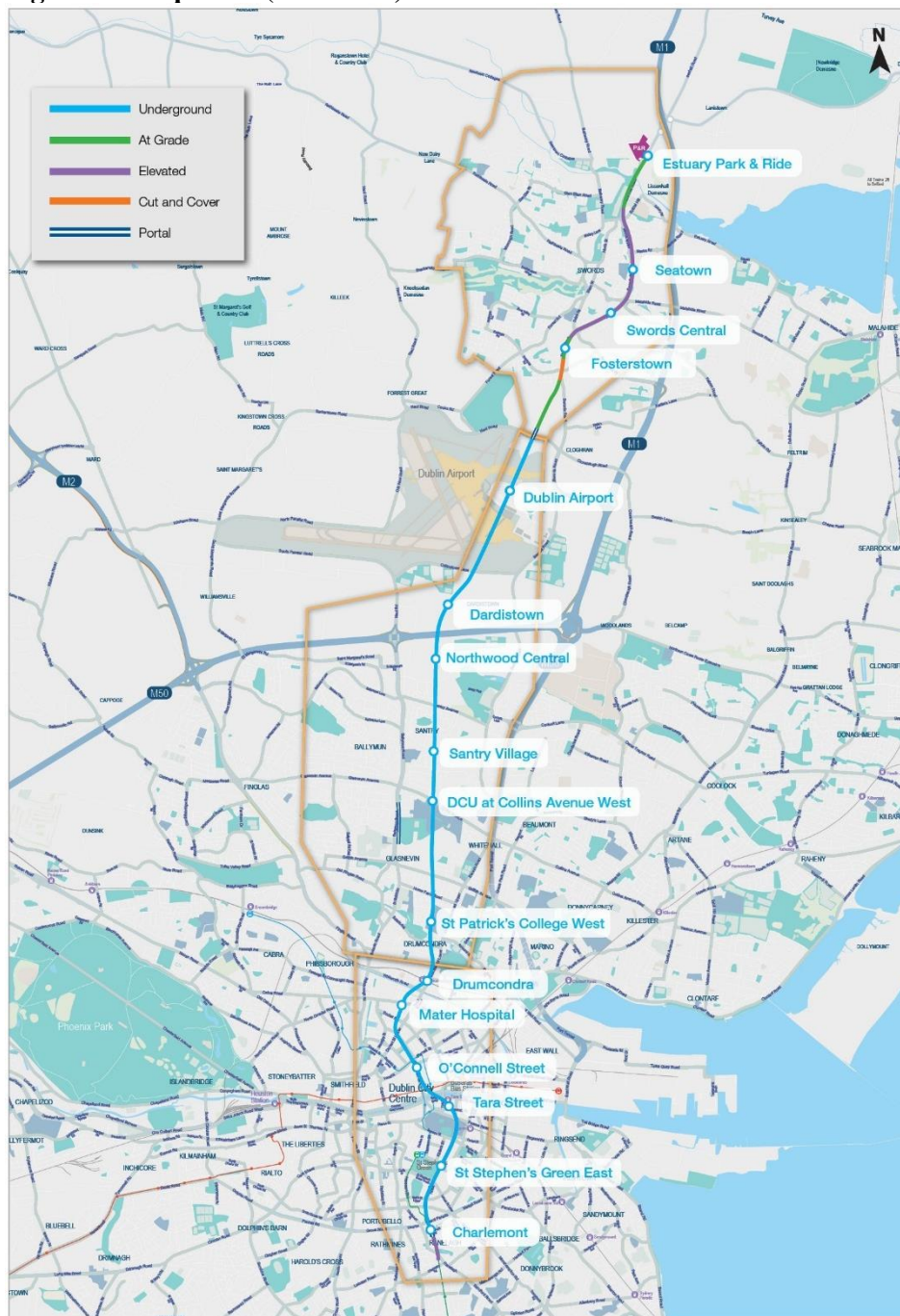
in the Swords area as both options though Swords have benefits/disbenefits. In overall terms, therefore Option 4 is considered to have some disadvantages over other options from an Archaeology, Architecture and Cultural Heritage perspective due to the potential impacts in Study Area A.

In terms of Soils and Geology (Ground Movement), the fact that Option 4 is in tunnel in the Swords area has an increased potential for ground movement on a quantifiable basis when compared with routes that are not in tunnel in Area C. Therefore, Option 4 is considered to have some disadvantages over other options, which are not entirely in tunnel.

In Summary, for Option 4 from an Environmental perspective, Landscape and Visual, Archaeology, Architecture and Cultural Heritage and Soils and Geology has some disadvantages over other options. Therefore, overall Option 4 is considered to have some disadvantages over other options.

8.2.5 Option 5

Option 5 (A2-B6-C4) serves Charlemont, St. Stephen's Green East, Tara Street, O'Connell Street, Mater Hospital, Drumcondra, St. Patrick's College West, DCU at Collins Avenue West, Santry Village, Northwood Central, Dardistown, Dublin Airport, Fosterstown, Swords Central, Seatown and Estuary Park & Ride as shown on **Figure 8.5**.

Figure 8.5: Option 5 (A2-B6-C4)

8.2.5.1 Economy

The main economic parameters derived for Option 5 and how they compare to other route options are summarised in **Table 8.6**.

Table 8.6: Option 5 Economy Summary

Economy				
Sub-criterion:	BCR	Total Cost (€ Million)	Patronage (24 hour NMN boarding)	Journey Time (minutes)
Result:	2.13	€4,343	135,465	26.92
Compared to other 9 Options:				
Economy Result	Some advantages over other options			

The BCR is favourable for Option 5, however the Total Cost and Patronage is unfavourable compared to other options. The journey time is among the slowest of all ten options and therefore does not offer as significant a time saving for patronage on this end-to-end option when compared to others. Overall, Option 5 is considered to have some advantages over other options in the economic assessment.

8.2.5.2 Integration

Integration on the overall route is a combination of an assessment of how the route option supports existing and planned land-use policy and an assessment of how well the route options integrates with public transport.

Integration with Land Use Policy varies along the length of the option as it moves through the Study Area. It is not considered a differentiator when compared with other options across the breadth of Study Area A as all options provide an opportunity for consolidation and regeneration within the city centre area. However, in Study Area B, Option 5 serves existing lower density residential developments in Santry with less potential for higher density developments along the corridor. By contrast, options serving Ballymun Main Street, which comprises vacant lands in public ownership, provide more opportunity to deliver high-density development to facilitate strategic development of the Ballymun area. In Study Area C, Option 5 directly serves the Metro Economic Corridor in line with the Fingal County Development plan, which generally runs along the R132. The Barrysparks LAP has also been developed based on the Metro Economic Corridor.

In terms of Public Transport Integration, Option 5 is among the mid-range in terms of transfers with other PT modes (10,950 transfers), during the AM peak period. Option 5 interchanges with the DART at Tara Street thus showing an increase in modal interchange over options without this connection, and also interchanges with Heavy Rail at Drumcondra. Option 5 serves Santry and will not interchange directly with buses running along the Ballymun Road, which is identified as a core bus corridor in the GDA Transport Strategy. In the Swords

area, Option 5 serves the R132 and has the potential to provide opportunity for direct interchange with bus services running along the R132 which is identified as a core bus corridor in the GDA Transport Strategy. Furthermore, the R132 is a wide road with potential for improved bus priority measures.

There is also potential to incorporate a well-integrated metro/bus interchange, near Swords Pavilions Shopping Centre and Barrysparks LAP lands. By contrast, other options which serve Swords Main Street have limited opportunity to provide bus priority measures due to space restrictions or would require significant interventions with subsequent impact on the streetscape and town centre environment.

Therefore, overall Option 5 is considered to have some disadvantages over other options in terms of Integration due to being less favourable on integration with Land Use Policy in the central area and less favourable Public Transport Integration with the bus network in Santry.

8.2.5.3 Accessibility & Social Inclusion

In terms of Key Trip Attractors, Option 5 serves more attractors than other options in the city centre. Of particular note, St. Stephen's Green, the historical city centre public park and garden is served by Option 5. However, Whitehall College of Further Education, Griffith Park and National Botanic Gardens is not served in the central study area.

Therefore, overall Option 5 is considered to have some advantages over other options from an Accessibility and Social Inclusion perspective due to serving more Key Trip Attractors in the city centre.

8.2.5.4 Environment

In terms of potential impact on Landscape and Visual, Option 5 has the potential for direct impact on key spaces and views in the city centre, however the impact is not as significant when compared to other options. As with other route options through Study Area B, Option 5 is not considered to have any potential for differentiating impacts under this criterion. Within Study Area C in the Swords area, Option 5 is not considered to have any potential for differentiating impacts under this criterion. In overall terms, therefore Option 5 is considered to have some advantages over other options from a Landscape and Visual perspective due to the lesser potential impacts in Study Area A.

In terms of potential impact on Archaeology, Architecture and Cultural Heritage, Option 5 has potential for impact on architectural heritage assets of national significance in Study Area A, however the impact is not as significant when compared to other routes. As with other route options through Study Area B, Option 5 is not considered to have any potential for differentiating impacts under this criterion as the route is in tunnel, with the potential for impact limited to the station locations. Within Study Area C, in the Swords area, Option 5 follows the R132 on an elevated structure which has known sites of archaeological importance from the work on the previous metro project. The tunnelled option has not been subject to an equivalent level of archaeological testing, and therefore has

potential for archaeological and cultural heritage impacts due to its physical proximity to Swords Castle demesne along Swords Main Street. Therefore, within Study Area C, Option 5 is not considered to have any potential for differentiating impacts under this criterion in the Swords area as both options through Swords have benefits/disbenefits. In overall terms, therefore Option 5 is considered to have some advantages over other options from an Archaeology, Architecture and Cultural Heritage perspective due to the lesser potential impacts in Study Area A.

In terms of Soils and Geology (Ground Movement), the fact that Option 5 is elevated in the Swords area has a reduced potential for ground movement on a quantifiable basis when compared with routes that are entirely in tunnel. Therefore, Option 5 is considered to have some advantages over other options, which are entirely in tunnel.

In Summary, for Option 5 from an Environmental perspective, Landscape and Visual, Archaeology, Architecture and Cultural Heritage and Soils and Geology has some advantages over other options. Therefore, overall Option 5 is considered to have some advantages over other options.

8.2.6 Option 6

Option 6 (A2-B6-C11) serves Charlemont, St. Stephen's Green East, Tara Street, O'Connell Street, Mater Hospital, Drumcondra, St. Patrick's College West, DCU at Collins Avenue West, Santry Village, Northwood Central, Dardistown, Dublin Airport, Airside Retail Park West, Pavilions Shopping Centre, North Street and Estuary Park & Ride as shown on **Figure 8.6**.

Figure 8.6: Option 6 (A2-B6-C11)

8.2.6.1 Economy

The main economic parameters derived for Option 6 and how they compare to other route options are summarised in **Table 8.7**.

Table 8.7: Option 6 Economy Summary

Economy				
Sub-criterion:	BCR	Total Cost (€ Million)	Patronage (24 hour NMN boarding)	Journey Time (minutes)
Result:	2.11	€4,449	139,953	26.65
Compared to other 9 Options:				
Economy Result	Some advantages over other options			

The BCR and Patronage is favourable for Option 6, however, the Total Cost is highly unfavourable compared to other options. The journey time is mid-range of all ten options and therefore represents a moderate time saving for patronage on this end-to-end option. Overall, Option 6 is considered to have some advantages over other options in the economic assessment.

8.2.6.2 Integration

Integration on the overall route is a combination of an assessment of how the route option supports existing and planned land-use policy and an assessment of how well the route options integrates with public transport.

Integration with Land Use Policy varies along the length of the option as it moves through the Study Area. It is not considered a differentiator when compared with other options across the breadth of Study Area A as all options provide an opportunity for consolidation and regeneration within the city centre area. However, in Study Area B, Option 6 serves existing lower density residential developments in Santry with less potential for higher density developments along the corridor. By contrast, options serving Ballymun Main Street, which comprises vacant lands in public ownership, provide more opportunity to deliver high-density development to facilitate strategic development of the Ballymun area. In Study Area C, Option 6 serves Swords Main Street which is already largely developed with low density retail offering along its length. As such, there would be little opportunity for further growth immediately along this route in the future unless significant changes are made to the County Development Plan, with the opportunity for site assembly to change density provision, likely to be more challenging in the short to medium term.

In terms of Public Transport Integration, Option 6 is among the mid-range in terms of transfers with other PT modes (10,850 transfers), during the AM peak period. Option 6 interchanges with the DART at Tara Street thus showing an increase in modal interchange over options without this connection, and also interchanges with Heavy Rail at Drumcondra. Option 6 serves Santry and will not interchange directly with buses running along the Ballymun Road, which is

identified as a core bus corridor in the GDA Transport Strategy. In the Swords area, Option 6 serves the Swords Main Street where there is limited opportunity to provide bus priority measures due to space restrictions or would require significant interventions with subsequent impact on the streetscape and town centre environment. These improvements to bus priority would be required on Swords Main Street/North Street to ensure high reliability of bus journey times and to provide more attractive interchange between bus and metro.

Therefore, overall Option 6 is considered to have some disadvantages over other options in terms of Integration due to being less favourable on integration with Land Use Policy in the central and Swords area and less favourable Public Transport Integration with the bus network in Santry and Swords Main Street.

8.2.6.3 Accessibility & Social Inclusion

In terms of Key Trip Attractors, Option 6 serves more attractors than other options in the city centre. Of particular note, St. Stephen's Green, the historical city centre public park and garden is served by Option 6. However, Whitehall College of Further Education, Griffith Park and National Botanic Gardens is not served in the central study area.

Therefore, overall Option 6 is considered to have some advantages over other options from an Accessibility and Social Inclusion perspective due to serving more Key Trip Attractors in the city centre.

8.2.6.4 Environment

In terms of potential impact on Landscape and Visual, Option 6 has the potential for direct impact on key spaces and views in the city centre, however the impact is not as significant when compared to other options. As with other route options through Study Area B, Option 6 is not considered to have any potential for differentiating impacts under this criterion. Within Study Area C criterion in the Swords area, Option 6 is not considered to have any potential for differentiating impacts under this. In overall terms, therefore Option 6 is considered to have some advantages over other options from a Landscape and Visual perspective due to the lesser potential impacts in Study Area A.

In terms of potential impact on Archaeology, Architecture and Cultural Heritage, Option 6 has potential for impact on architectural heritage assets of national significance in Study Area A, however the impact is not as significant when compared to other routes. The risk of identifying significant archaeological deposits in this area is also very high. As with other route options through Study Area B, Option 6 is not considered to have any potential for differentiating impacts under this criterion as the route is in tunnel, with the potential for impact limited to the station locations. Within Study Area C, in the Swords area, Option 6 follows the tunnelled option underneath Swords High Street. The tunnelled option has not been subject to the level of archaeological testing as the R132 from the work on the previous metro project, and has potential for archaeological and cultural heritage impacts due to its physical proximity to Swords Castle demesne along Swords Main Street. Therefore, within Study Area C, Option 6 is not

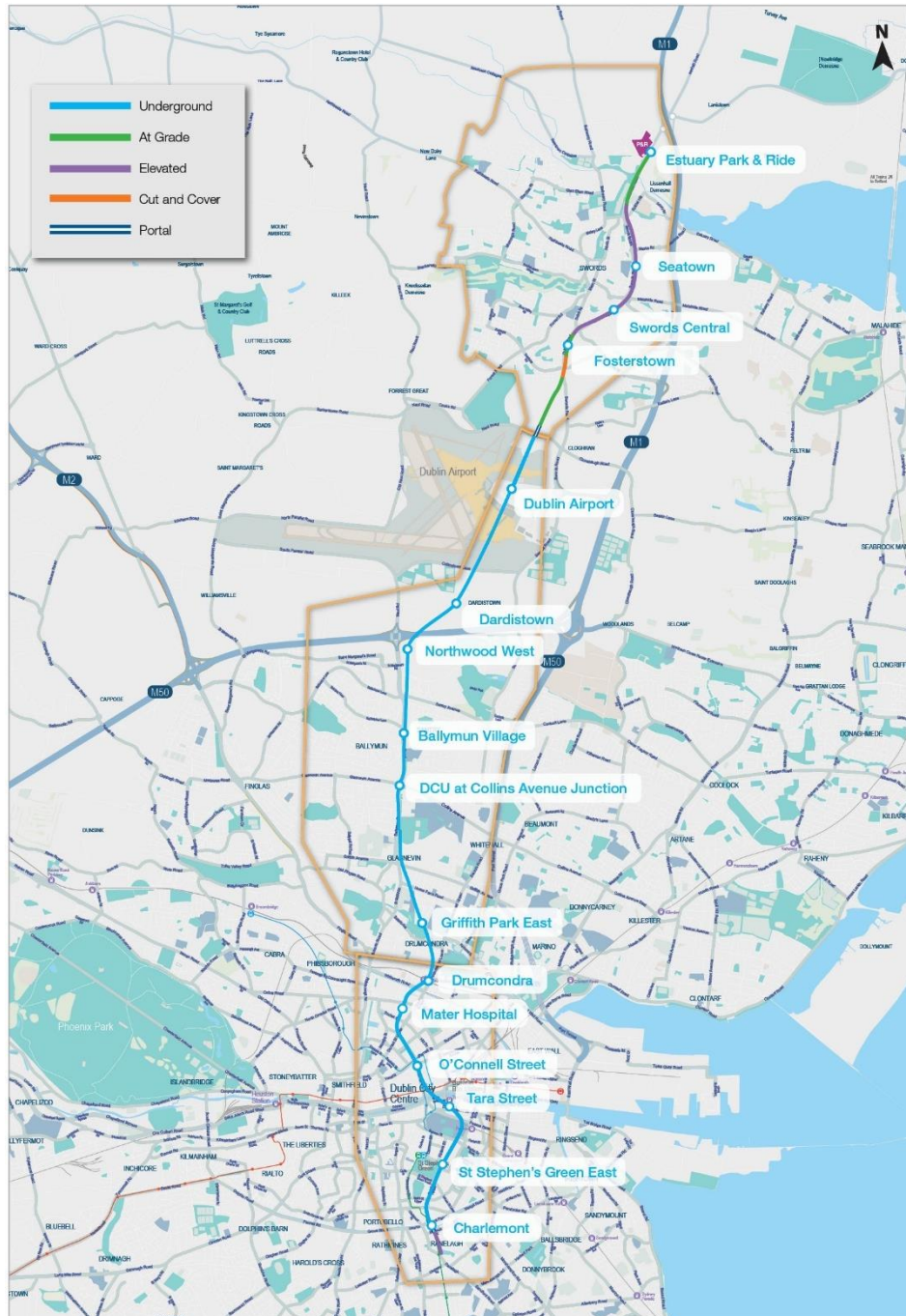
considered to have any potential for differentiating impacts under this criterion in the Swords area. In overall terms, therefore Option 6 is considered to have some advantages over other options from an Archaeology, Architecture and Cultural Heritage perspective due to the lesser potential impacts in Study Area A.

In terms of Soils and Geology (Ground Movement), the fact that Option 6 is in tunnel in the Swords area has an increased potential for ground movement on a quantifiable basis when compared with routes that are not in tunnel in Area C. Therefore, Option 6 is considered to have some disadvantages over other options, which are not entirely in tunnel.

In Summary, for Option 6 from an Environmental perspective, Landscape and Visual and Archaeology, Architecture and Cultural Heritage has some advantages over other options and Soils and Geology has some disadvantages over other options. Therefore, overall Option 6 is considered to have some advantages over other options.

8.2.7 Option 7

Option 7 (A2-B10-C4) serves Charlemont, St. Stephen's Green East, Tara Street, O'Connell Street, Mater Hospital, Drumcondra, Griffith Park East, DCU at Collins Avenue Junction, Ballymun Village, Northwood West, Dardistown, Dublin Airport, Fosterstown, Swords Central, Seatown and Estuary Park & Ride as shown on **Figure 8.7**.

Figure 8.7: Option 7 (A2-B10-C4)

8.2.7.1 Economy

The main economic parameters derived for Option 7 and how they compare to other route options are summarised in **Table 8.8**.

Table 8.8: Option 7 Economy Summary

Economy				
Sub-criterion:	BCR	Total Cost (€ Million)	Patronage (24 hour NMN boarding)	Journey Time (minutes)
Result:	2.07	€4,319	137,883	27.25
Compared to other 9 Options:				
Economy Result	Some disadvantage over other options			

The BCR and Total Cost is unfavourable for Option 7, however the Patronage is favourable compared to other options. The journey time is the slowest of all ten options and therefore does not present a time saving for patronage on this end-to-end option. Overall, Option 7 is considered to have some disadvantages over other options in the economic assessment.

8.2.7.2 Integration

Integration on the overall route is a combination of an assessment of how the route option supports existing and planned land-use policy and an assessment of how well the route options integrates with public transport.

Integration with Land Use Policy varies along the length of the option as it moves through the Study Area. It is not considered a differentiator when compared with other options across the breadth of Study Area A as all options provide an opportunity for consolidation and regeneration within the city centre area. However, in Study Area B, Option 7 serves Ballymun Main Street which comprises vacant lands in public ownership and provides more opportunity to deliver high-density development to facilitate strategic development of the Ballymun area. By contrast, options serving existing lower density residential developments in Santry provide less potential for higher density developments along the corridor. In Study Area C, Option 7 directly serves the Metro Economic Corridor in line with the Fingal County Development plan, which generally runs along the R132. The Barrysparks LAP has also been developed based on the Metro Economic Corridor.

In terms of Public Transport Integration, Option 7 is among the mid-range in terms of transfers with other PT modes (11,000 transfers), during the AM peak period. Option 7 interchanges with the DART at Tara Street thus showing an increase in modal interchange over options without this connection, and also interchanges with Heavy Rail at Drumcondra. Option 7 serves Ballymun Road, which is identified as a core bus corridor in the GDA Transport Strategy. By contrast, other options which serve Santry will not interchange directly with buses running along the Ballymun Road. In the Swords area, Option 7 serves the R132

and has the potential to provide opportunity for direct interchange with bus services running along the R132 which is identified as a core bus corridor in the GDA Transport Strategy. Furthermore, the R132 is a wide road with potential for improved bus priority measures.

There is also potential to incorporate a well-integrated metro/bus interchange, near Swords Pavilions Shopping Centre and Barrysparks LAP lands. By contrast, other options which serve Swords Main Street have limited opportunity to provide bus priority measures due to space restrictions or would require significant interventions with subsequent impact on the streetscape and town centre environment.

Therefore, overall Option 7 is considered to have some advantages over other options in terms of Integration due to favourable integration with Land Use Policy in the Ballymun and Swords area and favourable Public Transport Integration in the city centre, central and Swords area.

8.2.7.3 Accessibility & Social Inclusion

In terms of Key Trip Attractors, Option 7 serves more attractors than other options in the city centre. Of particular note, St. Stephen's Green, the historical city centre public park and garden is served by Option 7.

Therefore, overall Option 7 is considered to have some advantages over other options from an Accessibility and Social Inclusion perspective due to serving more Key Trip Attractors in the city centre.

8.2.7.4 Environment

In terms of potential impact on Landscape and Visual, Option 7 has the potential for direct impact on key spaces and views in the city centre, however the impact is not as significant when compared to other options. As with other route options through Study Area B, Option 7 is not considered to have any potential for differentiating impacts under this criterion. Within Study Area C in the Swords area, Option 7 is not considered to have any potential for differentiating impacts under this criterion. In overall terms, therefore Option 7 is considered to have some advantages over other options from a Landscape and Visual perspective due to the lesser potential impacts in Study Area A.

In terms of potential impact on Archaeology, Architecture and Cultural Heritage, Option 7 has potential for impact on architectural heritage assets of national significance in Study Area A, however the impact is not as significant when compared to other routes. As with other route options through Study Area B, Option 7 is not considered to have any potential for differentiating impacts under this criterion as the route is in tunnel, with the potential for impact limited to the station locations. Within Study Area C, in the Swords area, Option 7 follows the R132 on an elevated structure which has known sites of archaeological importance from the work on the previous metro project. The tunnelled option has not been subject to an equivalent level of archaeological testing, and therefore has potential for archaeological and cultural heritage impacts due to its physical proximity to Swords Castle demesne along Swords Main Street. Therefore, within

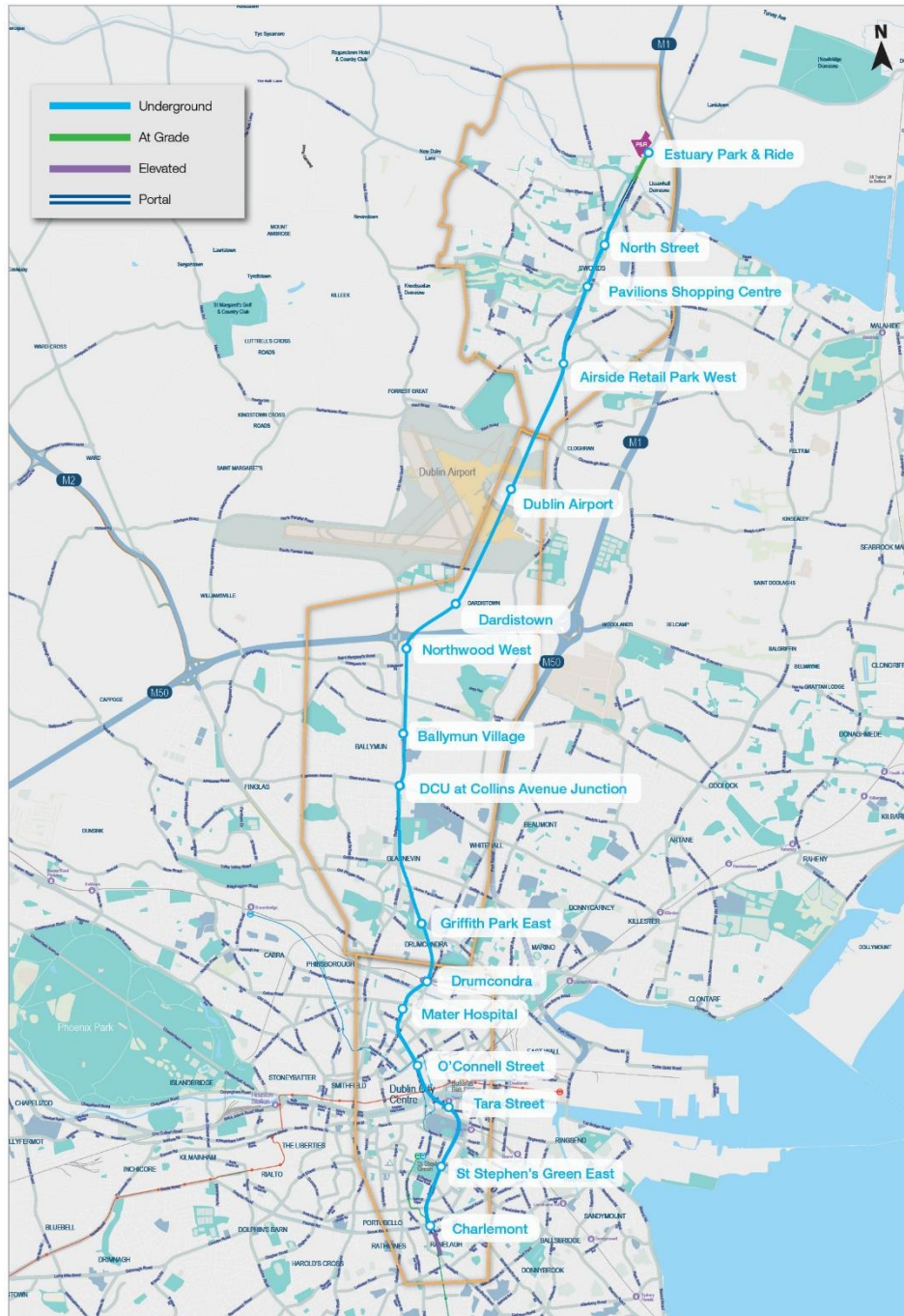
Study Area C, Option 7 is not considered to have any potential for differentiating impacts under this criterion in the Swords area as both options through Swords have benefits/disbenefits. In overall terms, therefore Option 7 is considered to have some advantages over other options from an Archaeology, Architecture and Cultural Heritage perspective due to the lesser potential impacts in Study Area A.

In terms of Soils and Geology (Ground Movement), the fact that Option 7 is elevated in the Swords area has a reduced potential for ground movement on a quantifiable basis when compared with routes that are entirely in tunnel. Therefore, Option 7 is considered to have some advantages over other options, which are entirely in tunnel.

In Summary, for Option 7 from an Environmental perspective, Landscape and Visual, Archaeology, Architecture and Cultural Heritage and Soils and Geology has some advantages over other options. Therefore, overall Option 7 is considered to have some advantages over other options.

8.2.8 Option 8

Option 8 (A2-B10-C11) serves Charlemont, St. Stephen's Green East, Tara Station, O'Connell Street, Mater Hospital, Drumcondra, Griffith Park East, DCU at Collins Avenue Junction, Ballymun Village, Northwood West, Dardistown, Dublin Airport, Airside Retail Park, Pavilions Shopping Centre, North Street and Estuary Park & Ride as shown on **Figure 8.8**.

Figure 8.8: Option 8 (A2-B10-C11)

8.2.8.1 Economy

The main economic parameters derived for Option 8 and how they compare to other route options are summarised in **Table 8.9**.

Table 8.9: Option 8 Economy Summary

Economy				
Sub-criterion:	BCR	Total Cost (€ Million)	Patronage (24 hour NMN boarding)	Journey Time (minutes)
Result:	2.09	€4,425	142,899	26.98
Compared to other 9 Options:				
Economy Result	Some disadvantages over other options			

The BCR and Total Cost is unfavourable for Option 8, however the Patronage is highly favourable compared to other options. The journey time is among the slowest of all ten options and therefore does not represent a significant time saving for patronage on this end-to-end option. Overall, Option 8 is considered to have some disadvantages over other options in this economic assessment.

8.2.8.2 Integration

Integration on the overall route is a combination of an assessment of how the route option supports existing and planned land-use policy and an assessment of how well the route options integrates with public transport.

Integration with Land Use Policy varies along the length of the option as it moves through the Study Area. It is not considered a differentiator when compared with other options across the breadth of Study Area A as all options provide an opportunity for consolidation and regeneration within the city centre area. However, in Study Area B, Option 8 serves Ballymun Main Street which comprises vacant lands in public ownership and provides more opportunity to deliver high-density development to facilitate strategic development of the Ballymun area. By contrast, options serving existing lower density residential developments in Santry provide less potential for higher density developments along the corridor. In Study Area C, Option 8 serves Swords Main Street which is already largely developed with low density retail offering along its length. As such, there would be little opportunity for further growth immediately along this route in the future unless significant changes are made to the County Development Plan, with the opportunity for site assembly to change density provision, likely to be more challenging in the short to medium term.

In terms of Public Transport Integration, Option 8 is among the mid-range in terms of transfers with other PT modes (11,000 transfers), during the AM peak period. Option 8 interchanges with the DART at Tara Street thus showing an increase in modal interchange over options without this connection, and also interchanges with Heavy Rail at Drumcondra. Option 8 serves Ballymun Road, which is identified as a core bus corridor in the GDA Transport Strategy. By

contrast, other options which serve Santry will not interchange directly with buses running along the Ballymun Road.

In the Swords area, Option 8 serves the Swords Main Street where there is limited opportunity to provide bus priority measures due to space restrictions or would require significant interventions with subsequent impact on the streetscape and town centre environment. These improvements to bus priority would be required on Swords Main Street/North Street to ensure high reliability of bus journey times and to provide more attractive interchange between bus and metro.

Therefore, overall Option 8 is considered to have some disadvantages over other options in terms of Integration due to less favourable integration with Land Use Policy and Public Transport Integration in the Swords area.

8.2.8.3 Accessibility & Social Inclusion

In terms of Key Trip Attractors, Option 8 serves more attractors than other options in the city centre. Of particular note, St. Stephen's Green, the historical city centre public park and garden is served by Option 8.

Therefore, overall Option 8 is considered to have some advantages over other options from an Accessibility and Social Inclusion perspective due to serving more Key Trip Attractors in the city centre.

8.2.8.4 Environment

In terms of potential impact on Landscape and Visual, Option 8 has the potential for direct impact on key spaces and views in the city centre, however the impact is not as significant when compared to other options. As with other route options through Study Area B, Option 8 is not considered to have any potential for differentiating impacts under this criterion. Within Study Area C in the Swords area, Option 8 is not considered to have any potential for differentiating impacts under this criterion. In overall terms, therefore Option 8 is considered to have some advantages over other options from a Landscape and Visual perspective due to the lesser potential impacts in Study Area A.

In terms of potential impact on Archaeology, Architecture and Cultural Heritage, Option 8 has potential for impact on architectural heritage assets of national significance in Study Area A, however the impact is not as significant when compared to other routes. The risk of identifying significant archaeological deposits in this area is also very high. As with other route options through Study Area B, Option 8 is not considered to have any potential for differentiating impacts under this criterion as the route is in tunnel, with the potential for impact limited to the station locations. Within Study Area C, in the Swords area, Option 8 follows the tunnelled option underneath Swords High Street. The tunnelled option has not been subject to the same level of archaeological testing as was the R132 from the work on the previous metro project, and has potential for archaeological and cultural heritage impacts due to its physical proximity to Swords Castle demesne along Swords Main Street. Therefore, within Study Area C, Option 8 is not considered to have any potential for differentiating impacts under this criterion in the Swords area as both options through Swords have benefits/disbenefits. In

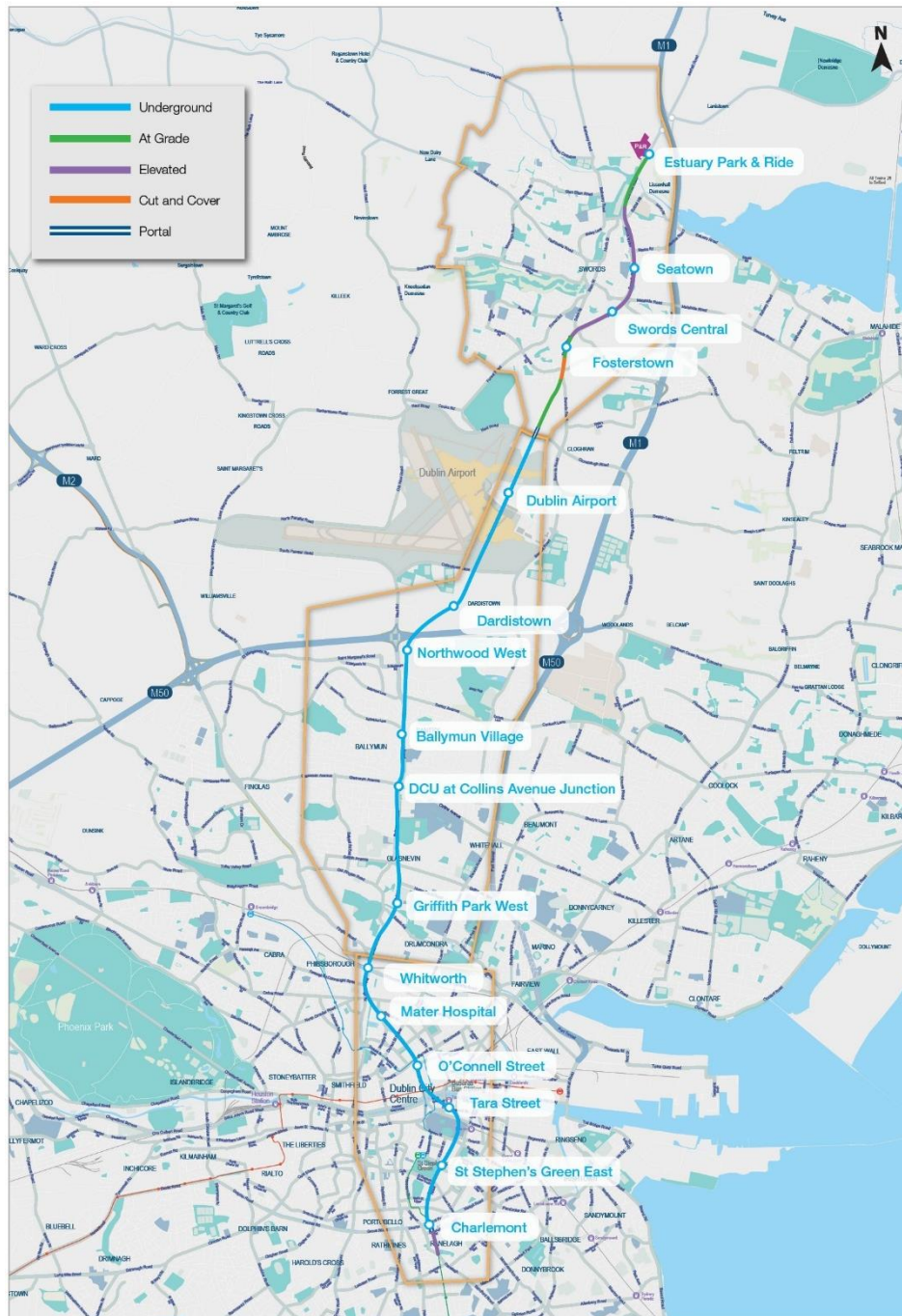
overall terms, therefore Option 8 is considered to have some advantages over other options from an Archaeology, Architecture and Cultural Heritage perspective due to the lesser potential impacts in Study Area A.

In terms of Soils and Geology (Ground Movement), the fact that Option 8 is in tunnel in the Swords area has an increased potential for ground movement on a quantifiable basis when compared with routes that are not in tunnel in Area C. Therefore, Option 8 is considered to have some disadvantages over other options, which are not entirely in tunnel.

In Summary, for Option 8 from an Environmental perspective, Landscape and Visual and Archaeology, Architecture and Cultural Heritage has some advantages over other options and Soils and Geology has some disadvantages over other options. Therefore, overall Option 8 is considered to have some advantages over other options.

8.2.9 Option 9

Option 9 (A4-B12-C4) serves Charlemont, St. Stephen's Green East, Tara Station, O'Connell Street, Mater Hospital (on Eccles St), Whitworth, Griffith Park West, DCU at Collins Avenue Junction, Ballymun Village, Northwood West, Dardistown, Dublin Airport, Fosterstown, Swords Central, Seatown and Estuary Park & Ride as shown on **Figure 8.9**.

Figure 8.9: Option 9 (A4-B12-C4)

8.2.9.1 Economy

The main economic parameters derived for Option 9 and how they compare to other route options are summarised in **Table 8.10**.

Table 8.10: Option 9 Economy Summary

Economy				
Sub-criterion:	BCR	Total Cost (€ Million)	Patronage (24 hour NMN boarding)	Journey Time (minutes)
Result:	2.20	€4,262	143,713	27.05
Compared to other 9 Options:				
Economy Result	Significant advantages over other options			

The BCR, Total Cost and Patronage is highly favourable for Option 9. The journey time is the second slowest of all ten options and therefore does not represent a significant time saving for patronage on this end-to-end option compared to other options. Overall, Option 9 is considered to have significant advantages over other options in this economic assessment.

8.2.9.2 Integration

Integration on the overall route is a combination of an assessment of how the route option supports existing and planned land-use policy and an assessment of how well the route options integrates with public transport.

Integration with Land Use Policy varies along the length of the option as it moves through the Study Area. It is not considered a differentiator when compared with other options across the breadth of Study Area A as all options provide an opportunity for consolidation and regeneration within the city centre area. However, in Study Area B, Option 9 serves Ballymun Main Street, which comprises vacant lands in public ownership and provides more opportunity to deliver high-density development to facilitate strategic development of the Ballymun area. By contrast, options serving existing lower density residential developments in Santry provide less potential for higher density developments along the corridor. In Study Area C, Option 9 directly serves the Metro Economic Corridor in line with the Fingal County Development plan, which generally runs along the R132. The Barrysparks LAP has also been developed based on the Metro Economic Corridor.

In terms of Public Transport Integration, Option 9 has the highest number of transfers with other PT modes (12,150 transfers), during the AM peak period. Option 9 interchanges with the DART at Tara Street thus showing an increase in modal interchange over options without this connection, and also interchanges with Heavy Rail at Whitworth. Option 9 also serves Ballymun Road, which is identified as a core bus corridor in the GDA Transport Strategy. By contrast, other options which serve Santry will not interchange directly with buses running along the Ballymun Road. In the Swords area, Option 9 serves the R132 and has the

potential to provide opportunity for direct interchange with bus services running along the R132, which is identified as a core bus corridor in the GDA Transport Strategy. Furthermore, the R132 is a wide road with potential for improved bus priority measures.

There is also potential to incorporate a well-integrated metro/bus interchange, near Swords Pavilions Shopping Centre and Barrysparks LAP lands. By contrast, other options which serve Swords Main Street have limited opportunity to provide bus priority measures due to space restrictions or would require significant interventions with subsequent impact on the streetscape and town centre environment.

Therefore, overall Option 9 is considered to have some advantages over other options in terms of Integration due to favourable integration with Land Use Policy in the Ballymun and Swords area, and favourable integration with Public Transport Integration in the city centre, Ballymun and Swords area.

8.2.9.3 Accessibility & Social Inclusion

In terms of Key Trip Attractors, Option 9 serves more attractors than other options in the city centre. Of particular note, St. Stephen's Green, the historical city centre public park and garden is served by Option 9.

Therefore, overall Option 9 is considered to have some advantages over other options from an Accessibility and Social Inclusion due to serving more Key Trip Attractors in the city centre.

8.2.9.4 Environment

In terms of potential impact on Landscape and Visual, Option 9 has the potential for direct impact on key spaces and views in the city centre. As with other route options through Study Area B, Option 9 is not considered to have any potential for differentiating impacts under this criterion. Within Study Area C in the Swords area, Option 9 is not considered to have any potential for differentiating impacts under this criterion. In overall terms, therefore Option 9 is considered to have some disadvantages over other options from a Landscape and Visual perspective due to the potential impacts in Study Area A.

In terms of potential impact on Archaeology, Architecture and Cultural Heritage, Option 9 has potential for impact on architectural heritage assets of national significance in Study Area A. The risk of identifying significant archaeological deposits in this area is also very high. As with other route options through Study Area B, Option 9 is not considered to have any potential for differentiating impacts under this criterion as the route is in tunnel, with the potential for impact limited to the station locations. Within Study Area C, in the Swords area, Option 9 follows the R132 on an elevated structure which has known sites of archaeological importance from the work on the previous metro project. The tunnelled option has not been subject to an equivalent level of archaeological testing, and therefore has potential for archaeological and cultural heritage impacts due to its physical proximity to Swords Castle demesne along Swords Main Street. Therefore, within Study Area C, Option 9 is not considered to have

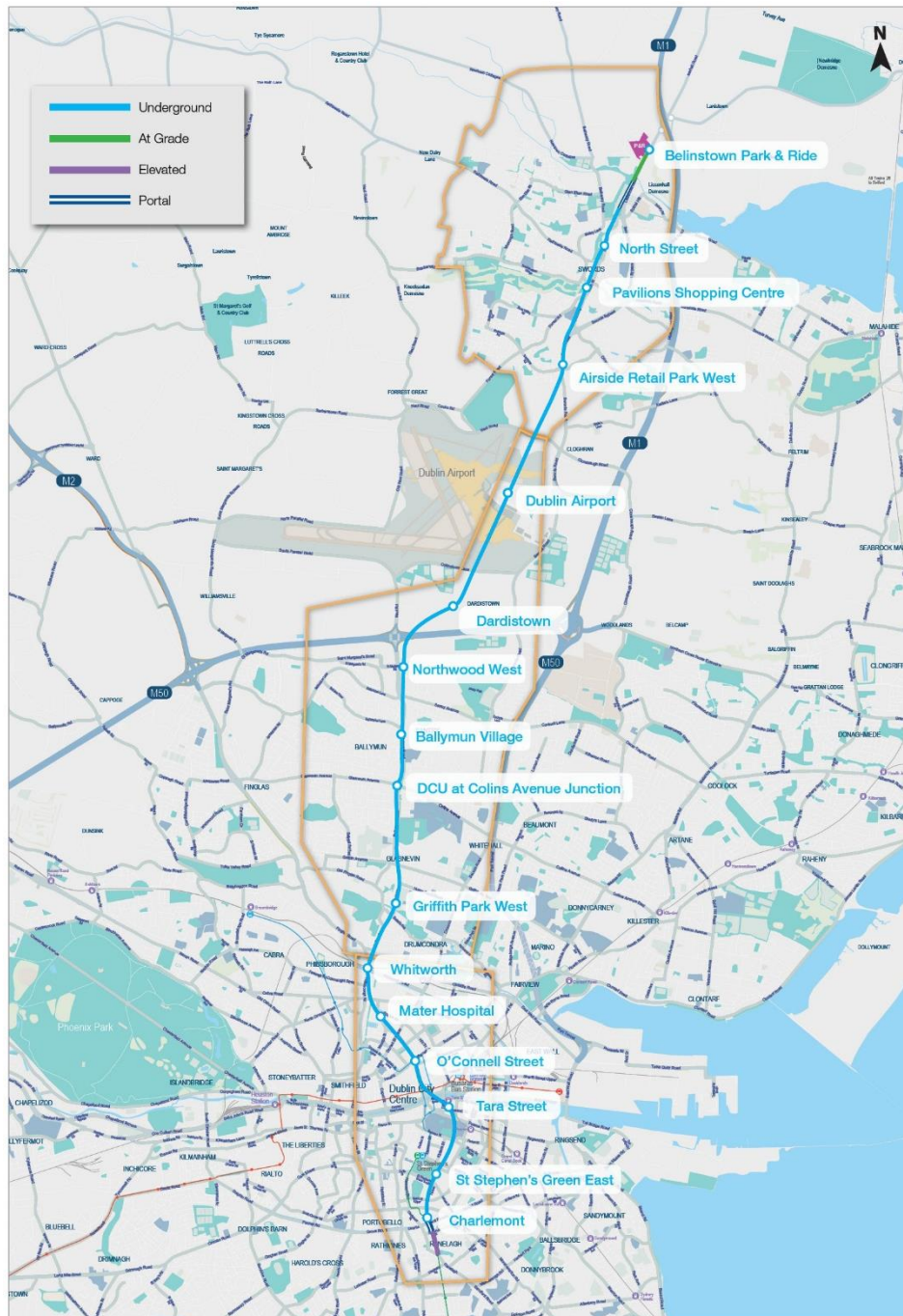
any potential for differentiating impacts under this criterion in the Swords area as both options through Swords have benefits/disbenefits. In overall terms, therefore Option 9 is considered to have some disadvantages over other options from an Archaeology, Architecture and Cultural Heritage perspective due to the potential impacts in Study Area A.

In terms of Soils and Geology (Ground Movement), the fact that Option 9 is elevated in the Swords area has a reduced potential for ground movement on a quantifiable basis when compared with routes that are entirely in tunnel. Therefore, Option 9 is considered to have some advantages over other options, which are entirely in tunnel.

In Summary, for Option 9 from an Environmental perspective, Landscape and Visual and Archaeology, Architecture and Cultural Heritage has some disadvantages over other options and Soils and Geology has some advantages over other options. Therefore, overall Option 9 is considered to have some disadvantages over other options.

8.2.10 Option 10

Option 10 (A4-B12-C11) serves Charlemont, St. Stephen's Green East, Tara Street, O'Connell Street, Mater Hospital (on Eccles St), Whitworth, Griffith Park West, DCU at Collins Avenue Junction, Ballymun Village, Northwood West, Dardistown, Dublin Airport, Airside Retail Park West, Pavilions Shopping Centre, North Street and Estuary Park & Ride as shown on **Figure 8.10**.

Figure 8.10: Option (A4-B12-C11)

8.2.10.1 Economy

The main economic parameters derived for Option 10 and how they compare to other route options are summarised in **Table 8.11**.

Table 8.11: Option 10 Economy Summary

Economy				
Sub-criterion:	BCR	Total Cost (€ Million)	Patronage (24 hour NMN boarding)	Journey Time (minutes)
Result:	2.21	€4,369	148,506	26.77
Compared to other 9 Options:				
Economy Result	Significant advantages over other options			

The BCR and Patronage is highly favourable for Option 10, however, the Total Cost is unfavourable compared to other options. The journey time is mid-range of all ten options and therefore does not represent a significant time saving for patronage on this end-to-end option compared to other options. Overall, Option 10, is considered to have significant advantages over other options in this economic assessment.

8.2.10.2 Integration

Integration on the overall route is a combination of an assessment of how the route option supports existing and planned land-use policy and an assessment of how well the route options integrates with public transport.

Integration with Land Use Policy varies along the length of the option as it moves through the Study Area. It is not considered a differentiator when compared with other options across the breadth of Study Area A as all options provide an opportunity for consolidation and regeneration within the city centre area. However, in Study Area B, Option 10 serves Ballymun Main Street which comprises vacant lands in public ownership and provides more opportunity to deliver high-density development to facilitate strategic development of the Ballymun area. By contrast, options serving existing lower density residential developments in Santry provide less potential for higher density developments along the corridor. In Study Area C, Option 10 serves Swords Main Street which is already largely developed with low density retail offering along its length. As such, there would be little opportunity for further growth immediately along this route in the future unless significant changes are made to the County Development Plan, with the opportunity for site assembly to change density provision, likely to be more challenging in the short to medium term.

In terms of Public Transport Integration, Option 10 is among the highest in terms of transfers with other PT modes (12,100 transfers), during the AM peak period. Option 10 interchanges with the DART at Tara Street thus showing an increase in modal interchange over options without this connection, and also interchanges with Heavy Rail at Whitworth. Option 10 serves Ballymun Road, which is

identified as a core bus corridor in the GDA Transport Strategy. By contrast, other options which serve Santry will not interchange directly with buses running along the Ballymun Road.

In the Swords area, Option 10 serves the Swords Main Street where there is limited opportunity to provide bus priority measures due to space restrictions or would require significant interventions with subsequent impact on the streetscape and town centre environment. These improvements to bus priority would be required on Swords Main Street/North Street to ensure high reliability of bus journey times and to provide more attractive interchange between bus and metro.

Therefore, overall Option 10 is considered to have some disadvantages over other options in terms of Integration due to less favourable integration with Land Use Policy and Public Transport Integration in the Swords area.

8.2.10.3 Accessibility & Social Inclusion

In terms of Key Trip Attractors, Option 10 serves more attractors than other options in the city centre. Of particular note, St. Stephen's Green, the historical city centre public park and garden is served by Option 10.

Therefore, overall Option 10 is considered to have some advantages over other options from an Accessibility and Social Inclusion perspective due to serving more Key Trip Attractors in the city centre.

8.2.10.4 Environment

In terms of potential impact on Landscape and Visual, Option 10 has the potential for direct impact on key spaces and views in the city centre. As with other route options through Study Area B, Option 10 is not considered to have any potential for differentiating impacts under this criterion. Within Study Area C, Option 10 is not considered to have any potential for differentiating impacts under this criterion in the Swords area. In overall terms, therefore Option 10 is considered to have some disadvantages over other options from a Landscape and Visual perspective due to the potential impacts in Study Area A.

In terms of potential impact on Archaeology, Architecture and Cultural Heritage, Option 10 has potential for impact on architectural heritage assets of national significance in Study Area A. The risk of identifying significant archaeological deposits in this area is very high. As with other route options through Study Area B, Option 10 is not considered to have any potential for differentiating impacts under this criterion as the route is in tunnel, with the potential for impact limited to the station locations.

Within Study Area C, in the Swords area, Option 10 follows the tunnelled option underneath Swords High Street. The tunnelled option has not been subject to the same level of archaeological testing as was the R132 from the work on the previous metro project, and has potential for archaeological and cultural heritage impacts due to its physical proximity to Swords Castle demesne along Swords Main Street. Therefore, within Study Area C, Option 10 is not considered to have any potential for differentiating impacts under this criterion in the Swords area as

both options have benefits/disbenefits. In overall terms, therefore Option 10 is considered to have some disadvantages over other options from an Archaeology, Architecture and Cultural Heritage perspective due to the potential impacts in Study Area A.

In terms of Soils and Geology (Ground Movement), the fact that Option 10 is in tunnel in the Swords area has an increased potential for ground movement on a quantifiable basis when compared with routes that are not in tunnel in Area C. Therefore, Option 10 is considered to have some disadvantages over other options, which are not entirely in tunnel.

In Summary, for Option 10 from an Environmental perspective, Landscape and Visual, Archaeology, Architecture and Cultural Heritage and Soils and Geology has some disadvantages over other options. Therefore, overall Option 10 is considered to have some disadvantages over other options.

8.3 Stage 2 MCA - Main-Criterion

Based on the findings from the Stage 2 sub-criterion assessment presented in **Section 8.2**, a summary of the overall assessment process and relative ranking of route options is presented in **Table 8.12**.

Table 8.12: Whole Route Options Assessment Summary (Main Criteria)

Assessment Criteria	Option 1 (A1-B6-C4)	Option 2 (A1-B6-C11)	Option 3 (A1-B10-C4)	Option 4 (A1-B10-C11)	Option 5 (A2-B6-C4)	Option 6 (A2-B6-C11)	Option 7 (A2-B10-C4)	Option 8 (A2-B10-C11)	Option 9 (A4-B12-C4)	Option 10 (A4-B12-C11)
Economy										
Integration										
Accessibility & Social Inclusion										
Environment										

As can be seen from this overall summary of the assessment process, Options 9 and 10 emerge as being the most favourable options. To understand why these options perform more favourably when compared to other options, there are a number of differentiating criterion as follows:

- Under the Public Transport Integration criterion, there are key differences in terms of the location, and potential impact of the proposed NMN interchange station with the Maynooth and Kildare Railway Lines, being at either

Drumcondra for Options 1-8 or at Whitworth Road for Route Options 9 and 10; and

- Route Options serving the wider Swords Area in terms of both economic differences and impact on land-use policy integration.

Each of these are discussed in more detail in subsequent sections.

8.3.1 Interchange with Maynooth & Kildare Railway Lines

A key difference between the options is the location of a potential interchange station on NMN connecting to the Maynooth and Kildare Railway Lines, being at either the existing Drumcondra railway station or the development of a new station at Whitworth Road.

The difference in performance between options interchanging at Drumcondra or Whitworth is considered in more detail under the following headings:

- Consistency with GDA Transport Strategy;
- Public Transport Patronage; and
- Passenger transfer from other public transport modes.

8.3.1.1 Consistency with GDA Transport Strategy

Chapter 6 of the Transport Strategy for the Greater Dublin Area 2016 – 2035 sets out the how transport services will be provided in the future. This deals with both the level of service and the integration of services and identifies that the public transport network needs to, amongst other things:

- Provide appropriate coverage of the region;
- Increase opportunities to transfer between modes and services;
- Provide fast and convenient access to major travel destinations throughout the region;
- Be easily understood to both local and visiting passengers; and
- Deliver reliable and predictable journey times.

The choice of station location on NMN will directly impact on how successful this network can be achieved. In the Phibsborough/Drumcondra area opportunities exist for interchange with the heavy rail network and local and regional bus network. The positioning of a station in this local area will have a significant influence on the integration of the network avoiding duplication and providing alternatives for passengers. In order to adequately cater for interchange with heavy rail it is necessary to have a station at either Drumcondra or Whitworth.

The Phoenix Park Tunnel Link (PPT) reopened for commuter passenger services as proposed in the GDA Transport Strategy and provides a link from the Kildare/Cork line to the city centre. The PPT provides a passenger connection on the existing rail connection that links Heuston and Connolly Stations. This connector runs from Islandbridge junction, just west of Heuston Station, crossing

the river Liffey and continuing northwards through Cabra, under the Royal Canal and the Maynooth line before heading eastwards around the north side of Glasnevin cemetery to Glasnevin Junction, where it joins the Maynooth line, which is immediately to the west of the R108 - Prospect Road i.e. Whitworth. There is currently no heavy rail station at this location. The line then continues eastwards through Drumcondra Station and onwards to Connolly Station. The line can also access the North Wall via North Strand Junction on existing tracks that are currently only used for freight movements.

The GDA Transport Strategy also promotes the construction of additional heavy rail stations in developing areas with sufficient transport demand. The addition of a heavy rail station in the area of Pelletstown, west of Whitworth, on the Maynooth Line is specifically referenced in the Strategy. The provision of a heavy rail station at Whitworth offers the additional opportunity of connecting with both the PPT and Maynooth lines.

A metro station at Whitworth is considered to better compliment the GDA Strategy than at Drumcondra, facilitating a seamless transfer/interchange with the two heavy rail lines. Drumcondra is and will remain highly accessible by public transport even without a metro station as is served by the heavy rail and bus network.

Furthermore, a Metro station located at Whitworth provides a better opportunity for interchanging with the Maynooth and Kildare lines than at Drumcondra because the PPT and Maynooth lines are at their closest point horizontally and vertically at Whitworth, thereby providing the opportunity for a NMN station to capture transfer to and from these lines more effectively than at Drumcondra, due to their proximity. The Whitworth location also facilitates the construction of an integrated metro station as the two heavy rail lines are beneath the existing ground level, making it possible to connect via an underground concourse to all three rails in a short plan distance.

The further advantage of Whitworth is that it is located approximately 1km to the west of Drumcondra. This saves over 2 minutes in journey time by offering the opportunity for passengers to transfer sooner from heavy rail to metro at Whitworth to access city centre locations to the south or to the Airport/Swords to the north. The impact of this is that there is an additional 600 transfer boardings from rail at Whitworth over Drumcondra in the AM peak (equivalent to a 33% increase – in the year of opening).

8.3.1.2 Overlap of Station Catchment

A comparison of the overlap of the Whitworth and Drumcondra station catchments with stations up and downstream was undertaken to understand if there were any benefits of the Whitworth over Drumcondra station locations (or vice versa) in terms of the physical areas served by these routes. The results of this assessment are illustrated in **Figure 8.11** and **Figure 8.12** and described in the following text.

Figure 8.11: Catchment Overlap Whitworth Station with adjacent Griffith Park and Mater Stations (1km catchment)

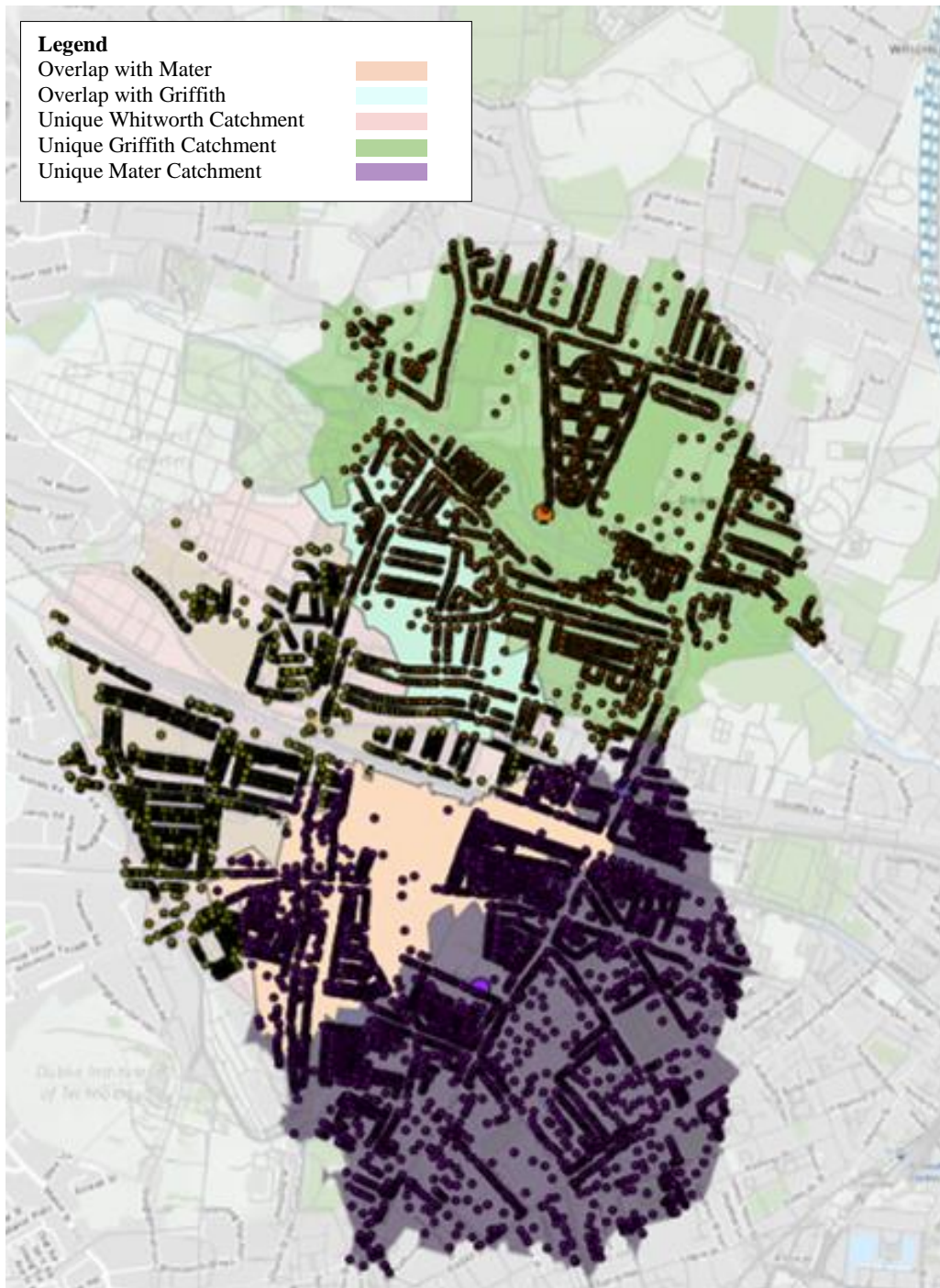
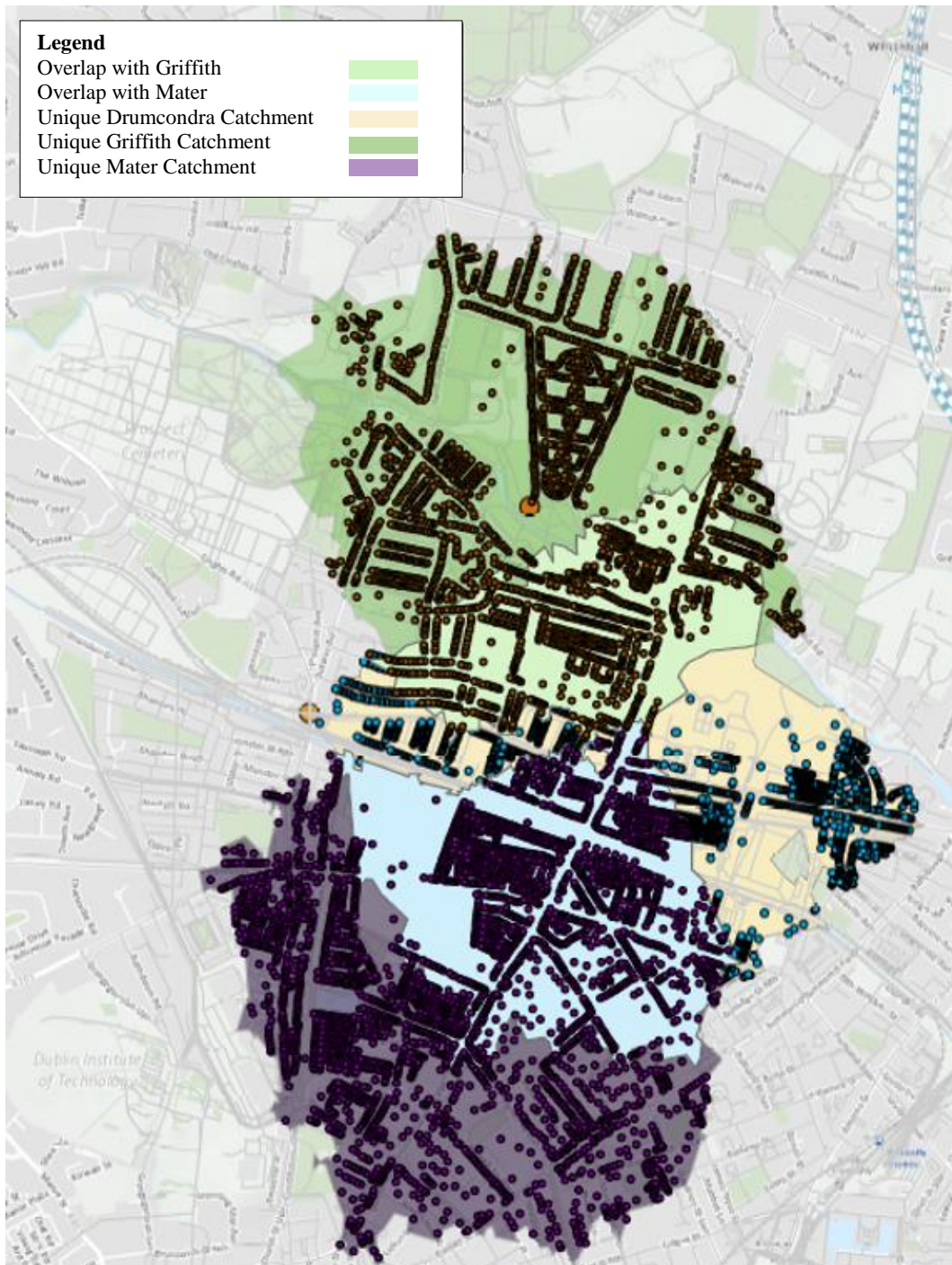


Figure 8.12: Catchment Overlap Drumcondra Station with adjacent Griffith Park and Mater Stations (1km catchment)



This assessment shows that for Whitworth Station, there is some overlap between it and the catchments of Griffith Park and Mater stations. Mater station covers some 32% of the catchment of Whitworth and 12% of the Whitworth catchment is covered by Griffith Park. The remaining 56% is served by the Whitworth Station alone.

For Drumcondra Station, there is significant overlap between the catchments of the Drumcondra, Griffith Park and Mater stations.

Mater covers some 60% of the catchment of Drumcondra and 20% of the Drumcondra catchment is covered by Griffith Park. The remaining 20% is served by Drumcondra Station alone.

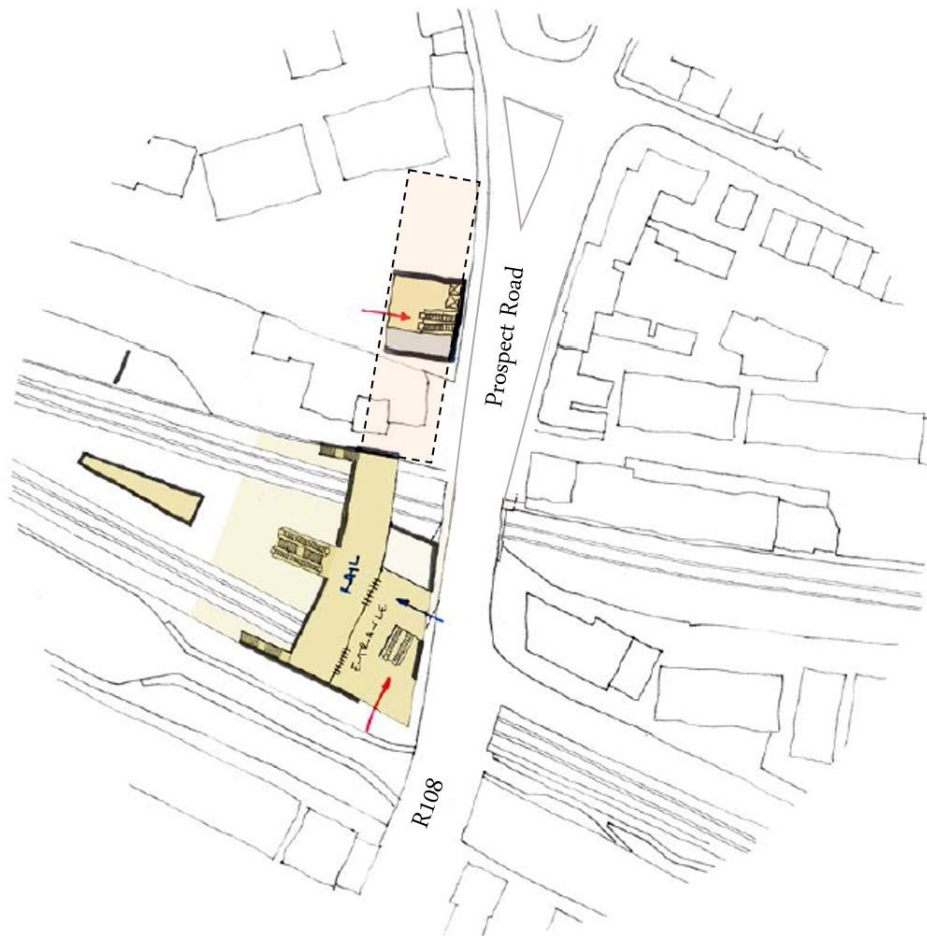
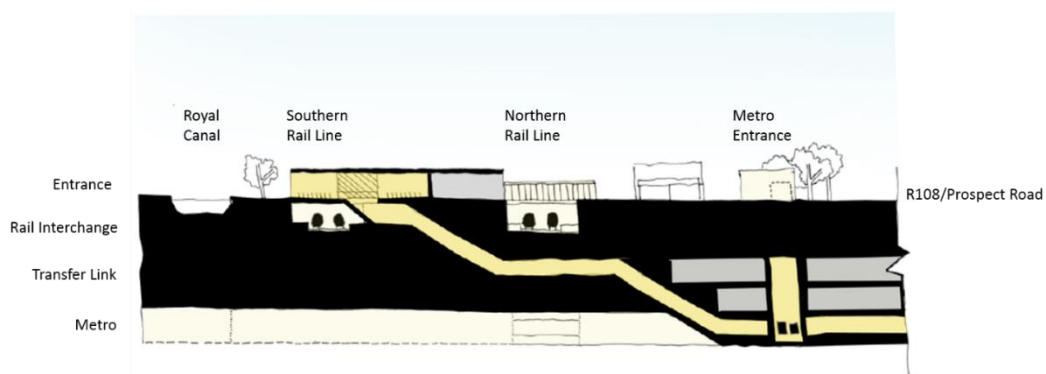
This assessment clearly shows that Whitworth Station serves a larger unique geographic area that is not served by stations up or downstream.

8.3.1.3 Integration with Phoenix Park Tunnel and Maynooth Heavy Rail Lines

Integration of public transport modes forms part of the GDA Transport Strategy, and key to integration is ensuring a positive passenger experience. This can be improved through better travel information, simplified fares and ticketing, improved interchange opportunities and easier access for mobility impaired and disabled people. A significant investment such as metro should be designed to deliver a high quality service which will serve the city for future generations.

The quality of service that can be provided at a station at Whitworth versus that provided at Drumcondra from the perspective of the end user is examined here.

Figure 8.13 and **Figure 8.14** illustrate in sketch format the likely station arrangement at Whitworth. Further detail on the proposed Whitworth station on specific route options can be found in Volume 3.

Figure 8.13: Potential Whitworth Interchange Station Layout**Figure 8.14: Potential Whitworth Interchange Station Section**

As shown, for Whitworth Station, the metro station box is provided directly adjacent to the upper rail line (to/from Connolly Station) with minimal transfer distance required both horizontally, maximum 30m to the lower rail line (to/from Docklands Station) which is furthest from the metro, and vertically with the metro beneath both heavy rail lines, which in turn are beneath the road level.

A similar opportunity does not exist naturally at Drumcondra as the two heavy rail lines diverge upon leaving Whitworth, and separate to approximately 160m in plan distance.

Figure 8.15 and **Figure 8.16** illustrate in sketch format the likely station arrangement at Drumcondra.

Figure 8.15: Potential Drumcondra Interchange Station Layout

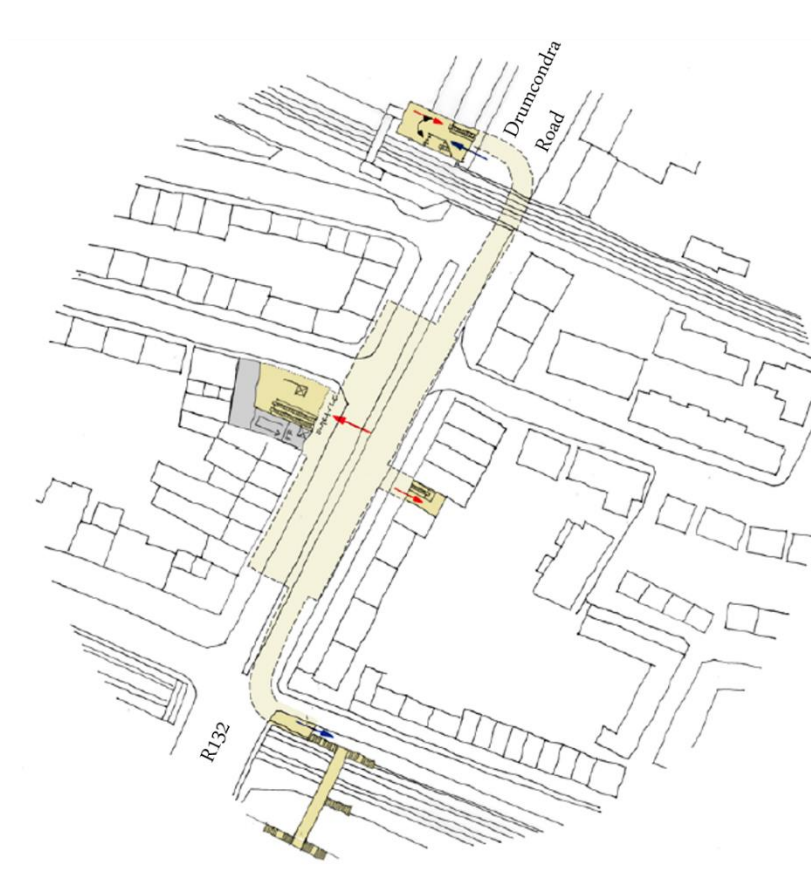
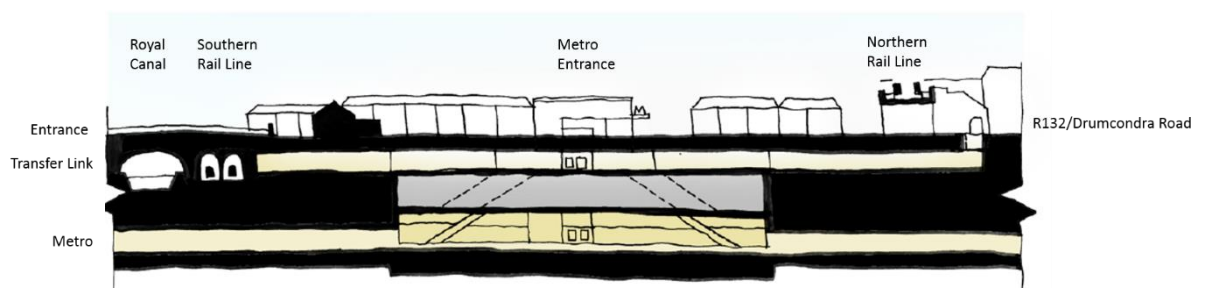


Figure 8.16: Potential Drumcondra Interchange Station Section



In terms of providing a comparable level of service to Whitworth in terms of internal station interchange between metro and the rail lines at Drumcondra, it would be more costly to replicate at Drumcondra. This is due to the significant cost implications of constructing a station along the Drumcondra Road Lower and the additional depth of the metro station to accommodate a comparable level of service internal transfer link to each of the heavy rail lines.

In addition, there is an elevation difference between the heavy rail lines at Drumcondra. The upper (to/from Connolly Station) heavy rail line crosses above Drumcondra Road Lower whereas the lower (to/from Docklands Station) heavy rail line crosses beneath Drumcondra Road Lower. While a metro station located between these two lines under the road would facilitate the connection between these two rail lines, passengers interchanging between the northern heavy rail line and the metro station itself would involve a vertical transfer from plus one to minus one level, plus a walking distance of 100m. Interchange between the upper (to/from Connolly Station) and lower (to/from Docklands Station) heavy rail lines would involve a significantly longer walk distance and would not likely occur due to the way finding required, as illustrated in **Figure 8.14**. The horizontal transfer length from metro to either rail line is approximately 110m, with vertical change in levels to interchange also adding to travel time.

In conclusion, the opportunity to connect a metro station to both heavy rail lines exists at both Whitworth and Drumcondra. However, from a passenger experience and ease of way-finding, Whitworth is preferable to Drumcondra due to the minimal separation both horizontally and vertically of the rail lines and the metro line. Way-finding, signage and access for users of all abilities is easier at Whitworth with only one level transfer whereas this becomes more complex at Drumcondra.

Route comparable options with a station at Whitworth versus those with a station at Drumcondra are therefore considered more preferable.

8.3.1.4 Integration with Bus Network

Integration between the rail and bus network is equally as important as integration between rail services. To compare the integration of Whitworth and Drumcondra Stations with the surrounding bus network, an assessment of bus services running past each station was undertaken by looking at bus services currently running past these stations and identifying how these integrated with the NMN route. Bus Routes are presented in **Figure 8.17** and **Figure 8.18**.

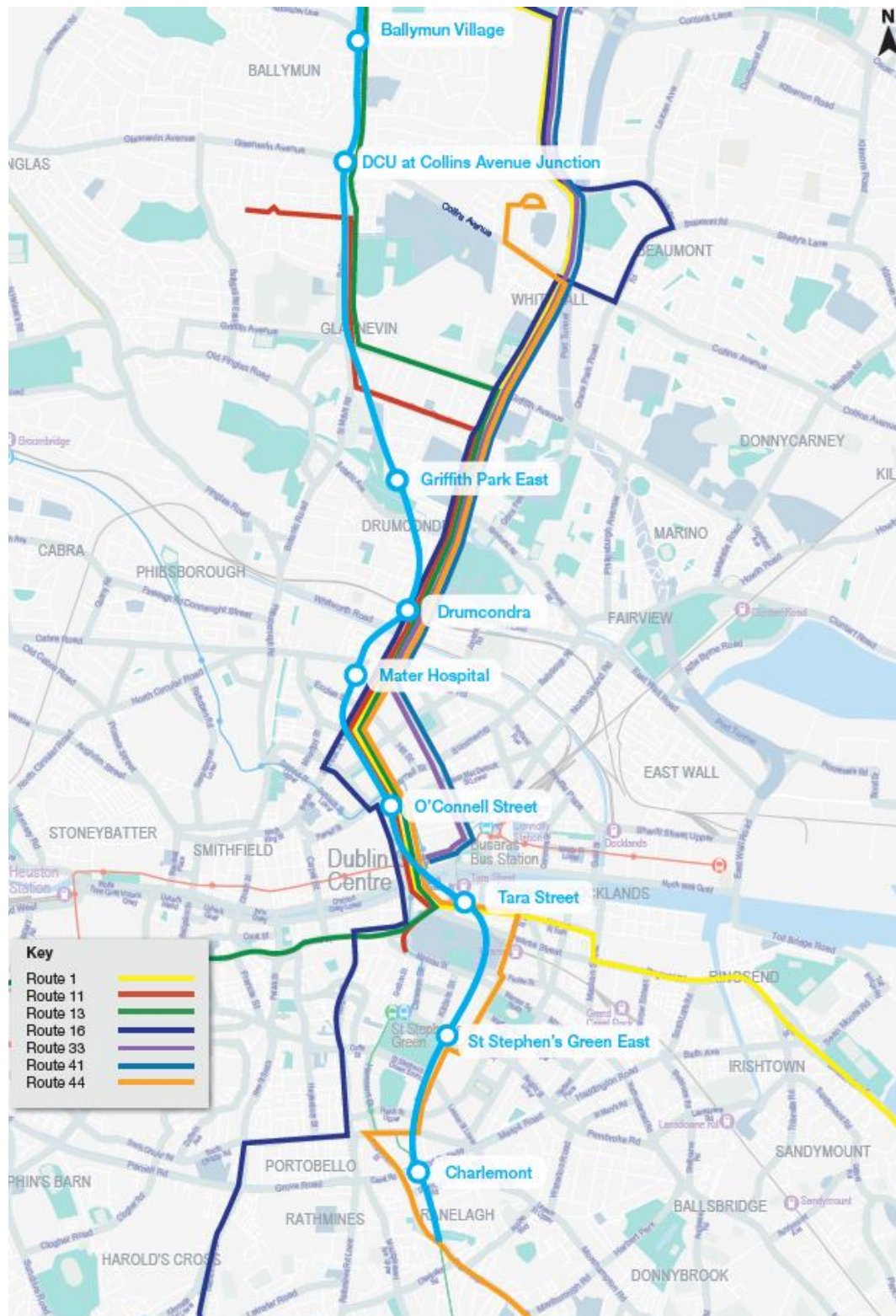
Figure 8.17: Bus Routes Passing Drumcondra Station (Option 7)

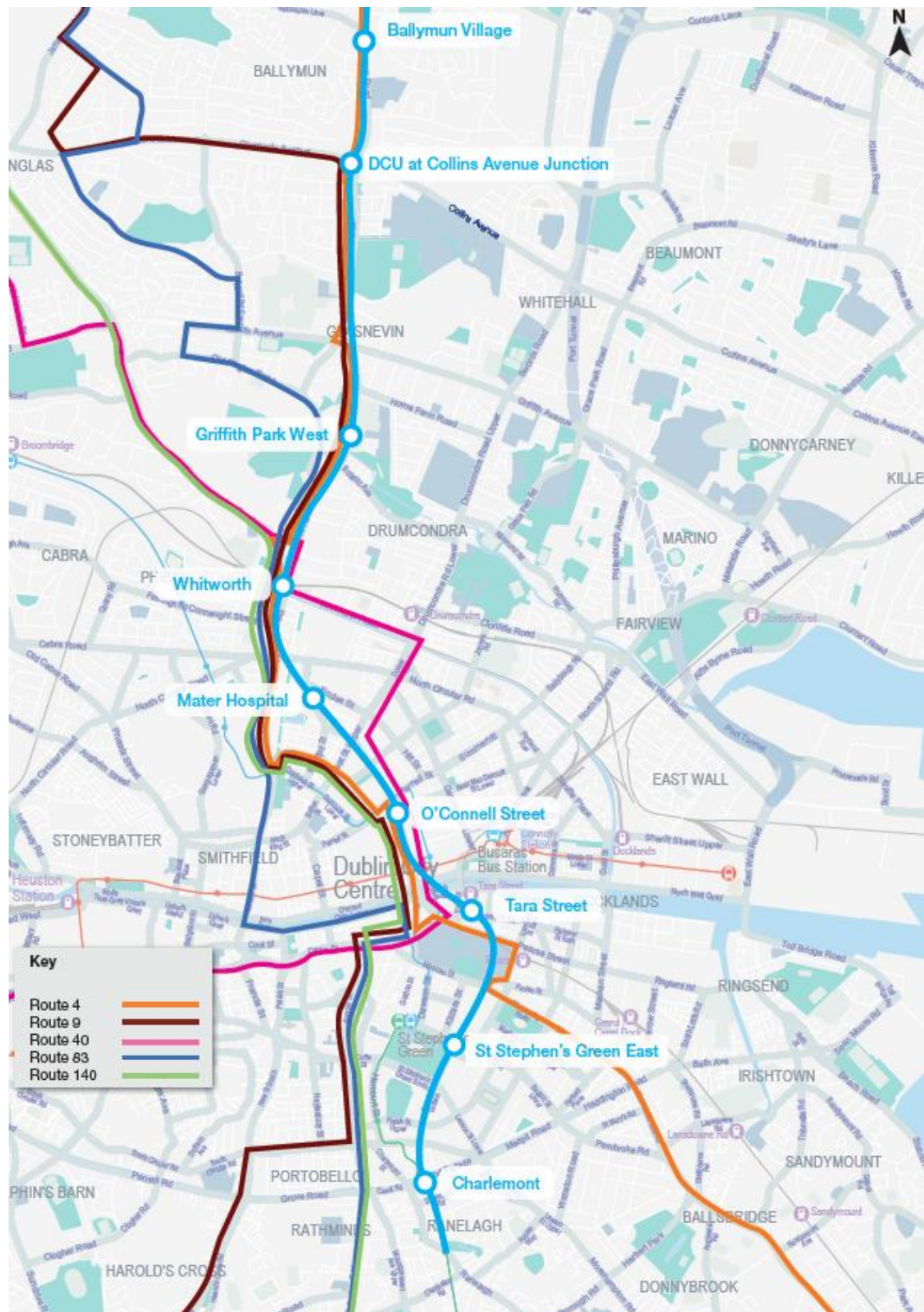
Figure 8.18: Bus Routes Passing Whitworth Station (Option 9)

Table 8.13: Integration of Metro Stations with Bus Network

	Route	Origin	Destination	Via	Frequency (minutes)	Duplication with NMN
Option 7	1	Santry	Sandymount	O'Connell / Townsend	15	No
	11	Wadelai Park	Sandyford	O'Connell / Leeson	15	Partial
	13	Harristown	Grangecastle	Ballymun / Drumcondra / Thomas Street	12	Partial
	16	Airport	Balinteer	Santry / Terenure	10	Yes
	33	Balbriggan	Abbey St	Santry	20-25	Yes
	41/c	Swords	Abbey St	Santry	8-10	Yes
	44	DCU	Enniskerry	O'Connell St. / Dundrum	60	Yes
Option 9	4	Harristown	Monkstown	Ballymun / O'Connell / Merrion Sq.	15	Partial
	9	Charlestown	Walkinstown	Ballymun South / O'Connell / Camden St.	15	Partial
	40	Charlestown	Liffey Valley	Finglas / Dame St. / Thomas St.	10-12	No
	83	Harristown	Kimmage	Finglas / College Green / Camden St.	10	No
	140	Finglas	Rathmines	Finglas / College Green / Camden St.	8-10	No

The assessment shows that a number of bus services currently running past Whitworth station have destinations in the south of the city which would be served by Metro and or the Luas Green Line. There is limited duplication of the routes and very limited opportunity for earlier transfer.

By contrast, a number of routes which currently run past Drumcondra station present earlier opportunities for transfer to Metro or mode switching with a number of routes serving the same corridor with duplication of services. Interchange from bus is likely to have occurred earlier along the route.

8.3.1.5 Patronage

In land-use planning terms the location of the stations is the more relevant consideration than the route between the stations. Both Whitworth Station and Drumcondra Station will equally facilitate the objectives of the Core Strategy and Land Use Zoning Objectives of the Dublin City Development Plan. A metro station at either of these locations is also considered equally warranted in terms of land use planning as either is capable of providing a public transport interchange. Therefore, a more detailed assessment of station patronage throughput was undertaken to establish whether there is an advantage at either location.

The patronage assessment undertaken as part of the Stage 2 MCA process provides a direct comparison of the patronage differential for options interchanging at Whitworth versus Drumcondra. This difference is illustrated by comparing Route Options 7 with 9 and Route Options 8 with 10 and is presented below (extracted from the **Transport Modelling Report, Appendix 8.1**).

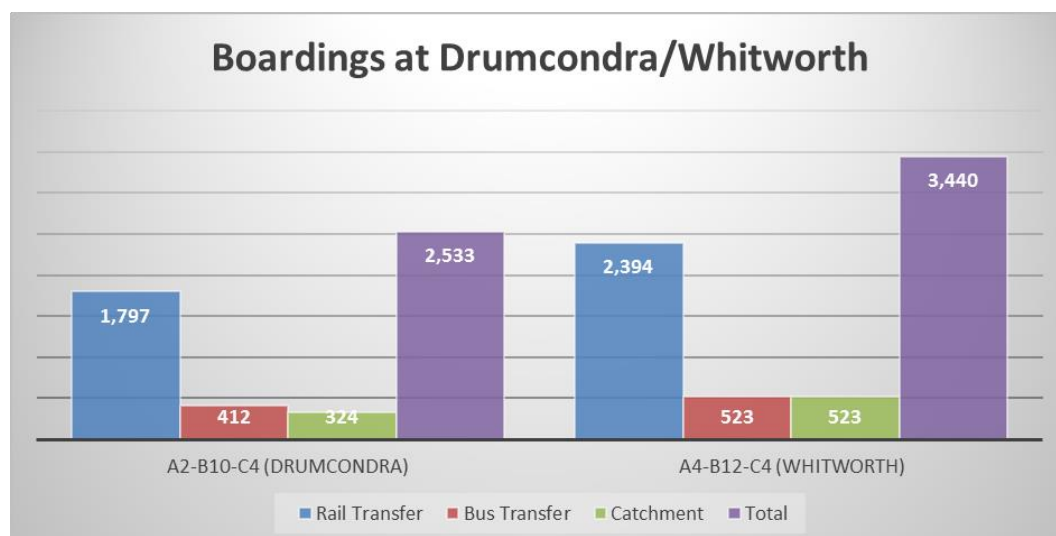
Table 8.14: Drumcondra v Whitworth Station Options - Public Transport Usage (2027 24-hr boardings)

Option	Public Transport Usage
	24-hr Passenger Boardings
Option 7: A2-B10-C4	137,883
Option 9: A4-B12-C4	143,713
Option 8: A2-B10-C11	142,899
Option 10: A4-B12-C11	148,506

Table 8.14 illustrates that when comparing Route Options 7 with 9 and 8 with 10, there are almost 6,000 more 24 hr passenger boardings forecast at Whitworth than Drumcondra. These differences are significant and are relevant in the context of overall potential transport network integration opportunities.

To illustrate this differential further, **Figure 8.1** (extracted from the **Transport Modelling Report, Appendix 8.1**) presents the AM Peak Hour trips from the local catchment as well as transfers from rail and bus at Drumcondra for Option 7 (A2-B10-C4) and similarly at Whitworth for Option 9 (A4-B12-C4) for comparison.

Figure 8.19: AM Peak Hour (2027) – Transfers and Boardings at Drumcondra/Whitworth



From **Figure 8.1**, in terms of interchange potential, Whitworth is seen to have significant advantages over Drumcondra. While the boardings resulting from the catchment area are similar at Whitworth and Drumcondra (approx. 200 higher catchment boardings at Whitworth), transfer boardings from Rail and Bus are higher at Whitworth than at Drumcondra.

The results show that more passengers are likely to transfer at Whitworth than at Drumcondra. For example, some heavy rail passengers travelling eastbound on the Maynooth and Kildare (via Phoenix Park Tunnel) Lines who wish to get to the city centre or the Airport will avail of the opportunity to transfer onto Metro earlier in their journey.

This is because the time taken for Metro to travel to the core city centre area (e.g. O'Connell St. / Tara Street / St. Stephen's Green) is quicker and preferable for more passengers than remaining on the heavy rail line to access the core city centre area by heavy rail stations. A rail-metro interchange at Whitworth therefore performs better in this regard than a rail-metro interchange at Drumcondra.

8.3.1.6 Journey Time

A comparison of the journey time between two nodes common to each option was undertaken to understand if there were any benefits to journey time of one option over another. This assessment was carried out for both the Maynooth (Broombridge to St. Stephens Green) and Kildare Lines (Park West / Cherry Orchard to St. Stephens Green) and compared against the existing journey time. The results are presented in **Table 8.15**.

Table 8.15: Summary of Assessment of Drumcondra v Whitworth

Route	Existing	Option 7	Option 9
Broombridge to SSG (Maynooth Line)	Transfer Rail to Luas - 5mins Luas Green line - 24mins Total - 29mins	Broombridge to Drumcondra - 5 mins Transfer Rail to Metro - 5mins Metro North - 6mins Total - 16mins	Broombridge to Whitworth - 3mins Transfer Rail to Metro - 4mins Metro North - 6mins Total - 13mins
Park West / Cherry Orchard to SSG (Kildare Line)	Rail to Tara - 22mins Walk - 13mins Total - 35mins	Rail to Drumcondra - 14mins Transfer Rail to Metro - 5mins Metro North - 6mins Total - 25mins	Rail to Drumcondra - 12mins Transfer Rail to Metro - 4mins Metro North - 6mins Total - 22mins

As can be seen in **Table 8.15** both Option 7 and Option 9 offer significant journey time benefits over the existing situation. However, as Whitworth provides an earlier interchange opportunity on both heavy rail lines, as well as a shorter physical interchange distance, Option 9 offers shorter journey times.

8.3.1.7 Summary

Table 8.16 presents summary of the assessment undertaken to compare the benefits or otherwise of Drumcondra and Whitworth stations.

Table 8.16: Summary of Assessment of Drumcondra v Whitworth

	Option 7 (Drumcondra)	Option 9 (Whitworth)
Station Catchments	There is significant overlap between the catchments of the three stations. Mater covers some 60% of the catchment of Drumcondra and 20% of the Drumcondra catchment is covered by Griffith Park.	There is some overlap between the catchments of the three stations. Mater covers some 32% of the catchment of Whitworth and 12% of the Whitworth catchment is covered by Griffith Park.
Interchange with PPT & Maynooth Line	110m horizontal interchange between metro and rail platforms with the PPT & Maynooth Lines separate interchange point for each line Significant vertical and horizontal divergence between existing rail lines compounded by the underground nature of metro alignment New platforms required to serve Docklands Line.	30m horizontal interchange between metro and rail platforms Closest horizontal and vertical alignments allowing ease of interchange across all combinations of rail & metro New platforms / station required to serve the existing rail lines.
Interchange with Bus	A number of the routes along this corridor present earlier opportunities for transfer to Metro or mode switching with a number of routes serving the same corridor with duplication of services. Interchange from bus is likely to have occurred earlier along the route.	A number of the routes have destinations in the south of the city which would be served by Metro and or the Luas Green Line. There is limited duplication of the routes and very limited opportunity for earlier transfer. The journey time savings make transfer from bus very attractive.
Patronage	24 hour 137,900 AM Peak 2,500 Local 330 Rail 1,800 Bus 400	24 hour 143,700 AM Peak 3,450 Local 500 Rail 2,400 Bus 500
Journey Time Reductions	Maynooth Line 13mins PPT 10mins	Maynooth Line 16mins PPT 13mins

Based on the analysis undertaken a station at Whitworth provides better access for the local population to the Metro system while also providing better levels of integration with the heavy rail and bus network thereby making a greater contribution to achieving the goals of the NTA Transport Strategy for the Greater Dublin Area.

8.3.2 Swords Area Route Option Comparison

Another key differentiator between the Route Options is consideration of NMN alignment options which will best serve the Swords area, currently and into the future. To show this difference a comparison of the transport user benefits, the net present value of costs and resulting Benefit to Cost Ratios for route Options 9 and

10 are shown in **Table 8.17**. Total Cost and Public Transport Usage are also presented in this table to provide an understanding of the contributing factors to these results.

Table 8.17: Transport User Benefits, Present Value of Costs, BCR, Total Cost and Public Transport Usage

	Transport User Benefits	Present Value of Costs	Benefit to Cost Ratio (BCR)	Total Cost	Public Transport Usage
	(€'000,000)	(€'000,000)		(€)	24-hr Passenger Boardings
Option 9: A4-B12-C4	6,274	2,855	2.20	4,262,000,000	143,713
Option 10: A4-B12-C11	6,544	2,960	2.21	4,369,000,000	148,506

In terms of forecast public transport usage, route Option 10, which serves Swords Main Street is forecast to have a higher number of 24hr passengers boardings at 148,506 versus 143,713 for Option 9. As a result, Route Option 10 also has higher transport user benefits than Option 9 (4% higher).

In terms of total capital cost however, Option 10 is approximately €107m more expensive than Option 9 (5% higher) as a result of the longer length of tunnel under Swords Main Street when compared to the elevated alternative along the R132 immediately to the east of Swords Main Street.

The effect of this is that Option 10 has higher transport user benefits but costs more than Option 9 to deliver these benefits, which results in both options having roughly the same BCR. In addition, the other key difference in the Swords area, is the extent to which each provides for land-use policy integration.

National, regional and local policy places significant emphasis on growth in the Swords area and in particular within the Metro Economic Corridor, which generally runs along the R132.

As set out in **Chapter 1**, and in more detail in **Appendix 1.1**, within the Fingal County Development Plan, Swords town and environs is planned to grow to a population of 100,000. Additionally, the Draft National Planning Framework targets a growth of 265,000 in Dublin and its suburbs by 2040, a large portion of which could be facilitated in areas along the Metro Economic Corridor. In addition to the County Development Plan, there are a number of Local Area Plans for strategic development land banks in the Swords area, namely Fosterstown LAP and Barrysparks LAP, which could collectively deliver residential population of approximately 5,000 people in addition to planned significant additional office (employment) and retail uses.

Both route options broadly serve the wider Metro Economic Corridor, but to differing degrees, the primary difference being the extent to which zoned higher density development lands focused on the 'Metro Quarter' on the R132, as identified in the Swords Master Plan, and as adopted by Fingal County Council in

their County Development Plan and locally through the Barrysparks LAP. The Barrysparks LAP has been developed on the basis of the route of Old Metro North along the R132 and, as such is heavily linked to the provision of the metro along this alignment, facilitating the provision of significant new commercial and retail development centred within the area. The interaction between the Barrysparks lands, the Metro station on the R132 and the Swords Pavilions expansion west of the R132 have been considered in some detail in the LAP with a metro station proposed between the two and integrated into the plan. While the alignment of Option 9 is elevated along the R132 compared to a mix of at-grade/elevated in the Original Metro North, this difference could be easily incorporated into any amended plan for the lands. It is worth noting the LAP states that “*no development shall commence within the LAP lands until the Government approves the awarding of the main infrastructural contract by the RPA for the construction of Metro North to Swords*” further highlighting the importance of the Metro in the context of development on these lands. By contrast, Option 10 which serves Swords Main Street would not directly serve the Barrysparks LAP lands identified for development.

Furthermore, Swords Main Street is largely developed with low-density retail offering along its length. As such, there would be little opportunity for further growth immediately along this route in the future unless significant changes are made to the County Development Plan, with the opportunity for site assembly to change density provision likely to be more challenging in the short to medium term.

Given the above, it is considered that Option 9, which runs along the R132 better facilitates the planned future strategic growth of Swords and environs. This therefore, in addition to the economic differences between route options, results in a preference for Option 9 over Option 10 in Swords.

8.3.3 Refinement of station locations

During concept design development, the location of the station at DCU Collins Avenue was moved south by approximately 100m, i.e. the overall length of the station box, to available space in front of the Roman Catholic Church to seek to reduce the impacts on the community during construction.

The location of the station at Ballymun Village also moved south by an equivalent distance of approximately 100m, again equivalent to the overall length of the station box, so that the station aligns with the centre of the Ballymun shopping centre area.

Each of these changes are not considered significant in terms of the overall multi-criteria assessment and would not alter the overall conclusion or ranking of the options. In addition, this change would be incorporated into the Emerging Preferred Route selected whether it is Option 9 or Option 10 and therefore would have the same impact on either option.

8.4 Conclusions and Recommendation

The following are the main conclusions of the multi-criteria assessment:

- The most direct end-to-end route options are the cheapest options to construct as they are the shortest in length, and would have a comparatively high BCR. These direct options would, however, attract lower patronage numbers compared to the other options;
- End-to-end route options which interchange with the heavy rail line at Drumcondra or Whitworth plus interchange with the DART at Tara Street are considered to integrate with the existing and planned public transport network better than options which do not interchange with DART at Tara;
- End-to-end route options which serve Whitworth better integrate with the GDA Transport Strategy than those options which serve Drumcondra, due to the overall better integration with the existing and planned public transport network, especially the heavy rail network. Furthermore, Whitworth Station has higher patronage than Drumcondra Station and facilitates a better passenger experience;
- End-to-end route options which serve Swords Main Street have slightly higher patronage than the equivalent options which serve the R132 in Swords. However, the additional cost of the end-to-end route options which serve Swords Main Street is €128m;
- End-to-end route options along the R132 are better in terms of supporting land-use policy integration and planned future growth; and
- End-to-end route options which serve A2/A4, B10/B12 or C4 (Option 5, 6, 7, 8 and 9) result in lesser impacts on the environment compared to those which serve alternative options.

Based on the preceding assessment, on balance, **Option 9 (A4-B12-C4)** emerges as preferred route for NMN for the following primary reasons:

- In terms of Economy, it delivers substantially more benefits than most of the options resulting in the joint highest BCR;
- It performs among the best in terms of public transport usage i.e. boardings over 24 hours, which in turn provides a positive economic return;
- In terms of Integration, it integrates better with the wider transport network with better potential for seamless interchange with other modes, particularly heavy rail in the city centre and bus in Swords, than other options considered;
- Again, in terms of Integration, it integrates better with current Land Use Policy particularly in Ballymun and Swords; and
- In terms of Environment, while there are some impacts in terms of Landscape and Visual and Archaeology, Architecture and Cultural Heritage, these impacts can be mitigated through design.

Option 9 (A4-B12-C4) is therefore recommended as the ‘Emerging Preferred Route’ for NMN.

9 Emerging Preferred Route

9.1 EPR Description

The alignment of New Metro North commences at the tie-in to the Green Line at Charlemont, south of the Grand Canal. Charlemont Station facilitates the transfer of passengers from the Luas Green Line to New Metro North in the interim until the upgrade of the Luas Green Line is complete, which will then facilitate through running of metro onto the Luas Green Line.

The New Metro North will cross beneath the canal in a tunnel, and proceed north through the city centre via a station at St Stephen's Green East and Tara Street, where interchange with the DART line is available. The proposed station is located in the block which bounds the Irish Rail lands at Tara Station. There will be a station at the top of O'Connell Street to provide access to the northern core retail area of the city centre. The metro will then continue in a tunnel north-west with a station near Mater Hospital, and on to Whitworth, where interchange with the heavy rail lines coming in from Maynooth and Kildare is possible. The location of the station at Whitworth is positioned near the point of convergence of the two heavy rail lines in order to maximise the interchange opportunities, both existing and into the future, whilst minimising impacts during construction to the local residents. The construction of a new heavy rail station at this location facilitates turn-back and termination of some commuter services here, thus freeing up inner city tracks. The underground metro provides an interchange with both commuter lines at this location.

From Whitworth, New Metro North will proceed north, again in tunnel generally following the alignment of R108 Prospect Road, to the playing fields at the Na Fianna GAA grounds. Continuing north, the metro serves DCU with a station located on the eastern side of the R108 in front of the Church of Our Lady of Victories which provides pedestrian access to DCU. This station also serves the bus routes currently on the orbital route of Collins Avenue. From Collins Avenue, the tunnel alignment continues to follow the R108 to Ballymun Village, with a station located near the village centre south of the junction with Shangan Road. New Metro North will then proceed north to Dublin Airport, remaining in a tunnel beneath the M50, with stations proposed in the business park at Northwood and at Dardistown, which is zoned for future development. The station at Dublin Airport is located at the hub designated for the metro within the Dublin Airport Masterplan.

New Metro North emerges from tunnel to the north of Dublin Airport and continues north to serve the Swords area, with an at-grade station at the south at Fosterstown before continuing on an elevated system along the median of the R132. There are two stations on the elevated section, at Swords Central and Seatown. The alignment returns to existing ground level to the north of Swords with the final station at Estuary, which also is the location of the strategic park and ride.

9.1.1 New Metro North Stations

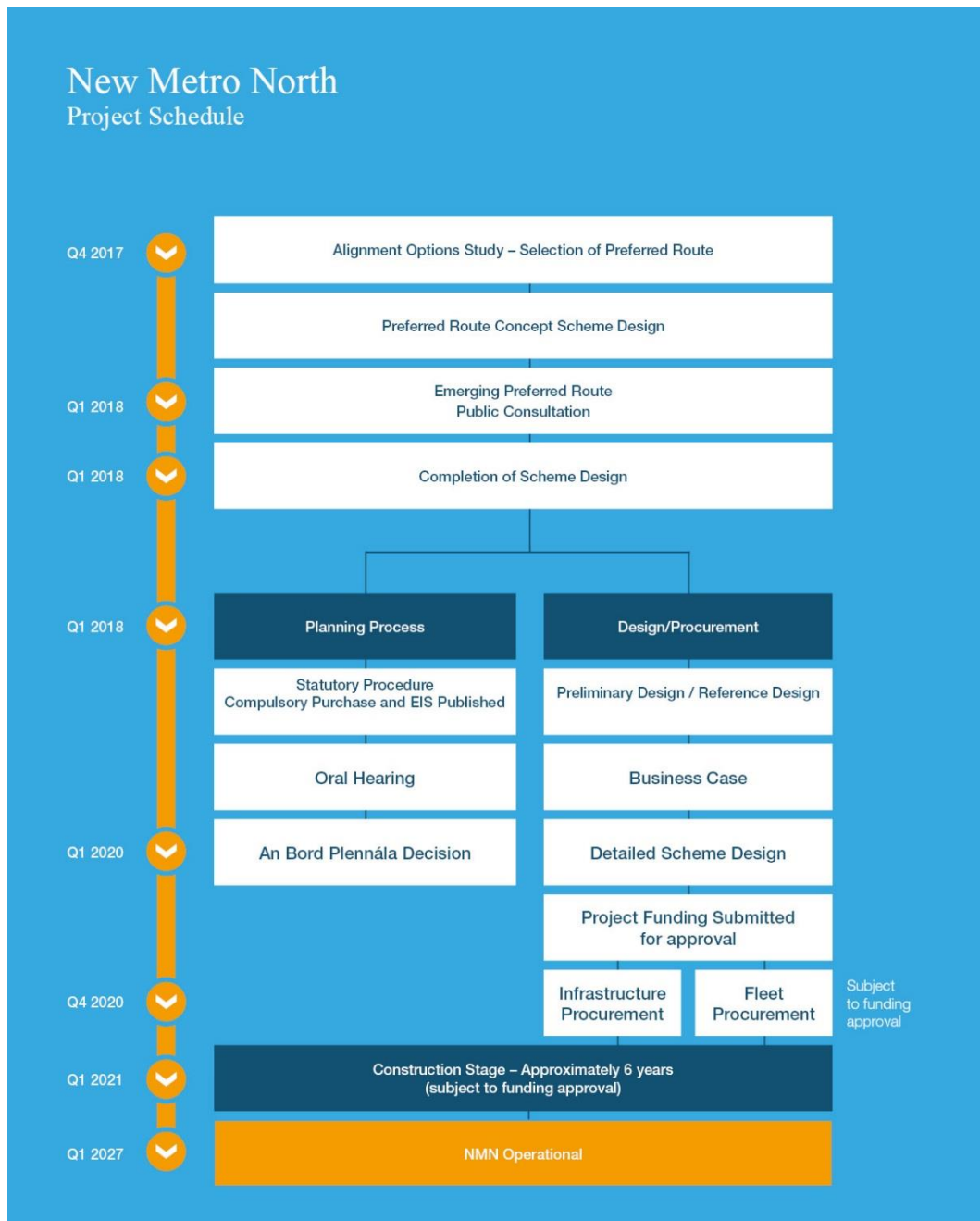
The stations on the Emerging Preferred Route to be taken forward and developed to concept design level are as follows:

1. Charlemont
2. St. Stephen's Green East
3. Tara Street
4. O'Connell Street
5. Mater Hospital (at Eccles Road)
6. Whitworth
7. Griffith Park West
8. Dublin City University
9. Ballymun Village
10. Northwood West
11. Dardistown
12. Dublin Airport
13. Fosterstown
14. Swords Central
15. Seatown
16. Estuary P&R

10 Next Steps

A flow chart illustrating the next stages in the project development, up to and including the statutory planning process, is presented in **Figure 10.1**.

Figure 10.1: New Metro North Next Steps



As part of this study an initial concept scheme design has been prepared for the preferred route and will be presented to the public as part of the ‘Emerging Preferred Route Public Consultation’.

A final concept scheme design will be completed, taking on board feedback from the public consultation process where practical, to confirm a preferred scheme for NMN, including land acquisition requirements where necessary.

This preferred scheme will be the subject of a detailed environmental impact assessment and progressed through the Statutory Planning and Compulsory Purchase Order (for land acquisition) processes.

Subsequent to the planning stage, the detailed scheme design will be finalised and tender documents for infrastructure procurement, associated systems and fleet acquisition will be prepared.

Subject to funding approval, the proposed scheme could then proceed to procurement and construction stages. It is anticipated that the construction period would be about 6 years.