



Dún Laoghaire to City Centre Core Bus Corridor Options Study

Feasibility and Options Assessment Report

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Prepared by

Dimitris Karakaxas
Associate Director /
Matthew Richardson
Graduate Engineer

Checked by

Dimitris Karakaxas
Associate Director

Approved by

Eoin O'Mahony
Associate Director

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Prepared for:

National Transport Authority 00353(0)18798300
Iveagh Court, Harcourt Lane
D02 WT20, Dublin 2
Ireland

AECOM Limited
4th Floor
Adelphi Plaza
Georges Street Upper
Co. Dublin
Ireland

T: +353 1 238 3100
aecom.com

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Glossary of Terms

- **BRT:** Bus Rapid Transit
- **DCC:** Dublin City Council
- **DTTAS:** Department of Transport, Tourism and Sport
- **EPO:** Emerging Preferred Option
- **EPS:** Emerging Preferred Scheme
- **FCC:** Fingal County Council
- **GDA:** Greater Dublin Area
- **GIS:** Geographic Information Systems
- **LAP:** Local Area Plan
- **LoS:** Level of Service
- **NTA:** National Transport Authority
- **OSi:** Ordnance Survey Ireland
- **pNHA:** proposed Natural Heritage Area
- **QBC:** Quality Bus Corridor
- **CBC:** Core Bus Corridor
- **QoS:** Quality of Service
- **RMP:** Record of Monuments and Places
- **ROA:** Route Options Assessment
- **RPA:** Railway Procurement Agency
- **RTPI:** Real Time Passenger Information
- **SAC:** Special Area of Conservation
- **SPA:** Special Protection Area

Definitions

- **Study Area:** The area along the Dun Laoghaire to City Centre corridor within which route options have been identified and assessed.
- **Study Area Section:** An identifiable extent of the study area between two locations.
- **Route Section:** The road(s) along which the Dun Laoghaire to City Centre Core Bus Corridor will be provided. A route section is generally confined to a single road/street.
- **Route Options:** Various adjacent route sections are combined to form 'end-to-end' route options.
- **Scheme Option:** This refers to the detailed development of a route option in terms of bus and cycle provisions and road configuration along the route. Typically, a number of scheme options are designed along each route option.
- **Journey Time:** The time taken to make a journey between two distinct points including dwell times at stops and delays at junctions.
- **CBC Infrastructure:** All physical facilities required to support the CBC system – stops, CBC lanes, public lighting, etc.
- **Route Options Assessment Study:** The assessment process for potentially viable route options carried out in order to identify the nature and extent of the effects, both positive and negative, on the existing and planned transport infrastructure and receiving environment. The outcome of the route options assessment study is a recommendation for a preferred route for the proposed scheme.

Citations

- The background mapping used frequently in figures in report Sections 4, 5, 6, 7 and 8 is based on OSi maps. The source is ArcGIS Viewer for Silverlight (ESRI), for which AECOM hold a license.
- Residential, employment destination and education destination figures in report Section 6 are based on the Census 2011 Small Area Population Statistics (SAPS).

Appendices

- **Appendix A - Multi Criteria Analysis Tables:** Presents the tables of criteria and sub criteria used to assess the developed scheme options along each route option identified in the Study Area.
- **Appendix B - Data Collection:** Presents a discussion on the data collected and the existing situation in the study area.
- **Appendix C - Bus Journey Times:** Presents the matrix and criteria used to calculate the journey times along each route.
- **Appendix D - Problem Identification:** Presents a summary of the problems identified as well as a discussion of the existing conditions along each of the route options.
- **Appendix E - Parking Survey:** Presents a discussion on the parking conditions identified in the existing road network within the study area.
- **Appendix F - Cost Estimate:** Presents a summary of the infrastructure and land acquisition costs associated with each of the scheme options considered.
- **Appendix G - Infrastructural Cost Estimate:** Presents a detailed breakdown of the infrastructural cost estimate for each of the scheme options considered.
- **Appendix H - Environmental Desktop Study Report.**
- **Emerging Scheme Design Drawings:** 20 Drawing Sheets

1. Introduction

1.1 Preamble

This report presents the findings of the route options assessment work undertaken for the Dún Laoghaire to City Centre Core Bus Corridor (CBC) and a recommendation on the **emerging preferred option** is made.

The work presented in this report concentrates on the bus priority provision developed for the CBC, based on the assumption that a number of high frequency bus services will avail of the CBC infrastructure.

The assessment undertaken of potentially feasible route options, identified within the scheme study area, against established MCA criteria is discussed in this report. Where a number of design options were considered along the preferred route, these are also discussed and documented. A concept scheme design along the emerging preferred option identified is subsequently presented.

1.2 Report Structure

- **Section 2:** The strategic transport policy context which has led to the identification of a need for the delivery of a CBC on this corridor is discussed in this section.
- **Section 3:** The objectives of the core bus network and the proposed scheme are presented. The extent of the CBC study area assessed, effectively defining the proposed scheme corridor, is described in this section identifying key constraints and opportunities, the integration of the corridor with the wider public transport network and the compatibility with other road users.
- **Section 4:** The methodology for identifying and assessing the feasibility of the various route options potentially available within the study area is discussed in this section including:
 - the selection and determination of initial criteria for screening and assessing technically feasible route options, based on distinct, project-specific objectives;
 - the definition of MCA criteria; and
 - the identification of Study Area Sections where practical route options have been considered and presentation of an initial network ('spiders web') of route sections examined.
- **Sections 5 and 6:** Details the route options assessment for each of the three Study Area Sections.
- **Section 7:** The Emerging Preferred Option is identified and described.
- **Section 8:** Presents a cost estimate for the concept design of the Emerging Preferred Scheme.
- **Section 9:** Discusses the Emerging Scheme Benefits.
- **Section 10:** Discusses the next steps.

2. Transport Context

2.1 Transport Strategy for the Greater Dublin Area 2016 – 2035

The Transport Strategy for the Greater Dublin Area 2016 – 2035 identified a core bus network for the Greater Dublin Area (GDA). This core network represents the most important bus routes in the region, which are generally characterised by a high frequency of bus services, high passenger volumes and with significant trip attractors located along the route. The identified core network comprises sixteen radial bus corridors, three orbital bus corridors and six regional bus corridors.

The GDA Transport Strategy includes objectives to develop the Core Bus network to achieve, as far as practicable, continuous priority for bus movement on the sections of the Core Bus Network within the Metropolitan Area, with the goal of making the overall bus system more efficient and attractive to users.

The Dún Laoghaire to City Centre CBC is identified as part of the Core Bus Network. The radial/orbital Core Bus Network identified in the GDA Transport Strategy is illustrated in Figure 2.1.1 and Figure 2.1.2 respectively. For context, the Dún Laoghaire CBC is highlighted in red.

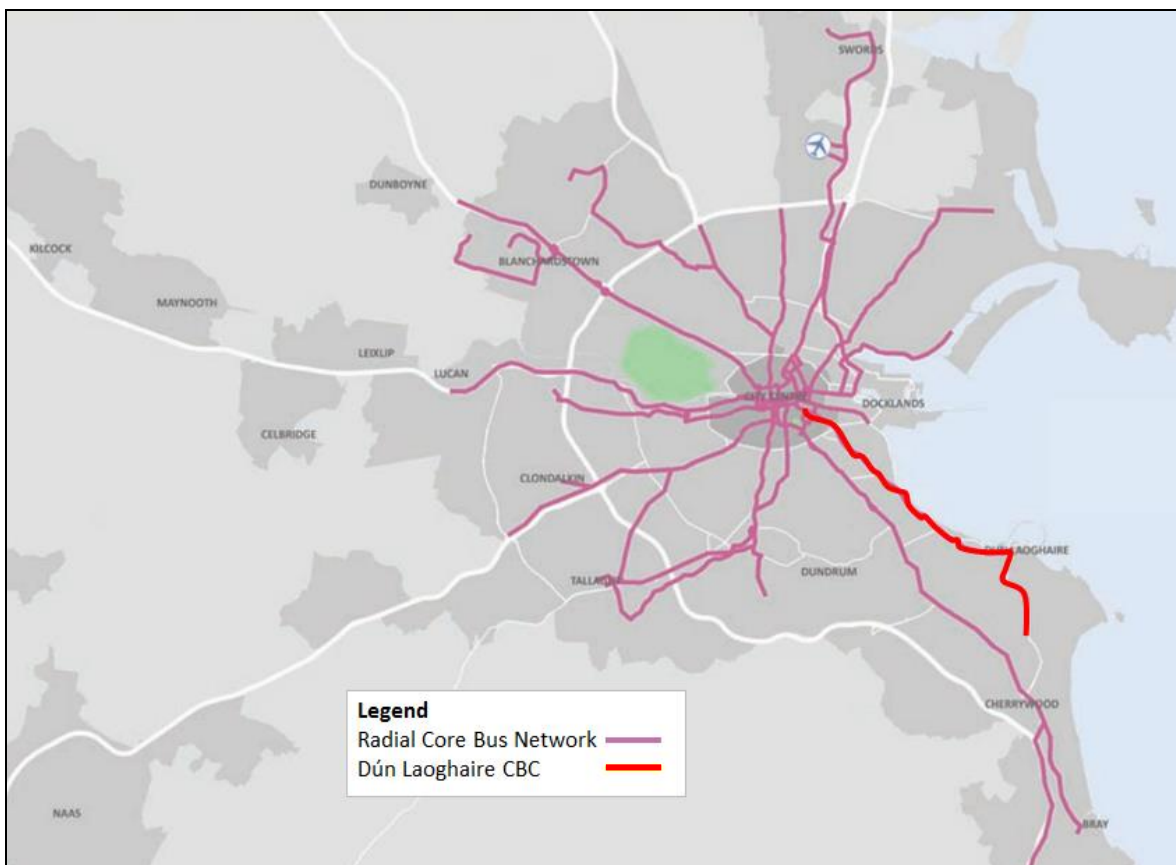


Figure 2.1.1 2035 Radial Core Bus Network (Source: Figure 5.5 Transport Strategy 2016 – 2035)

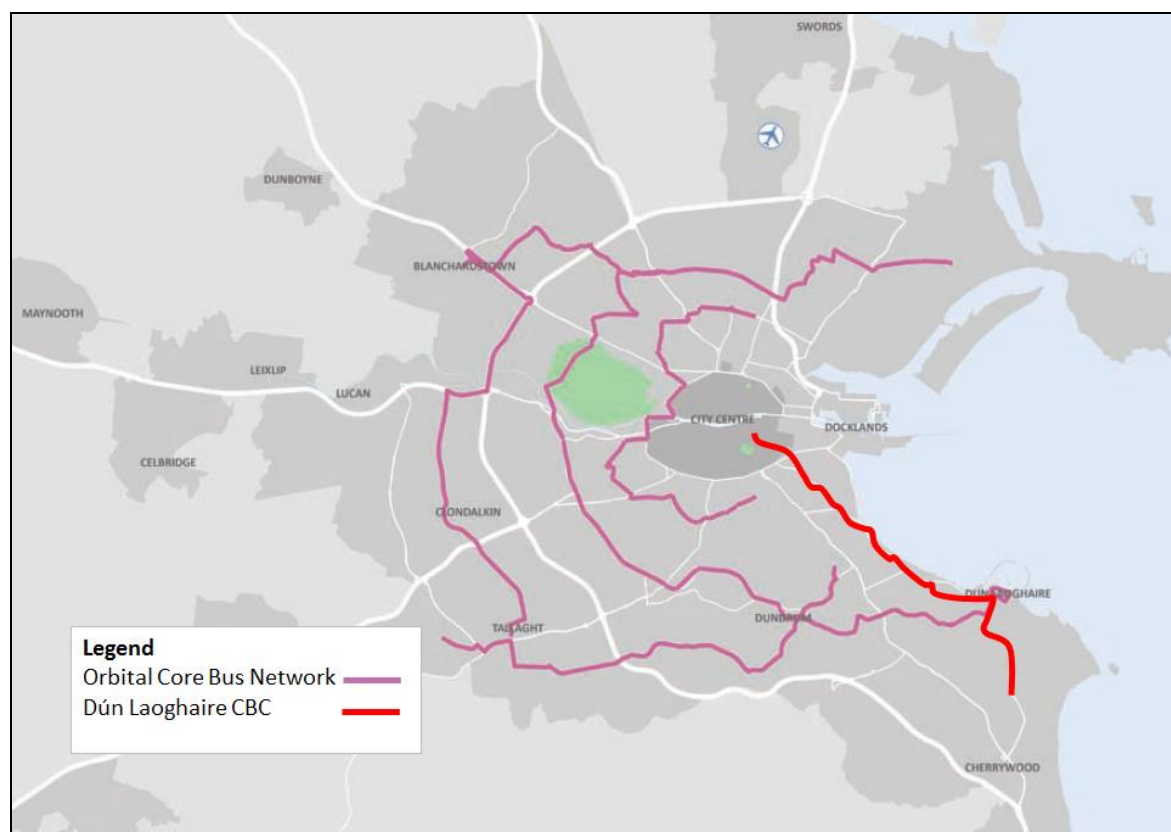


Figure 2.1.2 2035 Orbital Core Bus Network (Source: Figure 5.6 Transport Strategy 2016 – 2035)

2.2 Infrastructure and Capital Investment 2016-2021

On 29th September 2015, the Minister for Public Expenditure & Reform, Mr Brendan Howlin TD, announced an investment programme that proposed expenditure of €3.6 billion on public transport which included ‘further upgrading of Quality Bus Corridors’.

2.3 Integrated Implementation Plan 2013 – 2018

The NTA published the Integrated Implementation Plan 2013 – 2018 in February 2014. This report sets out the short term infrastructure investment programme for the GDA up to 2018 including in investment in existing bus services. The proposals in relation to Bus investment are encompassed in four investment areas: 1. Bus Fleet Investment; 2. Bus Stop and Shelter Provision; 3. General Bus Network Improvements; and 4. Bus Rapid Transit Schemes.

Investment areas 2 & 3 are of most relevant to the subject scheme and will be addressed. More specifically, the Integrated Implementation Plan proposes the following measures in relation to bus network improvements:

- Further development of a QBN appropriate to serve the needs of the GDA;
- Seeking to achieve, as far as practicable, continuous inbound priority and the maximum possible outbound priority on key bus routes into Dublin City Centre;
- Enhancing bus priority at other urban locations in the GDA;
- Seeking enhanced bus prioritisation at signalised traffic junctions in the GDA;

- Improving the level of interchange facilities between services and with other transport modes; and
- Creation of bus hubs or bus focal points in key urban locations in the GDA.

2.4 Greater Dublin Area Cycle Network Plan

The Greater Dublin Area (GDA) Cycle Network Plan sets out the strategy for the development of an integrated cycle network. It identifies that the Dún Laoghaire to City Centre corridor forms part of the primary cycle network (Routes S05, 13, 12, S03, 13, 13A), secondary cycle network (Route S02, S04, 13E, N5, 13D13G, 13F, S06) and thus form a key part of the strategic cycle network, see Figure 2.4.1.

It is therefore important that any upgrade to bus priority infrastructure along the corridor should take cognisance of this objective and, where practical, provide cycle infrastructure to the appropriate level and quality of service (as defined by the NTA National Cycle Manual) required for a primary and secondary cycle route.



Figure 2.4.1 GDA Cycle Network Plan (extract) – 1

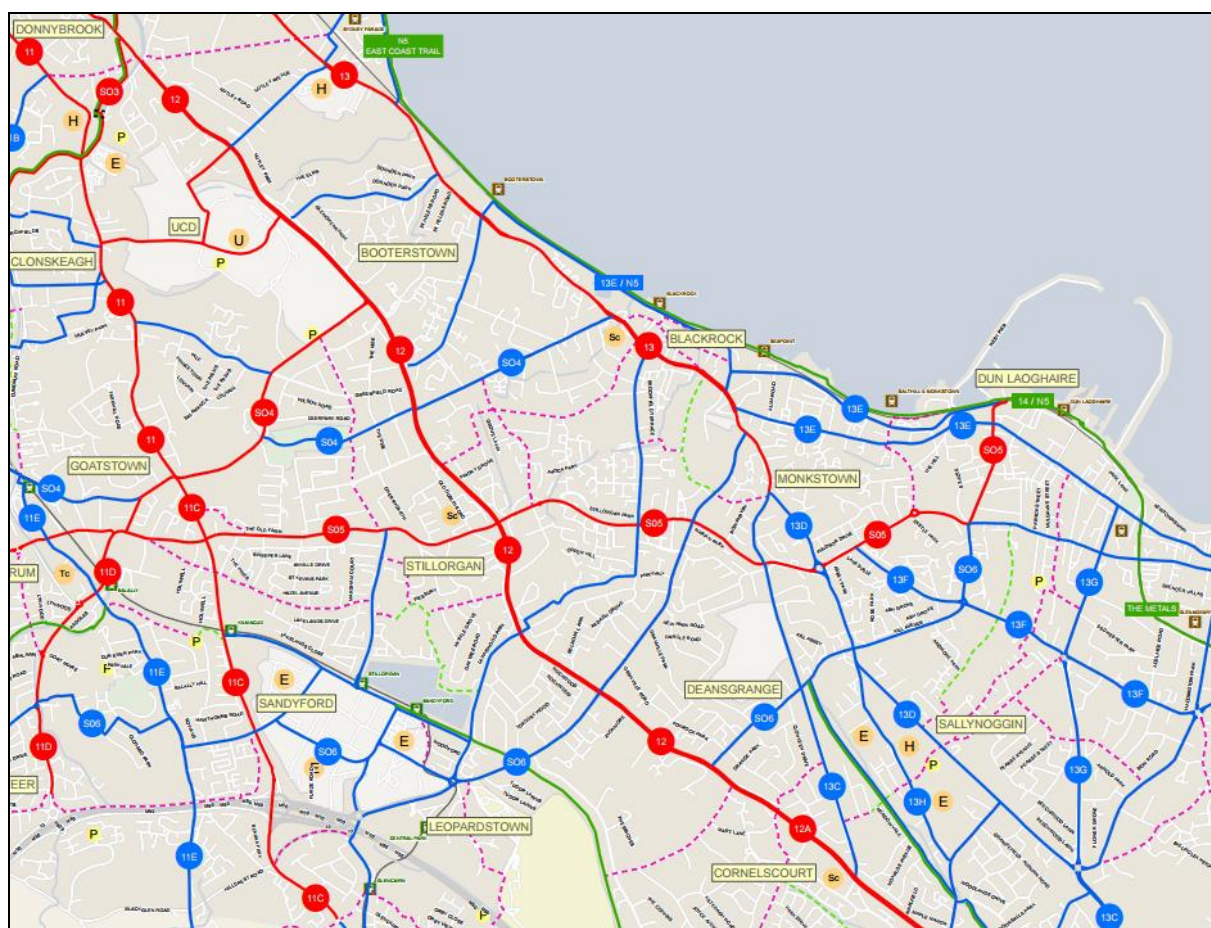


Figure 2.4.2 GDA Cycle Network Plan (extract) – 2

2.5 Dublin City Centre Transport Study

The Dublin City Centre Transport Study has been prepared to integrate the transport policies and proposals of Dublin City Council (DCC) and the National Transport Authority (NTA) and inform an agreed framework for strategic investment.

The study was issued for public consultation in June 2015 and proposes the following relevant measures to improve the operation, management and efficiency of the bus network within Dublin City:

- To maximise the performance of the bus network by ensuring that sufficient road capacity and junction priority are provided to allow buses to operate efficiently, with reliable and predictable journey times;
- To further optimise the routing of the bus corridors through the City Centre area, improving interchange arrangements and optimising the efficiency of the service.

In relation to existing QBCs, the study proposes to implement measures to rectify existing capacity and travel time issues. These measures include the provision of continuous bus lanes and the deployment of advanced ITS, such as traffic signal operation and journey time reporting.

2.6 Dublin City Council Development Plan (2016 – 2022)

- To support improvements to the city's bus network and related services to encourage greater usage of public transport in accordance with the objectives of the NTA's strategy and the Government's 'Smarter Travel' document.
- To facilitate and support measures proposed by transport agencies to enhance capacity on existing public transport lines and services, to provide/improve interchange facilities and provide new infrastructure.
- To review future strategic provision of bus depots/garages in the city in consultation with Dublin Bus and the NTA.

2.7 Dún Laoghaire – Rathdown County Council Development Plan (2016 – 2022)

This Development Plan seeks to protect and nurture the future growth of Dún Laoghaire-Rathdown – both by serving and leading the community by creating the conditions that will attract and sustain social and economic development. It contains some objectives in relation to bus travel which are of general relevance to the Scheme such as:

- An increased travel mode share for walking and cycling; this increase will be mainly related to local trips to work, schools, retail and leisure within the larger urban areas.
- An increased travel mode share for public transport for work trips to the main employment zones of Sandyford, Cherrywood and Dublin City Centre and between the other larger urban centres; there may be scope to improve public transport mode share to larger urban centres along the main bus and rail corridors, particularly where this improves access and interchange between bicycle and rail.
- Enhanced safety for all modes – especially for vulnerable road users.

The continued expansion of the Bus Network is of the utmost importance. In addition, the continuation and improvement of existing bus services along radial and orbital routes, subject to sufficient demand and availability of finance, is also considered a priority. As part of the continuing development of the Bus Network in the County, the Council will facilitate the provision of radial and orbital bus priority schemes to integrate with established high quality and frequency bus and rail routes. The provision of bus priority measures on a route may include some, but not all, of the following measures:

- The deployment of advanced traffic management techniques and Intelligent Transport Systems (ITS) applications, i.e. the provision of an urban traffic signalling systems such as SCATS (Sydney Coordinated Adaptive Traffic System), changes to the traffic signalling configuration, public transport traffic signal priority, route optimisation through traffic signal co-ordination, junction redesign.
- Reallocation of existing road space with increased levels of segregation from other vehicular traffic.
- Enhancement of nearby pedestrian and cycle facilities.

- High quality running surfaces.
- Widening of the roadway where appropriate.
- Traffic Management measures to include turning movement bans or a restriction on some, or all, other road vehicles on a section of road etc.

3. Corridor Audit and Scheme Objectives

3.1 Physical Constraints and Opportunities

There are a number of constraints and opportunities, both natural (i.e. existing natural environment) and physical (the built environment), which constrain route options for the proposed scheme within the defined study area. These include:

- Grand Canal (including protected structures);
- River Dodder;
- Royal Dublin Society (RDS);
- Embassy properties;
- Existing and committed future development along the route;
- Existing protected monuments within the study area;
- Significant street trees and other natural features along the potential route options within the study area;
- The existing urban and sub-urban roads and street network;
- Blackrock College;
- DART line (Iarnród Éireann);
- Dublin Bay;
- The need to maintain traffic flow for all modes during construction;
- Limited availability of land in urban and suburban areas; and
- Public parks including Blackrock Park, Elm Park and St Vincent's Park.

3.2 Interchange with existing and proposed public transport

One of the key objectives of the proposed CBC scheme is to enhance interchange between the various modes of public transport operating in the city and wider metropolitan area, both now and in the future. Route options within the study area have therefore been developed with this in mind and, in so far as possible, seek to provide for improved existing or new interchange opportunities with other transport services, including:

- Existing Dublin Bus services at numerous locations along the route;
- Existing DART service along the route;

The Eastern Bypass infrastructural proposals are also noted.

3.3 Compatibility with other users

A key objective of the proposed scheme is to improve pedestrian and cyclist facilities along the route. In general, suitable level of service should be proposed for these modes. Where it is considered impractical to construct cycle facilities along a

particular section of the CBC route, such facilities would need to be provided along suitable alternative routes and as required by the GDA Cycle Network Plan.

There may be locations where segregated cycle facilities cannot be provided along the CBC route and there is no suitable routing alternative. In this instance, it may be possible for cyclists to share with vehicles in the bus lane. However, such proposals need careful consideration and design to ensure the safety of cyclists, with additional mitigation measures, such as speed restrictions for vehicles in bus lanes being applied.

General traffic flow and local access will generally be maintained along the CBC corridor although it is inevitable that there will be impacts on traffic capacity along the route associated with the reallocation of road space to CBC priority and cycle lanes and the introduction of turning movement restrictions. Reductions in traffic carrying capacity of the road network need, however, to be considered in the context of the overall significant increase in efficiency and reliability of the bus services that will be achieved.

3.4 Scheme Objectives

Having regard to the findings of the studies and plans set out in Section 2, the following objectives were established for the Dun Laoghaire CBC Corridor:

- Deliver the on street infrastructure necessary to provide continuous priority for bus movements along the Core Bus Corridor. This will mean enhanced bus lane provision on the corridor, removing current delays in relevant locations and enabling the bus to provide a faster alternative to car traffic along the route, making bus transport a more attractive alternative for road users. It will also make the bus system more efficient, as faster bus journeys means that more people can be moved with the same level of vehicle and driver resources; and
- Provide any cycle facilities along the route that are required under the Greater Dublin Area Cycle Network Plan (published by the NTA, 2013) to the target Quality of Service(s) specified therein and to give consideration to further providing cycle facilities along sections of the route where they may be not expressly required under the Cycle Network Plan.

4. Assessment Methodology

4.1 Introduction

This section of the report presents the methodology used for the assessment of potentially viable route options identified within the study area. A two-stage assessment process was adopted as follows:

- An initial ‘Stage 1’ high-level route sections assessment or ‘sifting’ process which appraised potentially viable route sections in terms of ability to achieve scheme objectives and whether they could be practically delivered; and
- Routes which passed this initial stage were taken forward to a more detailed ‘Stage 2’ assessment.

4.2 Study Area

Arising from the transport policy context and scheme objectives set for the Dun Laoghaire CBC, the broad study area identified for the proposed scheme is illustrated in red in Figure 4.2.1 below. The study area includes road network in the vicinity of the existing bus routes and extends to include additional potentially feasible route options. The study area is generally bounded to the north by the City Centre and to the south by Sallynoggin/Glenageary.

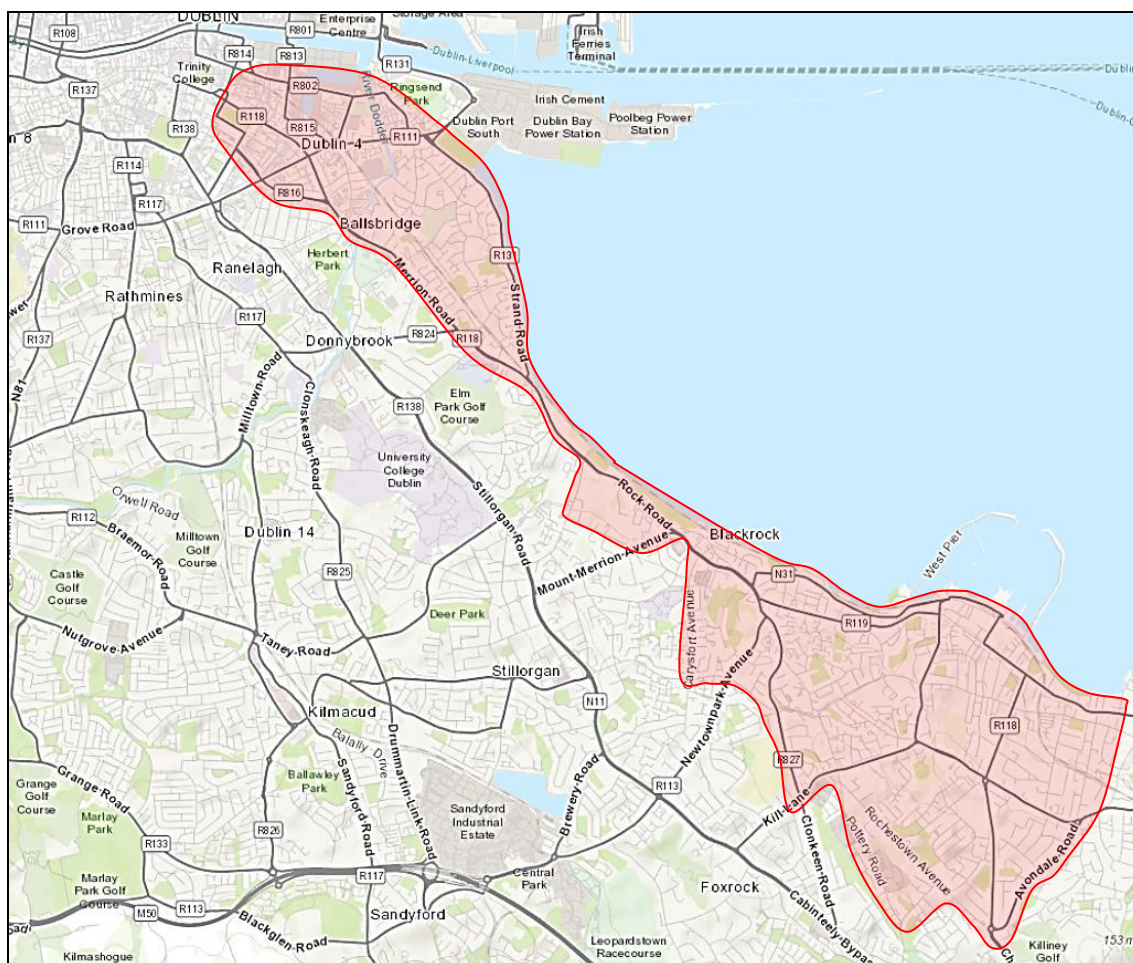


Figure 4.2.1 Study Area

Due to other studies examining the Stillorgan Road/ Bray Road (R138/N11) corridor as a bus route (Blanchardstown to UCD BRT and Bray to City Centre CBC); the Dún Laoghaire to City Centre CBC study area does not include the Stillorgan Road/ Bray Road (R138/N11) corridor. The study area has been divided into three manageable sections to simplify the assessment process:

- Study Area Section (SAS) 1 – City Centre to Booterstown;
- Study Area Section (SAS) 2 – Booterstown to Blackrock; and
- Study Area Section (SAS) 3 – Blackrock to Dun Laoghaire.

The extent of each of these corridor sections is presented in Figure 4.2.2.

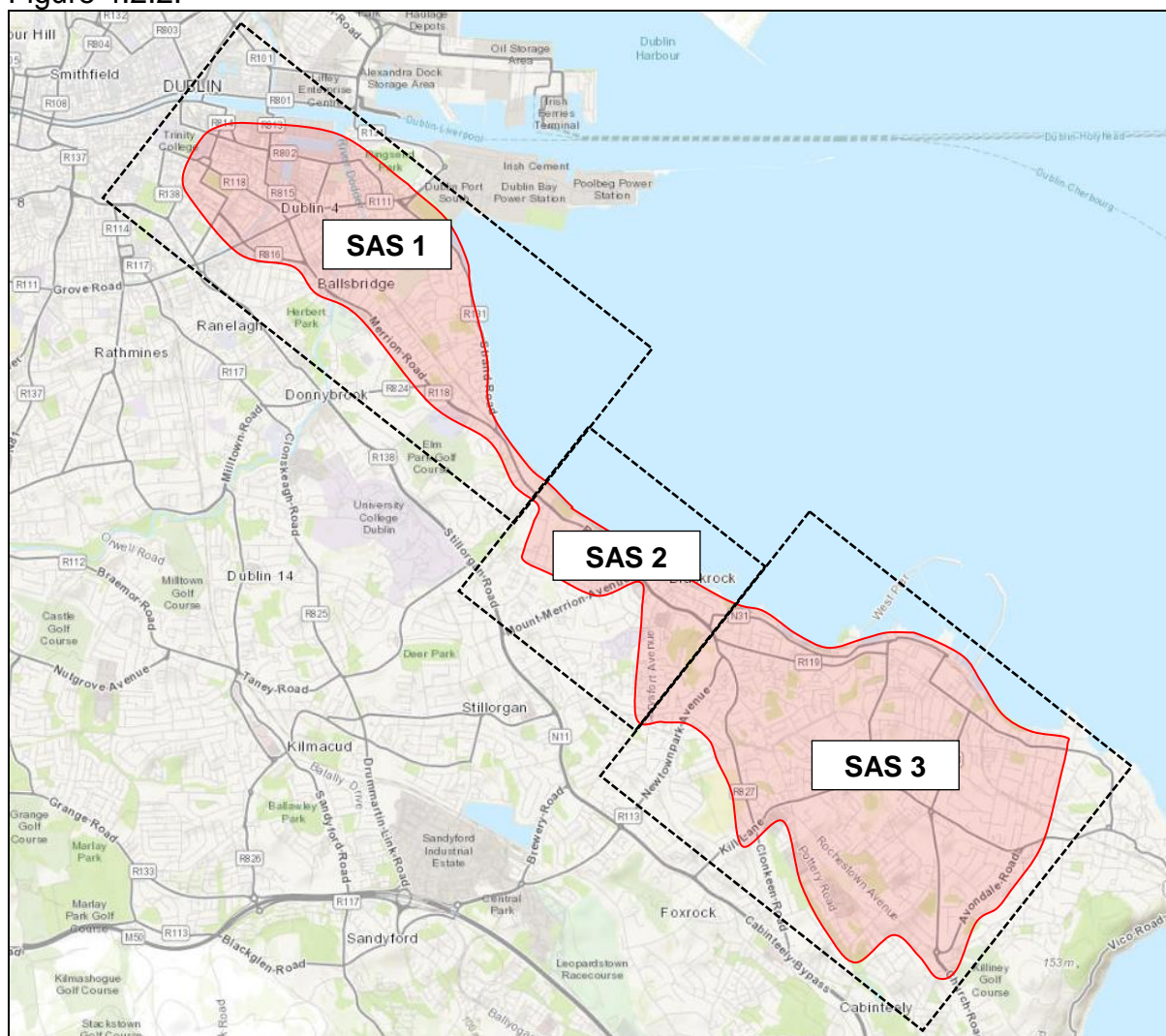


Figure 4.2.2: Study Area Sections

4.3 Stage 1: Route Sections Assessment – Sifting Stage

An initial ‘spiders-web’ of potential route sections that could accommodate a CBC was identified for each Study Area Section. This ‘spiders-web’ of route sections was chosen with reference to the CBC characteristics and in order to meet the scheme objectives as set out in Section 2 of this report.

Initial route sections identified also took cognisance of the physical constraints and opportunities present (Section 3.3) and the ability to integrate with other public transport modes and routes (Section 3.4). Of particular relevance in developing the spiders-web was the potential for the road or route sections to facilitate fast and reliable journey times and thereby be able to practically accommodate bus lane priority.

The resulting study area corridor spiders-web of route sections identified is presented in Figure 4.3.1.

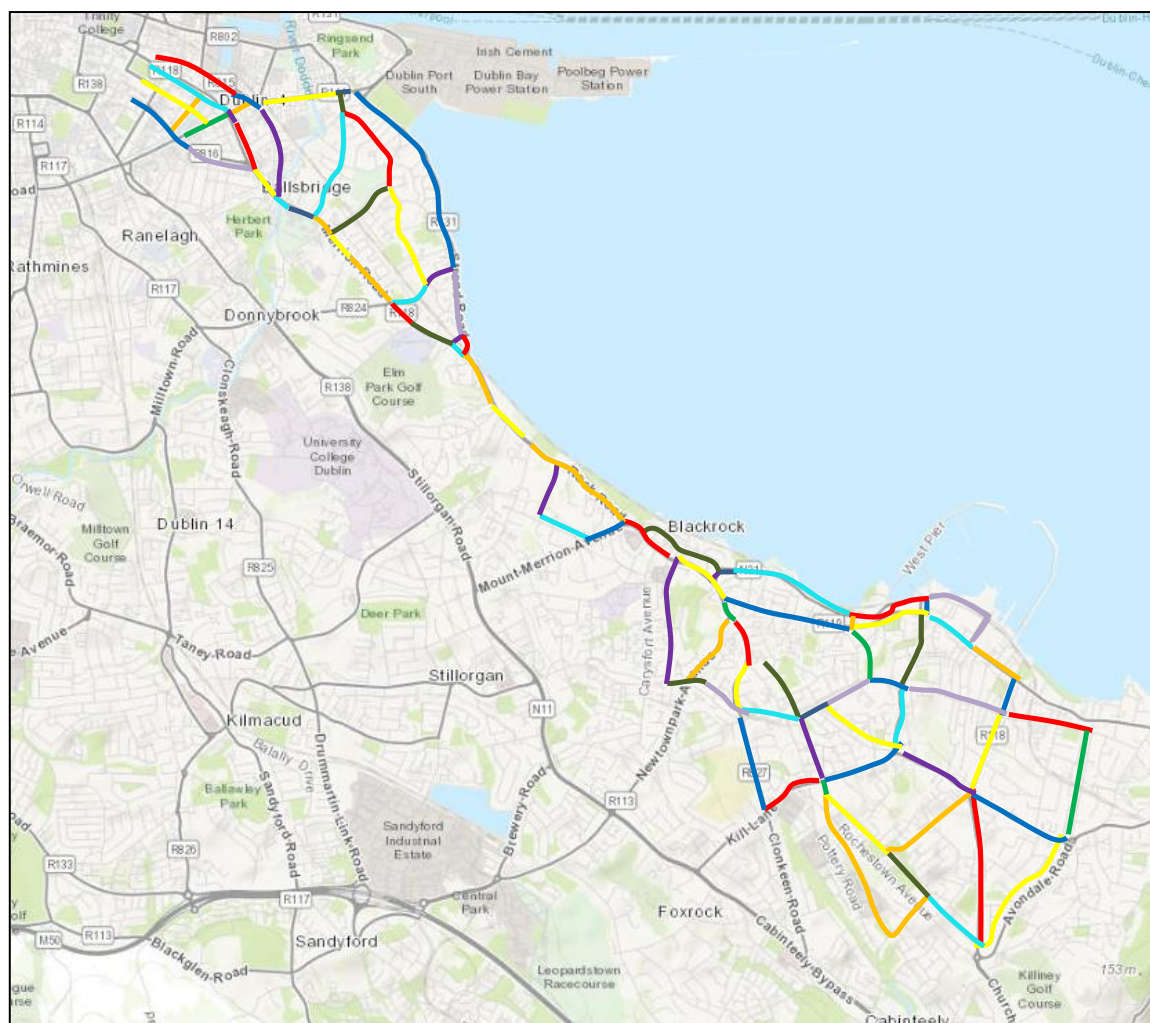


Figure 4.3.1 Spiders Web of Route Sections

At the Stage 1 ‘sifting’ stage, the initial ‘spiders-web’ of route sections presented in Figure 4.3.1 was narrowed down using a high level qualitative method based on professional judgement and a general appreciation for existing physical conditions/constraints within the study area from available survey information and site visits. This exercise identified route sections that would either not achieve the scheme objectives or would be subject to significant cost and/or impact to achieve these objectives (e.g. excessive land-take).

This assessment stage focused on engineering constraints, together with a desktop study, identifying high level environmental constraints and population catchment analysis.

4.4 Stage 2: Scheme Options Assessment - Detailed Assessment

Following completion of the ‘Stage 1’ assessment, the remaining potentially feasible route sections were progressed to Stage 2 of the assessment process. This stage comprised a more detailed qualitative and quantitative assessment of scheme options identified along each potential route, using criteria established to compare scheme options.

The first step in the Stage 2 assessment was to combine shorter route sections which passed the Stage 1 assessment, to form longer end-to-end potential routes within each SAS.

After developing routes options, each was explored using different design concepts to identify the degree of facility provision and necessary infrastructure requirements. This process involved the development of several scheme options for each route within each SAS.

The scheme options for each route were then progressed to a multi-criteria analysis.

The ‘Common Appraisal Framework for Transport Projects and Programmes’ 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;
- Safety;
- Environment; and
- Physical Activity.

Physical Activity has been scoped out of the multi-criteria analysis at this stage. This is because all route options are considered to promote physical activity equally and as such it is not considered to be a key differentiator between route options.

An appreciation of constraints and opportunities within the study area as well as the defined project objectives, led to the establishment of project-specific route options MCA criteria.

These were tailored to have commonality to the Common Appraisal Framework guidelines where practical.

Table 4.1 presents a summary of the MCA criteria and sub-criteria used as part of the ‘Stage 2’ detailed route options assessment process.

Table 4.1: MCA criteria

| MCA criteria | Assessment Sub-Criteria |
|-----------------------|---|
| 1. Economy | 1.a. Capital Cost |
| | 1.b. Transport Reliability and Quality (Journey Time) |
| 2. Integration | 2.a. Land Use Integration |
| | 2.b. Residential Population and Employment Catchments |

| MCA criteria | Assessment Sub-Criteria |
|--|--|
| | 2.c. Transport Network Integration |
| | 2.d. Cycle Network Integration |
| | 2.e. Traffic Network Integration |
| 3. Accessibility & Social Inclusion | 3.a. Key Trip Attractors (Education/Health/Commercial/Employment) |
| | 3.b. Deprived Geographic Areas |
| 4. Safety | 4.a. Road User Safety |
| 5. Environment | 5.a. Archaeology and Cultural Heritage |
| | 5.b. Architectural Heritage |
| | 5.c. Flora & Fauna |
| | 5.d. Soils and Geology |
| | 5.e. Hydrology |
| | 5.f. Landscape and Visual |
| | 5.g. Air Quality |
| | 5.h. Noise & Vibration |
| | 5.i. Land Use Character |

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

4.4.1 Economy (Criterion 1)

4.4.1.1 Capital Cost (1.a.)

Capital cost estimates consist of both the indicative infrastructure cost estimate and land acquisition costs. For the route options considered, an outline 'Order of Magnitude' cost was prepared for assessment and comparison purposes.

This cost estimate was based on a range of per kilometre rates reflecting the extent of construction works required. The following steps have been followed in order to derive cost estimates for each route option:

- Step 1: Define construction activity levels and assumptions for corridor sections.
- Step 2: Define construction activity levels and assumptions for junctions.
- Step 3: Estimation of cost rates in relation to construction activity levels for corridor sections.

- Step 4: Estimation of cost rates in relation to construction activity levels for junctions.
- Step 5: Estimation of cost rates in relation to construction activity levels for stops.
- Step 6: Apply appropriate cost rates to each route option to derive route option cost estimate.

Criterion 1.a.i. Indicative Infrastructure Cost Estimate

1.a.i.i. Corridor Sections

As part of the route optioneering process, constraints and associated mitigation measures, which provide improved / full bus lane provision, have been identified, grouped and ranked in levels.

Table 4.2: Construction Works for Corridor Sections

| Construction Activity Level | Construction Works Assumption | €/km |
|---|--|------------|
| Minor – Minor works locally | <ul style="list-style-type: none"> • Kerbs improvement locally (removal and replacement) • Footpaths improvement locally (breaking out/additional concrete) • Road resurfacing locally (milling/reinstatement or overlay) • Road markings (non-destructive removal of existing road markings, new road markings) • Signage (removal/relocation/replacement of existing and/or installation of new) | €650,000 |
| Moderate – Roadway widening (excluding private land acquisition) | <ul style="list-style-type: none"> • General site clearance (street furniture removal/relocation, etc.) • Safety barriers/guardrails (removal and new) • Services protection/relocation/diversion (power supply, communications) • Drainage works (removal of and installation of new drainage systems) • Limited earthworks • Pavement full depth reconstruction • Road markings (non-destructive removal of existing road markings, new road markings) • Kerbs footways and paved areas (removal and new) • Road lighting (relocation, cabling, ducting) • Signage (removal/relocation/replacement of existing and/or installation of new) • Street furniture removal/relocation • Landscaping works (top soiling, fence, trees relocation, hedges, road margins re-grading, etc.) | €1,300,000 |

| Construction Activity Level | Construction Works Assumption | €/km |
|---|--|------------|
| Major – Roadway widening (including private land acquisition): | <ul style="list-style-type: none"> • General site clearance (street furniture removal/relocation, etc.) • Safety barriers/guardrails (removal and new) • Services protection/relocation/diversion (power supply, communications, water, gas) • Drainage works (removal of and installation of new drainage systems) • Earthworks (embankment treatments, retaining walls, slopes regrading, etc.) • Pavement full depth reconstruction • Kerbs footways and paved areas (removal and new) • Road markings (non-destructive removal of existing road markings, new road markings) • Signage (removal/relocation/replacement of existing and/or installation of new) • Road lighting (replacement, cabling, ducting) • Landscaping works (top soiling, fence, trees relocation, hedges, road margins, re-grading, etc.) • Property boundary reinstatement works (walls, gates, driveways landscaping etc.) | €2,500,000 |

1.a.i.ii. Junctions

Table 4.3 presents the construction activity levels for junctions, the assumed level of works for each category and the per junction rate.

Table 4.3: Construction Works for Junctions

| Construction Activity Level | Construction Works Assumption | €/junction |
|-----------------------------|-------------------------------|------------|
|-----------------------------|-------------------------------|------------|

| Construction Activity Level | Construction Works Assumption | €/junction |
|---|---|-----------------|
| <p>Minor – Modifications to existing signal controlled junctions to introduce bus priority (i.e. changing method of control, etc.), without significant alteration to their existing geometry and layout</p> | <ul style="list-style-type: none"> • Road markings (non-destructive removal of existing road markings, new road markings) • Anti-skid surface • Signage (removal/relocation/replacement of existing and/or installation of new) • Dished kerbs and tactile paving • Guardrails/Bollards • Additional signal poles/heads • Additional traffic signals ducting, cabling and chambers • Modifications to the signal controller and associated traffic signal installation works (including electrical) • Additional loop detectors | <p>€70,000</p> |
| <p>Moderate – Upgrading existing minor/major junctions (including roundabouts) to signal control junctions, without significant alteration to their existing geometry and layout (excluding private land acquisition)</p> | <ul style="list-style-type: none"> • Kerbs improvement locally (removal and new) • Footpaths improvement locally (breaking out and new) • Road markings (non-destructive removal of existing road markings, new road markings) • Signage (removal/relocation/replacement of existing and/or installation of new) • Anti-skid surface • Dished kerbs and tactile paving • Guardrails/Bollards • New signal poles/heads • New traffic signals ducting, cabling and chambers • New signal controller and associated traffic signal installation works (including electrical) • New loop detectors • Services protection/relocation/diversion (power supply, communications) • Limited earthworks • Pavement reconstruction • New road lighting (relocation, cabling, ducting) | <p>€230,000</p> |

| Construction Activity Level | Construction Works Assumption | €/junction |
|---|--|-------------------|
| <p>Major – Significant modifications to existing signal controlled junctions (including private land acquisition)</p> | <ul style="list-style-type: none"> • General site clearance (street furniture removal/relocation, etc.) • Safety barriers/guardrails (removal and new) • Services protection/relocation/diversion (power supply, communications, water, gas) • Drainage works (removal of and installation of new drainage systems) • Earthworks (embankment treatments, retaining walls, slopes re-grading, etc.) • Pavement full depth reconstruction • Kerbs footways and paved areas (removal and new) • Road markings (non-destructive removal of existing, new road markings) • Anti-skid surface • Signage (removal/relocation/replacement of existing and/or installation of new) • Dished kerbs and tactile paving • Guardrails/ Bollards • Additional signal poles/heads • Additional traffic signals ducting, cabling and chambers • Modifications to the signal controller and installation works (incl. electrical) • Additional loop detectors • Road lighting (replacement, cabling, ducting) • Landscaping works (top soiling, fence, trees, hedges, margins re-grading, etc.) • Property boundary reinstatement works (walls, gates, driveways landscaping etc.) | <p>€1,000,000</p> |

1.a.i.iii. Bus Stops

For cost estimation purposes only, CBC stops have been assumed to comprise the following items:

- Raised Kerbs
- Raised Platform
- Paving
- Illuminated shelters
- Identification posts

- RTPI
- Lighting
- Associated ducting (communications and power)
- Bus Stop Furniture (i.e. passenger guardrails, benches, bollards, etc.)

Based on the above assumptions, outline costs for the bus stops were estimated to be €20,000/stop

These costs exclude VAT, professional fees and re-routing of services.

It should be noted that the above listed Bus Stop cost estimates are subject to refinement, based on a more detailed analysis at detailed design stage.

Criterion 1.a.ii. Land Acquisition Cost Estimate

Land Acquisition Costs will be accounted for separately @ €1,500/m²

Exclusions from the cost estimation process at this stage are listed below:

- VAT
- Fees for planning process,
- Statutory Undertakers
- Professional Fees
- Escalation and inflation adjustments

4.4.1.2 Transport Reliability and Quality of Service (1.b.)

This criterion assesses route options in terms of the degree to which transport reliability and quality of service is likely to be achieved. The assessment considers the following:

Criterion 1.b.i. Journey Time; the extent to which journey time savings, and associated economic benefits, for public transport services, can be achieved on a route. This would be practically achieved through the extent to which any or all of the following measures can be implemented;

- Enhancement of existing bus and / or provision of new bus lanes along road links;
- Provision of bus lanes through junctions (preferably through signal controlled junctions);
- Local upgrading of road sections to provide more carriageway space and therefore, additional capacity;
- Use of traffic signals to provide virtual priority e.g. queue relocation;
- Removal of 'pinch points' for bus services and traffic along the route; and
- Rationalisation of existing bus stops in terms of location, indentation (i.e. ability to provide laybys to avoid blockage of bus lanes) and spacing.

Journey times for each route option have been calculated by comparing the time required by a bus to travel between common start and end points on each route.

The following assumptions have been made in calculating the comparative journey times along route options:

- Top operational speed (free-flow) of 50 kph in suburban areas and 30 kph in City Centre areas;
- Dwell time of 15 seconds per stop on average (assumes introduction of cashless fares as part of the CBC/Bus Service upgrade programme in the Greater Dublin Area. Assumes that on average, buses stop at every second stop i.e. 30 second delay at every second stop);
- Delay of 15 seconds per junction on average (assumes buses stop at every second junction i.e. 30 second delay at every second junction)

These assumptions assume dedicated bus priority infrastructure or free-flowing traffic conditions along a route section by direction of travel. Where the indicative scheme determined for a route suggests that this is not practically achievable, modified speeds and delay assumption are applied as appropriate. These additional delays are estimated based on available queue length information, automatic vehicle location information from Dublin Bus and estimates of the impact of traffic management measures (such as queue relocation).

Delays at junctions and stops include delays associated with deceleration /acceleration to/from a stationary position.

Criterion 1.b.ii. Number of Major Junctions; the number of major junctions / signalised crossings along each route have been compared.

For the purposes of this assessment, major junctions are generally defined as signalised junctions and roundabouts (i.e. any junction likely to cause delays to buses)

Regardless of the level of practical or feasible bus priority provided at major junctions, there will always be an element of delay to buses associated with signalised junctions, even with the most efficient signalling system being provided. While it is impossible to completely avoid major junctions on any route option, this risk of potential delay has been considered when comparing route options. This feeds into the overall journey time calculations as indicated above.

Criterion 1.b.iii. Level of Bus Priority Provision; the level of bus priority achievable along route options has been considered and compared. The level of priority is predominantly concerned with the degree to which road space can practically be allocated to buses, the amount of protection afforded to this priority (i.e. segregation) and the provision for buses at junctions such as bus lanes at the stop line. This feeds into the overall journey time calculations as indicated above.

4.4.2 Integration (2)

4.4.2.1 Land-Use Integration (2.a.);

This criterion identifies the extent to which a route would encourage or support planned development and provide for economic opportunities; whether particular route options offer synergies with other urban enhancement proposals and whether route options afford the potential to regenerate particular streets or quarters (of most relevance to the City Centre area).

The interaction of routes with Local Area Plans (LAPs), masterplans or specific objectives in the County Development Plans are also considered under this criterion.

4.4.2.2 Residential Population and Employment Catchments (2.b.);

Criterion 2.b.i. Residential Population Catchments: This criterion compares the existing residential populations within 5, 10 and 15 minute walk catchments from bus stops and is representative of the number of potential bus users for a particular route option. The assessment does not include future populations of zoned, but yet undeveloped residential development lands along route options. The analysis involved extracting 2011 population statistics from the Central Statistics Office (CSO) 'small areas' dataset. GeoDirectory was used to assist in calculating the proportional figures for the population within the specific contour bands for each of the routes. This information was subsequently used to calculate the population living within the contours.

Criterion 2.b.ii. Employment Population Catchments: This criterion compares the existing employment populations within a 10 minute walk catchments. The analysis involved extracting information from the 2011 POWSCAR (Place of Work, School or College - Census of Anonymised Records) data, which contains data on employment and school goers within specific areas. The areas used for the analysis were taken from the NTA's multi-modal transport model of the Greater Dublin Area and correspond to the zones defined in the model. These zones are effectively modified Central Statistics Office (CSO) boundaries. GeoDirectory was used to assist in calculating the proportional figures for the employment units within the specific contour bands for each of the routes. This information was subsequently used to calculate the number of people working within the contours. As with the residential population catchments, the assessment does not quantitatively assess the future populations of zoned, but yet undeveloped commercial development lands along route options.

4.4.2.3 Transport Network Integration (2.c.);

This criterion identifies the extent to which route options would maximise wider public transport usage and reach in terms of facilitating efficient interchange between other transport routes and modes (e.g. Other core/feeder bus routes, Swiftway BRT routes, Luas, DART, suburban rail, future Metro.). Linked to this, is the availability of space at potential interchange locations for facilities such as cycle parking areas, covered interchange areas, safe walking areas to and from stops, kiss-and-ride etc.

4.4.2.4 Cycle Network Integration (2.d.);

This criterion considers whether a route option forms part of the GDA Cycle Network Plan, with routes which overlap with designated Cycle Routes given a higher designation in terms of benefits arising where cycle infrastructure can be provided as part of the proposed scheme. In some instances however it may be more appropriate to modify an existing or proposed cycle route as part of the GDA Cycle Network so that CBC and cycle network objectives can both be achieved within the broader corridor area. Consideration is also given to cycle routes intersecting with the bus route.

The quality of cycle provision practically achievable on route options has been assessed as this is considered to be a proxy for encouraging physical activity along the route. For comparison purposes, the highest level of practical cycle provision

achievable on each route has been determined and compared between route options.

4.4.2.5 Traffic Network Integration (2.e.);

A comparative assessment of the expected traffic impact of each route option was undertaken based on professional judgement and understanding of traffic conditions in the Study Area.

This represents a high level assessment of the traffic impact of the route options considered in the Stage 2 Multi – Criteria Analysis (MCA). The anticipated traffic impact expected to be incurred by motorists using private vehicles as a result of the different route options will be assessed. The dis - benefit experienced by motorists in respect of reduced junction capacity and restricted movements will be considered.

4.4.3 Accessibility and Social Inclusion (3)

4.4.3.1 Key Trip Attractors (3.a.)

This assessment criterion identifies key trip attractors located within approximately 15 minute walk catchments which would generate significant demand for bus services but would not be otherwise picked up by either the employment or residential catchment analysis. For the purposes of this assessment the following land-uses have been considered as key trip attractors:

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

4.4.3.2 Deprived Geographic Areas (3.b.)

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

4.4.4 Safety (4)

4.4.4.1 Road User Safety (4.a.)

Generally, the introduction of CBC will result in a reduction in road collisions due to people switching from private car to public transport. However, the reduction in collisions is unlikely to differ between various route options, particularly over the short sections being investigated as part of this assessment.

Therefore, for the purposes of comparing route options, the number of junctions along the route has been used as a proxy for road safety. The number of junctions is effectively a measure of the number of potential conflicts on the route and therefore a measure of the potential for a collision.

The type of movement required by the bus at junctions on the route is also considered with routes where turning movements (either left or right) are required being assigned a lower score in terms of safety.

4.4.5 Environmental (5)

The scope and methodology for the environmental assessment was established by considering what environmental aspects are likely to be impacted and are therefore of importance in evaluating the route options. A list of the environmental topics considered is outlined in Table 4.4.

Table 4.4: Environmental Aspects Considered

| Aspect | Rationale |
|--|--|
| Included in Environmental Assessment | |
| 6.a./6.b. Archaeological, Architectural and Cultural Heritage | The provision of CBC infrastructure has the potential to impact on the archaeological, architectural and cultural heritage environment. At this stage of the assessment process, a conservative approach has been adopted in assessing the potential for impact and this is further described below (see Section 5.3.6.1). |
| 6.c. Flora and Fauna | The provision of CBC infrastructure has the potential to impact on flora and fauna. |
| 6.d. Soils and Geology | The provision of CBC infrastructure has the potential to impact on soil and geology as a result of land-take and possible ground excavation (including potential to encounter ground contamination). |
| 6.e. Hydrology | The provision of CBC infrastructure has the potential to impact on surface water bodies as a result of land-take (with particular emphasis on floodplains and flood zones). |
| 6.f. Landscape and Visual | The provision of CBC infrastructure has the potential to impact the townscape/streetscape along the CBC route. |
| 6.g Air Quality | The provision of CBC infrastructure has the potential to impact the air quality along the CBC route. |
| 6.h. Noise & Vibration | The provision of CBC infrastructure has the potential to impact the noise environment along the CBC route. |
| 6.i. Land Use Character | The provision of CBC infrastructure has the potential to impact on land use character through land-take, severance or reduction of viability which prevents or reduces it from being used for its intended use. |
| Scoped out of Environmental Assessment | |
| Agronomy | Given the urban/suburban nature of the proposed scheme and the assumption that the CBC will run on predominantly existing road infrastructure this aspect is not considered to be relevant to the assessment. |
| Hydrogeology | Hydrogeology is not considered to be a determining factor in the selection of the preferred route option. Also at this stage of the design process it is not possible to determine the quality, type or duration of |

| Aspect | Rationale |
|----------------------------------|---|
| | these impacts, particularly as the location and type of structures e.g. underpasses, bridges etc. is unknown. |
| Property/Land Acquisition | This aspect has been considered separately as part of the Economy criterion in the overall multi-criteria analysis commensurate with the information available at the route option assessment stage. |
| Socio-economics | Elements of socio-economics such as journey times, catchment analysis, transport integration, quality of service for cyclists etc. are assessed under other non-environmental criteria and will be considered as part of the multi-criteria analysis. |

An environmental impact study was undertaken by Roughan O’ Donovan to assess the scheme options under the environmental aspects considered. The results of the study are included in the MCA tables presented in Appendix A and the Environmental Impact Report is included in Appendix H.

Archaeological, Architectural and Cultural Heritage

As mentioned previously a conservative approach has initially been adopted in undertaking the route options assessment in relation to the archaeological, architectural and cultural heritage environment. The constraints comprise Recorded Monuments and Protected Structures (RMPs) within 50m of each CBC route section, extending to 250 m in greenfield areas. Sites of archaeological and cultural heritage merit and sites of architectural heritage merit which are directly intersected by the CBC route sections are also included within the scope of this assessment.

During the detailed design of the proposed scheme, the aim will be to avoid known constraints and/or minimise the number of constraints which may be directly or indirectly impacted by the proposed scheme. Appropriate mitigation for construction will be included which will seek, where practicable, to ensure preservation in situ of archaeological remains and the avoidance of impacts on archaeological and cultural heritage constraints. A similar approach has been adopted in relation to the route options assessment for architectural heritage.

As a result, the assessment effectively evaluates the potential for impact on architectural heritage from façade to façade which provides for a comparative and qualitative evaluation of Protected Structures along route sections, in particular along heavily developed sections such as those identified within the City Centre.

However, it is important to note that the CBC route will primarily travel on existing established road networks. Other than locations of potential significant widening of the existing road curtilage, it is currently not anticipated that adjacent structures and buildings will be impacted by the proposed scheme (while acknowledging that the designation of, and protection afforded to a Protected Structure is not restricted to the structure itself but to all elements within its curtilage, e.g. coal cellars and boundary elements). Within the City Centre, the selection of a viable route options will involve the running of the CBC service in the vicinity of numerous Protected Structures irrespective of which route section is preferred (archaeological, architectural and cultural heritage is only one of the criteria being considered as part of the MCA analysis). The detailed design of the proposed scheme will seek to avoid and minimise impacts on architectural heritage.

4.4.6 Route Options Summary Table

For each Study Area Section, a route options summary table (in Project Appraisal Balance Sheet, (PABS)) format 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 presented in **Appendix A**.

For each individual assessment criterion considered, routes have been relatively compared against each other based on a five point scale, ranging from having significant advantages to having significant disadvantages over other route options. For illustrative purposes, this five point scale is colour coded as presented in Table 4.5 with advantageous routes graded to 'dark green' and disadvantaged routes graded to 'dark red'.

Table 4.5: Route Options Colour Coded Scoring Scale

| Colour | Description |
|--------|---|
| | Significant advantages over the other options |
| | Some advantages over other options |
| | Neutral compared to other options |
| | Some disadvantages compared to other options |
| | Significant disadvantages compared to other options |

The extent of reporting may vary between each Study Area Section options assessment, depending on the significance attached to specific criterion in terms of route differentiation.

At the end of each Study Area Section options assessment, an overall Multi Criterion Analysis (MCA) table is provided, bringing together each of the individual criterion assessments.

This is then summarised for each Study Area Section under the main assessment criterion as set out in Table 4.1.

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 options.

All criteria are considered in undertaking the assessment and a lower scoring on one criterion, for example, will not necessarily mean that the option is not suitable.

The recommended options from each Study Area Section are then collated to provide the emerging preferred end-to-end option.

4.4.7 Conclusion

The outcome from the transport analysis and the findings of the multi-criteria analysis are then finally considered in a holistic manner to derive a preferred 'end-to-end' route.

5. Stage 1: Route Sections Assessment

5.1 Introduction

As outlined in Section 4, the study area has been divided into three sections to simplify the assessment process:

- Study Area Section (SAS) 1 – City Centre to Booterstown;
- Study Area Section (SAS) 2 – Booterstown to Blackrock; and
- Study Area Section (SAS) 3 – Blackrock to Dun Laoghaire.

This Section of the report addresses the route sections in each of the Study Area Sections.

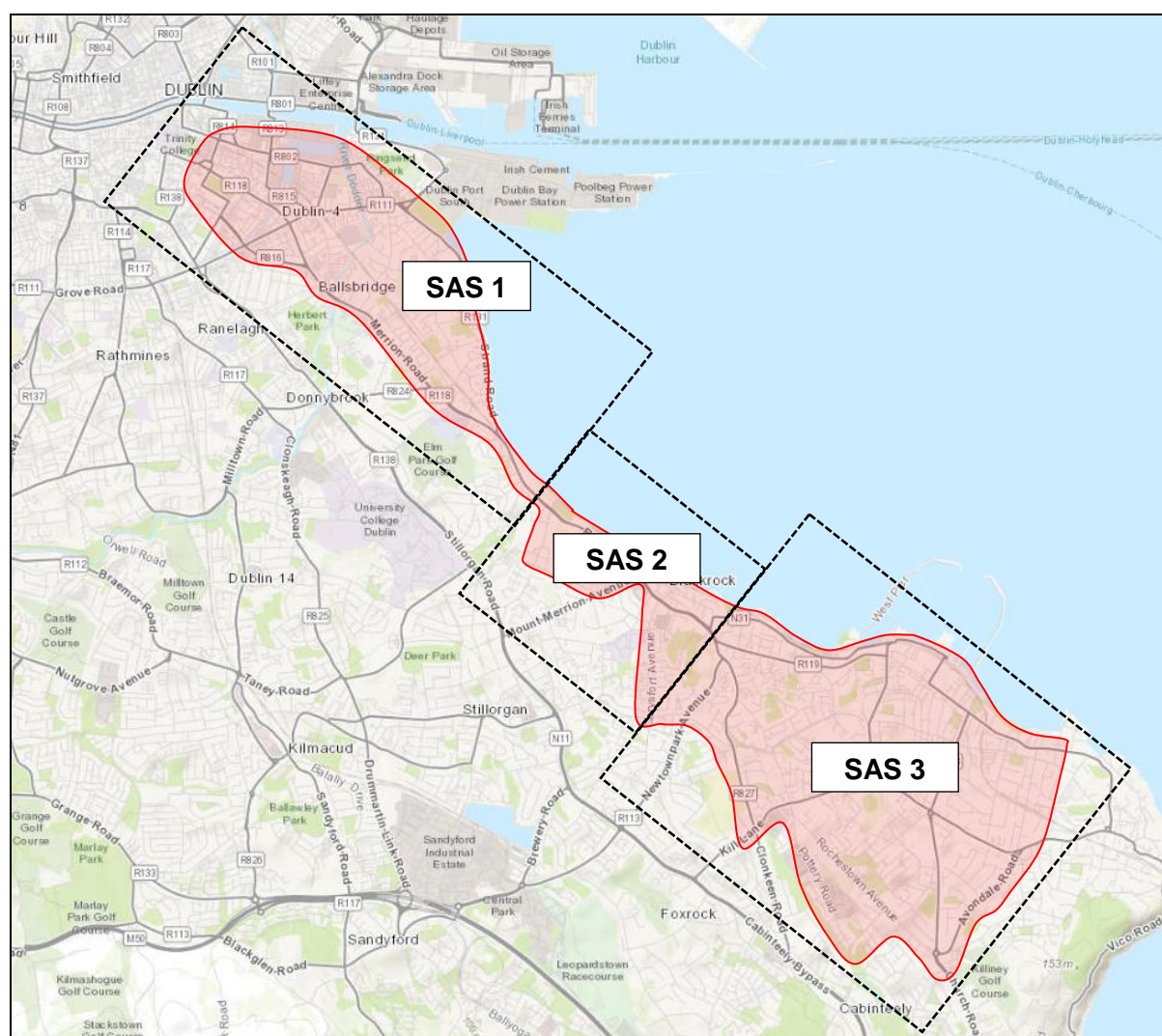


Figure 5.1.1: Study Area Sections

5.2 SAS 1: City Centre to Booterstown

Within SAS 1, there are a number of route sections which have been considered. The route sections considered are concentrated in the vicinity of Dublin City Centre.

As there are a large number of potential ‘end-to-end’ routes within study area, the roads available for CBC routing have been subdivided into shorter sections for the purposes of the ‘Stage 1’ route sections sifting process. Following the route sifting process, remaining routes have been combined to form longer route options where possible.

Figure 5.2.1 presents the initial potential route sections identified. A summary of the Stage 1 route sections sifting process is presented in Table 5.1.

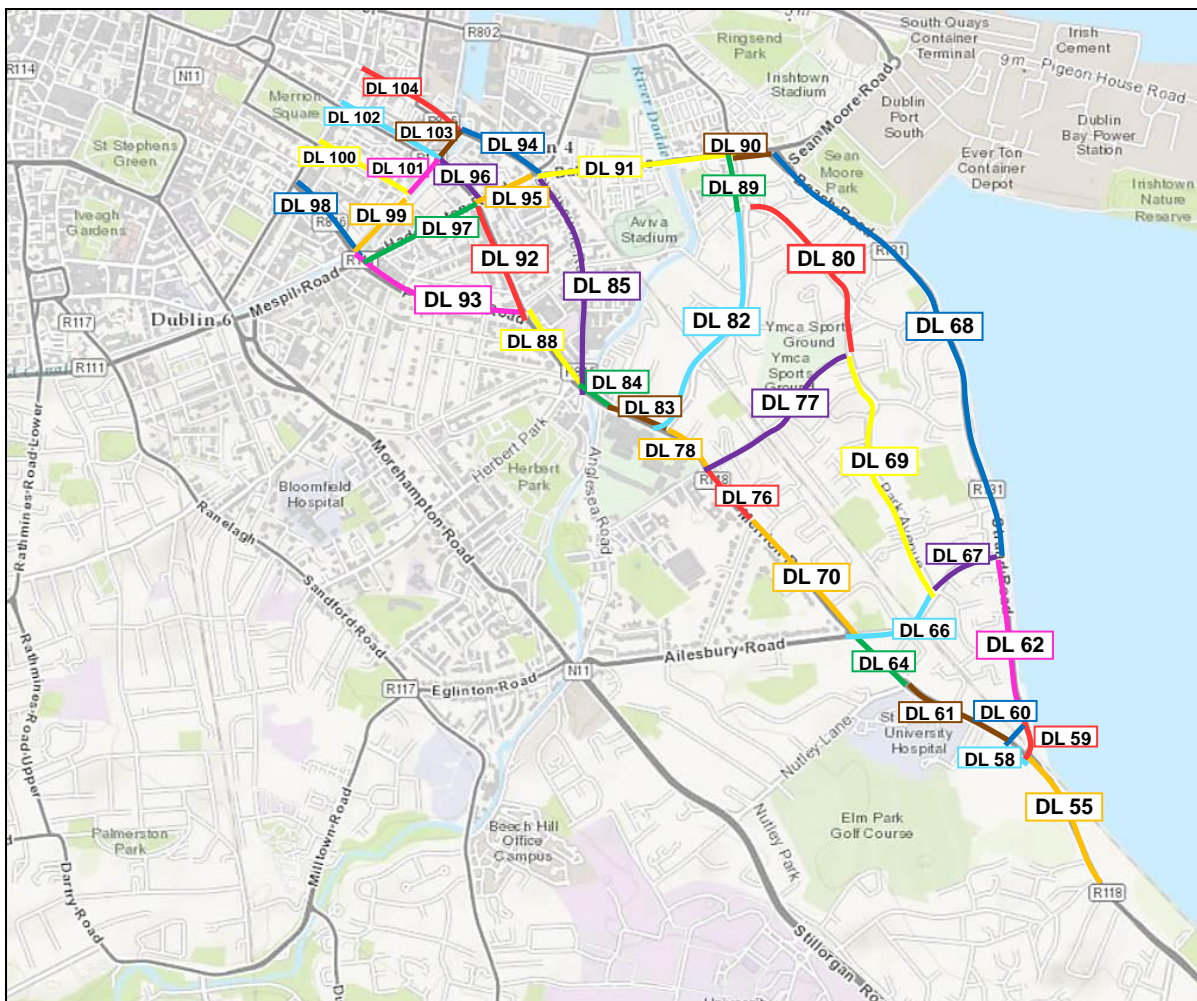


Figure 5.2.1: SAS 1 Route Sections – City Centre to Booterstown

Table 5.1: SAS 1 Route Sections Sifting (Stage 1) Summary

| Section No. | Description | Area Characteristics | Comment | Pass /Fail |
|-------------|--|---|--|------------|
| DL 55 | Merrion Road (R118), Rock Road/Trimleston Avenue to Strand Road. | Suburban Wide carriageway with existing bus facilities in part. Protected houses. | Wide carriageway with two lanes in either direction, including a bus lane southbound; as a result, this is a viable route section. | Pass |
| DL 58 | Merrion Rd, Strand Rd to New Bridge Link | Suburban | Four lane carriageway with bus lane inbound, limited capacity to widen due to protected structures, however space available on road; as a result, this is a viable route section. | Pass |
| DL 59 | Strand Rd, Merrion Rd to New Link | Suburban | Narrow carriageway, with limited scope to widen. Some on-street parking activity; as a result this is not a viable route. | Fail |
| DL 60 | New Bridge Link, Merrion Rd to Strand Rd | Suburban Proposed bridge | Proposed bridge link, therefore could be designed to accommodate facilities, as a result, this is a viable route section. | Pass |
| DL 61 | Merrion Road (R118), Proposed Bridge (R131) to Nutley Lane. | Suburban Existing bus facilities. | Wide carriageway with existing fragmented bus facilities/on-street parking. Mature trees along the route, however direct access to key attractor, as a result, this is a viable route. | Pass |
| DL 62 | Strand Road (R131), Proposed Bridge Link to Sydney Parade Avenue. | Suburban On-street parking activity. Protected lands to the east. Rail crossing | Narrow carriageway, with limited scope to widen. Some on-street parking activity. Protected lands to the east; as a result this is not a viable route. | Fail |
| DL 64 | Merrion Road (R118), Nutley Lane to Ailesbury Road. | Suburban In-bound bus lane and outbound cycle lane. Tree lined. | Wide carriageway with existing inbound bus lane, and two outbound lanes; as a result, this is a viable route. | Pass |
| DL 66 | Ailesbury Road – Sydney Parade Road, Merrion Road to Park Avenue | Suburban On-street parking towards eastern end. Large no of protected houses. | Wide carriageway in parts. However narrows at railway crossing. Number of embassies located along route and some protected houses; as a result, this is not a viable route section. | Fail |
| DL 67 | Sydney Parade Avenue, Park Avenue to Strand Road. | Suburban | Single carriageway narrows in parts, with on street parking towards eastern end. Large number of residential developments, with limited capacity to widen; as a result this is not a viable route section. | Fail |
| DL 68 | Strand Road (R131), Sydney Parade Avenue to Sean Moore Road/Bath Street. | Suburban Protected lands to east | Narrow carriageway, limited scope to widen, as a result, this is not a viable route section. | Fail |

| Section No. | Description | Area Characteristics | Comment | Pass /Fail |
|-------------|--|---|---|------------|
| DL 69 | Park Avenue – Gilford Road, Sydney Parade Avenue to Sandymount Avenue. | Suburban On-street car parking. Traffic calming provided. | Single carriageway with residential properties, some on-street parking to the north of the link, limited capacity to widen the road; as a result, this is not a viable route section. | Fail |
| DL 70 | Merrion Road (R118), Ailesbury Road to Sandymount Avenue/Simmonscourt Road. | Suburban Tree Lined. No of Embassies present. | Wide carriageway with existing inbound bus lane and outbound cycle lane, large mature trees, and embassies, also a direct route to key attractor, therefore this is a viable route section. | Pass |
| DL 76 | Merrion Road (R118), Shrewsbury Road to Simmonscourt Road/Sandymount Avenue. | Urban Tree lined. Embassies | Single carriageway with bus lane inbound and cycle lane outbound, Embassies on link, young tree lined, however provides a direct link to key attractor and wide footpaths could be reduced to provide sufficient space for facilities; as a result, this is a viable route section. | Pass |
| DL 77 | Sandymount Avenue, Merrion Road (R118) to Gilford Road. | Suburban Narrow carriageway, on-street parking in sections. 5m height restriction at rail crossing. Bus route. | Single carriageway with some on-street parking, limited capacity to widen, narrow rail crossing, as a result this is not a viable route section. | Fail |
| DL 78 | Merrion Road (R118), Sandymount Avenue/Simmonscourt Road to Serpentine Avenue. | Suburban Wide carriageway with existing bus facilities provided. | Wide carriageway with existing bus facilities in part, direct access to key attractor, as a result, this is a viable route section. | Pass |
| DL 80 | Gilford Road – Sandymount Road, Sandymount Avenue to Tritonville Road. | Suburban Traffic calming provided. | Wide carriageway in parts though there is a large volume of on-street parking which would need to be removed to provide facilities, as a result, this is not a viable route. | Fail |
| DL 82 | Serpentine Avenue – Tritonville Road, Merrion Road (R118) to Sandymount Road. | Suburban Traffic calming provided. | Carriageway width varies, with narrow sections at railway crossing; limited capacity to widen in part due to residential properties, as a result, this is not a viable section. | Fail |
| DL 83 | Merrion Road (R118), Serpentine Avenue to Anglesea Road. | Suburban Tree lined. RDS Access | Wide carriageway with existing bus facilities, provides direct access to key attractor, as a result, this is a viable route section. | Pass |
| DL 84 | Pembroke Road (R118), Anglesea Road to Shelbourne Road (R815)/Herbert Park | Urban | Wide carriageway with existing bus facilities, as a result, this is a viable route section. | Pass |

| Section No. | Description | Area Characteristics | Comment | Pass /Fail |
|-------------|---|--|---|------------|
| DL 85 | Shelbourne Road (R815), Pembroke Road (R118)/Herbert Park to Bath Avenue (R111)/South Lott's Road/Haddington Road (R111)/Grand Canal Street Upper (R815). | Suburban On-street parking. Embassy on link. | Wide carriageway on southern end, with on-street parking, reducing in width at northern end of link, limited availability to widen in part due to residential units; as a result, this is not a viable route. | Fail |
| DL 88 | Pembroke Road (R118), Herbert Park/Shelbourne Road to Pembroke Road (R816)/Lansdowne Road. | Suburban Existing bus facilities. Embassy present. | Wide carriageway with existing bus facilities, as a result, this is a viable route section. | Pass |
| DL 89 | Tritonville Road, Sandymount Road/Newbridge Avenue to Londonbridge Road/Church Avenue (R111). | Suburban On-street parking. | Wide carriageway with on-street parking, does not link to other routes, as a result this is not a viable route. | Fail |
| DL 90 | Church Avenue, Bath Street/Beach Road/Sean Moore Road to Tritonville Road | Suburban | Single carriageway, narrow bounded by development and converges with another CBC study area; as a result, this is not a viable route section. | Fail |
| DL 91 | Londonbridge Road- Bath Road, Irishtown Road to Shelbourne Road/Haddington Road, Grand Canal Street/South Lotts Street | Urban | Single carriageway with large volume of on-street parking, converges with another CBC study area, as a result, this is not a viable route section. | Fail |
| DL 92 | Northumberland Rd, Pembroke Rd/Lansdown Rd to Haddington Rd | Urban Bus lane on one side of the road, with cycle facilities on the opposite side. | Wide carriageway with three lanes generally provided, including a bus lane on one side of the road (varies), with cycle facilities on the opposite side. Tree lined street, with wide footpaths, as such, this is a viable route section. | Pass |
| DL 93 | Pembroke Road – Baggot Street (R816), Pembroke Road (R118)/Northumberland Road/Lansdowne Road to Mespil Rd/Haddington Rd. | Suburban On-street parking. Tree lined. Existing bus route. | Wide carriageway with four lanes in parts, on-street parking and large mature trees; as a result, this is a viable route section. | Pass |
| DL 94 | Grand Canal Street Upper (R815), South Lott's Road/Bath Avenue (R111)/Shelbourne Road (R815)/Haddington Road (R111) to Clanwillian Place | Urban On-street parking provided. Dublin Bike station provided. | Converges with another CBC study area, as a result, this is not a viable route section. | Fail |
| DL 95 | Haddington Road (R111), Northumberland Road (R118) to Grand Canal Street Upper (R815)/South Lott's Road/Bath Avenue R111)/Shelbourne Road (R815). | Suburban | Wide single carriageway with large volumes of on-street parking, limited capacity to widen, as a result, this is not a viable route section. | Fail |

| Section No. | Description | Area Characteristics | Comment | Pass /Fail |
|-------------|---|--|--|------------|
| DL 96 | Northumberland Road (R118), Haddington Road (R111) to Clanwilliam Place | Urban | Wide carriageway with some existing bus facilities and on street parking areas. Sufficient space for bus and cycle lanes and provides a direct route to key destination as a result, this is a viable route section. | Pass |
| DL 97 | Haddington Road (R111), Northumberland Road (R118) to Baggot Street | Urban | Wide carriageway with on-street parking and trees, as a result, this is not a viable route section. | Fail |
| DL 98 | Baggot Street (R816), Mespil Road/Baggot Street/Haddington Road to Baggot Street Lower/Fitzwilliam Street Upper | Suburban On-street parking. Tree lined. Existing bus route. | Wide carriageway with four lanes in parts, on-street parking and large mature trees though sufficient space for bus and cycle lanes and provides a direct route to end of scheme; as a result, this is a viable route section. | Pass |
| DL 99 | Herbert Place, Baggot Street to Mount Street Upper/Warrington Place | Urban | Single carriageway with on-street parking and off-road cycle track; as a result this is not a viable route section. | Fail |
| DL 100 | Mount Street Upper, Herbert Place/Warrington Place to Merrion Square South | Urban | Single carriageway with on-street parking, and insufficient space for facilities, as a result, this is not a viable route section. | Fail |
| DL 101 | Warrington Place, Mount Street Upper/Herbert Place to Northumberland Road/Clanwilliam Place | Urban | Single carriageway with on-street parking and off-road cycle track; as a result this is not a viable route section. | Fail |
| DL 102 | Northumberland Road (R118), Clanwilliam Place/Northumberland Road/Warrington Place to Merrion Square. | Urban Disjointed bus facilities. Some trees on southern section. | Wide carriageway with some existing bus facilities and on street parking areas. Sufficient space for facilities and provides a direct route to key destination as a result, this is a viable route section. | Pass |
| DL 103 | Clanwilliam Place, Mount Street Lower/Warrington Place/Northumberland Road to Grand Canal Street | Urban | Single carriageway with on-street parking and sufficient space for facilities, provides direct link to key destination, as a result, this is a viable route section. | Pass |
| DL 104 | Grand Canal Street Lower (R815), Clanwilliam Place to Merrion Square East. | Urban On-street parking provided. Dublin Bike station provided. | Converges with another CBC study area, as a result, this is not a viable route section. | Fail |

Following the 'Stage 1' sift, 18 of the 37 route sections passed the initial sifting stage.

Though routes DL 60, 100 and 103 all passed, they were not progressed to the next assessment stage as they do not link with the other passing route sections.

The 15 route sections which progressed to Stage 2 are presented in Figure 5.2.2.

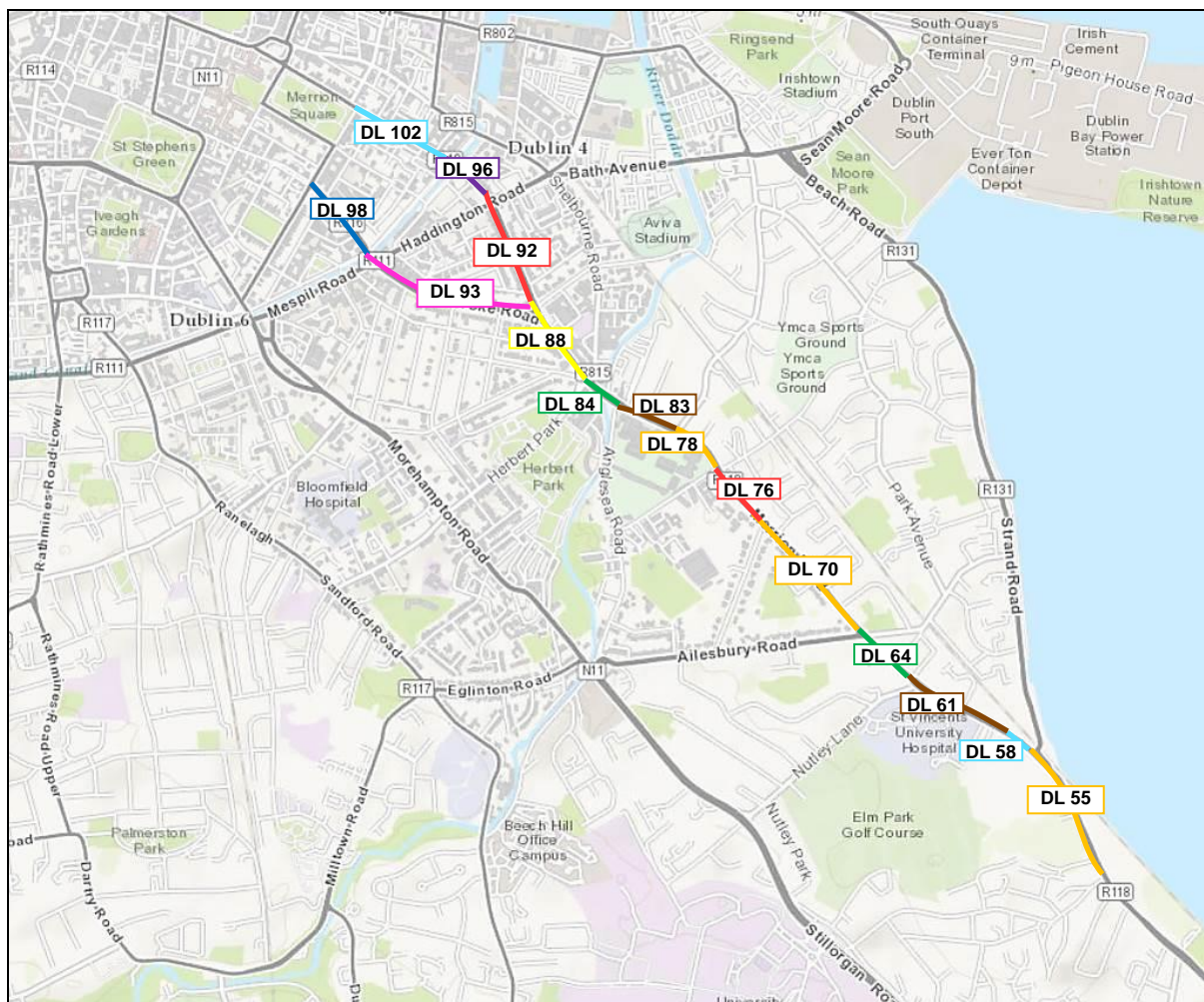


Figure 5.2.2: Route Sections passing Stage 1 'Sift' in SAS 1

5.3 SAS 2: Booterstown to Blackrock

There are a relatively small number of potential ‘end-to-end’ routes within the Middle section in comparison with the Northern and Southern section of the study area. Figure 5.3.1 presents the initial potential route sections identified. A summary of the Stage 1 route sections sifting process is presented in Table 5.2.

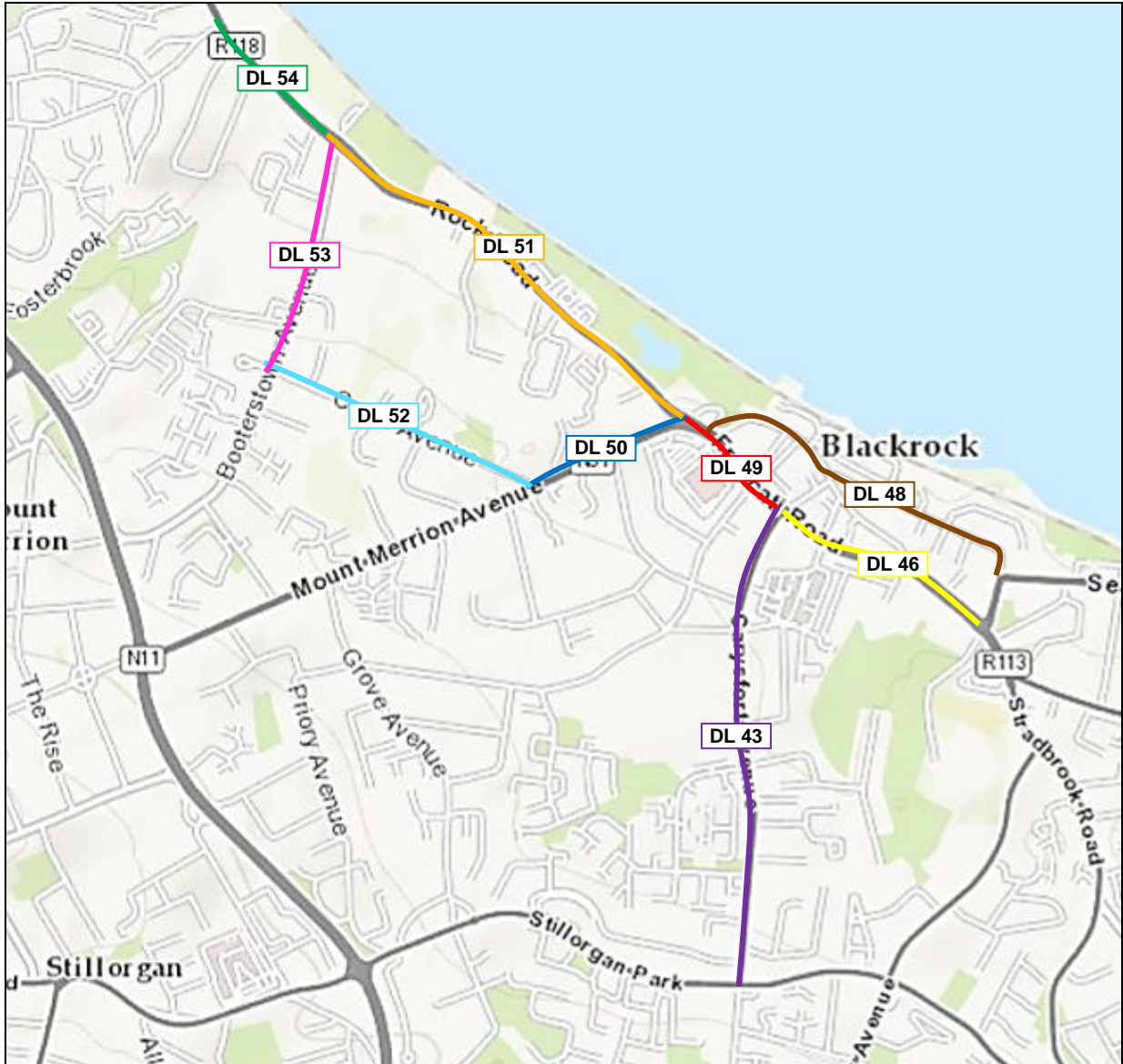


Figure 5.3.1: SAS 2 Route Sections – Booterstown to Blackrock

Table 5.2: SAS 2 Route Sections Sifting (Stage 1) Summary

| Section No. | Description | Area Characteristics | Comment | Pass/Fail |
|-------------|--|--|---|-----------|
| DL 43 | Carysfort Avenue (R825), Stillorgan Park Avenue/Fleurville to Fascafi Road (N31). | Suburban Existing bus route. On-street parking. | Single carriageway road, with large volume of on-street parking, narrowing at the northern end of the route with limited availability for land take, as a result, this is not a feasible route section. | Fail |
| DL 46 | Temple Hill – Frascafi Road (N31), Newtown Avenue/Temple Road (N113) to Craysfort Avenue | Suburban Off-road cycle facilities. | Dual carriageway with cycle facilities, as a result, this is a viable section. | Pass |
| DL 48 | Newtown Avenue – Main Street – Craysfort Avenue, Seapoint Avenue (N31) to Craysfort Avenue (R825)/Frascati Road (N31). | Urban One way street with contra flow cycle track and on-street parking, moving to two-way on main street. | Limited potential to widen along much of this route; as a result, this is not a viable section. | Fail |
| DL 49 | Frascati Road (N31), Craysfort Avenue (R828) to Mount Merrion Avenue (N31)/Rock Road (R118). | Suburban Cycle facilities. | Dual carriageway with cycle facilities, as a result, this is a viable route section. | Pass |
| DL 50 | Mount Merrion Avenue (N31), Frascafi Road/Rock Road to Cross Avenue. | Suburban Eastbound bus lane. On-street parking provided. St. Andrews Church. | Single carriageway road with east bound bus lane, large volume of on-street parking to be removed for west bound bus lane; as a result, this is not a viable section. | Fail |
| DL 51 | Rock Road (R118), Frascafi Road (N31)/Mount Merrion Avenue (N31) to Booterstown Avenue. | Suburban Wide carriageway with existing bus facilities. Protected lands to the east. | Wide carriageway with bus lanes in both directions, as a result, this is a viable route section. | Pass |
| DL 52 | Cross Avenue, Mount Merrion Avenue (N31) to Booterstown Avenue. | Suburban On-street parking in places. Tree lined. Some protected houses. | Wide carriageway with wide grass verge, mature trees and on-street parking. Bus and cycle lanes could be provided along grass verge. As a result, this is a viable route section. | Pass |
| DL 53 | Booterstown Avenue, Cross Avenue to Rock Road (R118). | Suburban On-street parking provided making carriageway narrow. Protected house. | Single carriageway, very narrow particularly at eastern end, limited potential to widen due to residential properties; as a result, this is not a viable route section. | Fail |
| DL 54 | Rock Road (R118), Booterstown Avenue to Trimleston Avenue. | Suburban Existing bus facilities. On street parking. Protected lands to the east. Protected structures to West. | Wide carriageway with two lanes in each direction and existing bus facilities, as a result, this is a viable route. | Pass |

Following the 'Stage 1' sift, 5 of the 9 route sections assessed passed the initial sifting stage.

Though route DL 52 passed, it was not progressed to the next assessment stage as it does not link with the other passing route sections.

The 4 route sections which progressed to Stage 2 are presented in Figure 5.3.2.

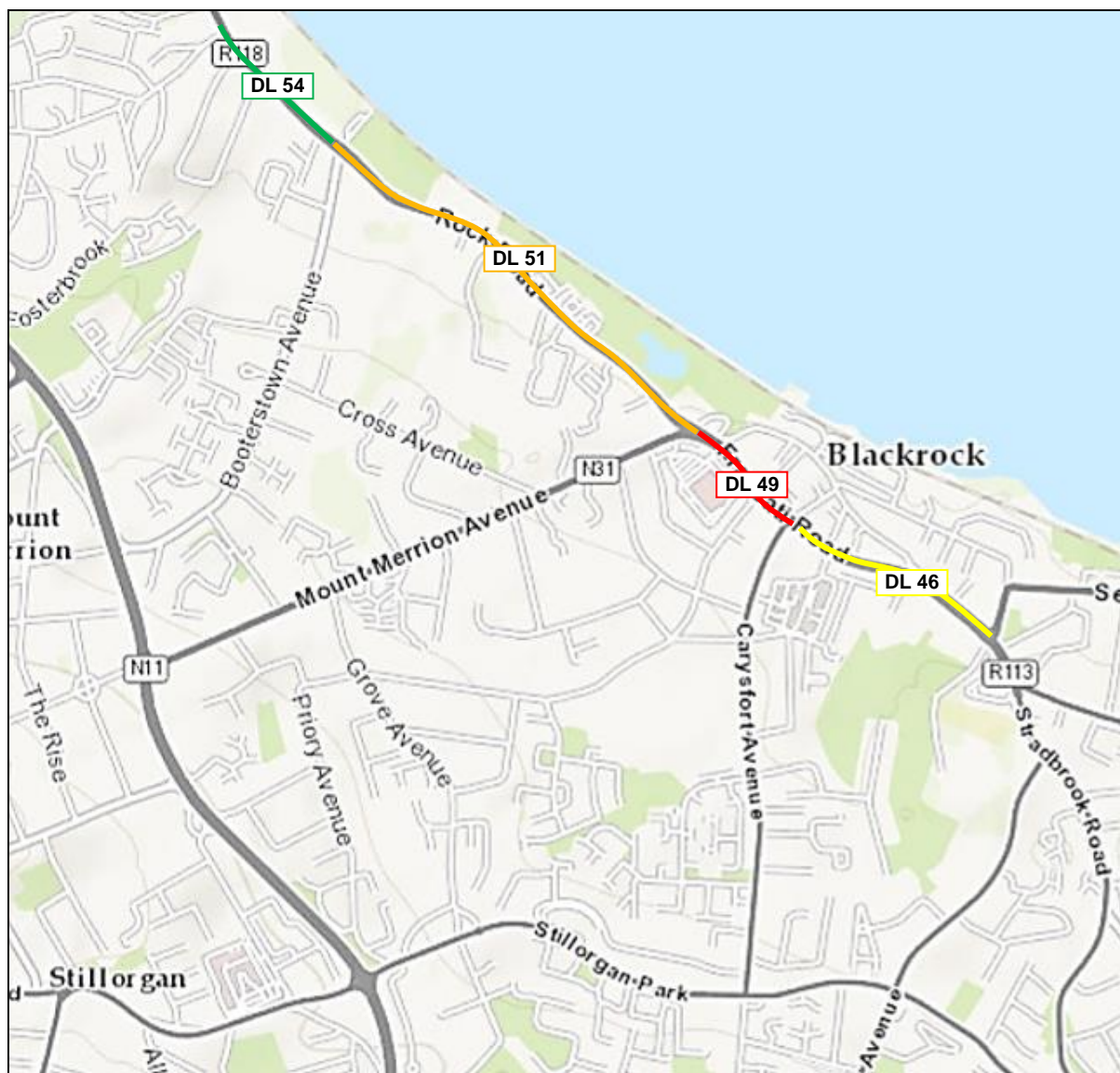


Figure 5.3.2: Route Sections passing Stage 1 'Sift' in SAS 2

5.4 SAS 3: Booterstown to Dun Laoghaire

As with SAS 1, there are a large number of potential ‘end-to-end’ routes with SAS 3.

The roads available for CBC routing have been subdivided into shorter sections for the purposes of the ‘Stage 1’ route sections sifting process.

Following the route sifting process, remaining routes sections have been combined to form longer route options where possible.

Figure 5.4.1 presents the initial potential route sections identified. A summary of the Stage 1 route sections sifting process is presented in Table 5.3.



Figure 5.4.1: SAS 3 Route Sections – Blackrock to Dun Laoghaire

Table 5.3: SAS 3 Route Sections Sifting (Stage 1) Summary

| Section No. | Description | Area Characteristics | Comment | Pass/Fail |
|-------------|--|--|---|-----------|
| DL 01 | Albert Road Lower, Elton Park/Hudson Road to Killiney Towers Roundabout | Suburban On-street parking | Single carriageway road with residential frontage and a number of dedicated disabled parking bays provided. On street parking also provided: as a result it is not a feasible section | Fail |
| DL 02 | Avondale Road, Killiney Towers Roundabout to The Graduate Roundabout | Suburban Off-street parking. Existing cycle lanes and grass verges. Existing bus route | Single carriageway road with grass verges on both sides and trees. Cycle lane facilities provided. Parking off-street with sufficient space for bus lanes; as a result it is a feasible route section. | Pass |
| DL 03 | Rochestown Avenue (R828), The Graduate Roundabout to Johnstown Road | Suburban, Off-street parking. Wide verge on one side. Existing bus route | Single carriageway road with wide grass verge on one side where bus and cycle lanes could be provided; as a result it is a feasible route section. | Pass |
| DL 04 | Sallyglan Road (R118), The Graduate Roundabout to The Deerhunter Roundabout | Suburban, Off-road cycle track New bus route proposed for this link. | Single carriageway road with grass verge and young trees. Walled lined route with cycle facilities provided behind the wall so grass verge could be used for bus lanes; as a result this is a feasible section. | Pass |
| DL 05 | Glenageary Road Upper, Killiney Towers Roundabout to The Deerhunter Roundabout | Suburban Existing on-road cycle lanes. Existing bus route. | Single carriageway with on-road cycle lanes. Off-road parking for residential properties, road could be widened to provide bus lanes; as a result this is a feasible section | Pass |
| DL 06 | Hudson Road/Eden Road Upper and Lower, Albert Road Lower to Glenageary Road Lower. | Suburban On-street parking. | Single carriageway with some on-street parking, due to residential development bounding the road, limited capacity to widen in parts; as a result, this is not a viable route section. | Fail |
| DL 07 | Johnstown Road/Pottery Road, Rochestown Avenue (R828) to Rochestown Avenue (R828) | Suburban Johnstown Road: Off-road car parking. Existing cycle facilities. Pottery Road: Cycle facilities provided. | Recently widened single carriageway with the maximum widening achievable provided in some locations but north of Lidl; little scope to widen further. Circuitous route away from principal trip attractors; as a result this is not a feasible section. | Fail |
| DL 08 | Rochestown Avenue (R828), Johnstown Road to Sallynoggin Road. | Suburban Wide carriageway with lands available to widen into. | Single carriageway with building lines set back over much of the route; as a result this is a feasible section. | Pass |

| Section No. | Description | Area Characteristics | Comment | Pass/Fail |
|-------------|--|--|--|-----------|
| DL 09 | Sallynoggin Road Upper, Rochestown Avenue (R828) to The Deerhunter Roundabout | Suburban Wide carriageway, some traffic calming in place. On-street parking provided in places. | Single carriageway with parking over much of its length. While it does serve a potential user demand, the circuitous route makes it an unviable routing. | Fail |
| DL 10 | Glenageary Road Lower, The Deerhunter Roundabout to Eden Park Upper/Corrig Road | Suburban Off-street parking. Some traffic calming. | Single carriageway with large number of properties fronting the road with limited land available to widen; as a result this is not a feasible section | Fail |
| DL 11 | Glenageary Road Lower, Eden Road Upper/Corrig Road to Glasthule Road/Park Road/George Street Upper | Suburban, | Single carriageway with large number of properties fronting the road with limited land available to widen; as a result this is not a feasible section | Fail |
| DL 12 | Rochestown Avenue, Sallynoggin Road to Pottery Road/Rochestown Avenue | Suburban Cycle facilities provided. | Single carriageway with building lines set back over much of the route; as a result this is a feasible section. | Pass |
| DL 13 | Rochestown Avenue, Pottery Road/Rochestown Avenue to Bakers Corner | Suburban Existing cycle facilities. | Single carriageway with available space to provide facilities; as a result this is a feasible section. | Pass |
| DL 14 | Glenageary Road Upper, The Deerhunter Roundabout to Jct of Kill Ave/Oliver Plunkett Road/Mounttown Lower/Highthorn Park/Glenageary Road Upper. | Suburban Cycle facilities and fragmented bus facilities. | Single carriageway with existing bus and cycle facilities, narrows towards southern end; however this is a feasible route section. | Pass |
| DL 15 | Corrig Road/Tivoli Road, Glenageary Road Upper (R118)/Eden Road Upper to York Road/Mounttown Road Upper/Mounttown Road Lower. | Suburban, Narrow carriageway with double yellow lines. | Single carriageway narrow road with residential properties located along its length. Limited potential to widen over much of the route, as a result it is not a feasible section. | Fail |
| DL 16 | George Street Upper, Park Road/Glasthule Road/Glenageary Road Upper to Marine Road/George Street Lower | Urban Main street, with sections of on-street parking. Some traffic calming features. Existing bus route. | Limited potential to widen however it is an existing bus route serving multiple bus lines and provides a direct route into the town centre section to connect with other bus routes; as a result this is a feasible section. | Pass |
| DL 17 | Marine Road/Crofton Road, George Street Upper/Lower to York Road/Old Dunleary Road (N31). | Urban Link to main street, wide carriageway, existing bus route/terminus. | Limited potential to widen due to location of DART line, however it is an existing bus route serving multiple bus lines and provides link to DART services and town centre; as a result this is a feasible section. | Pass |

| Section No. | Description | Area Characteristics | Comment | Pass/Fail |
|-------------|---|--|--|-----------|
| DL 18 | George Street Lower, Marine Road/George Street Upper to York Road. | Urban Main Street, traffic calmed, loading facilities, one-way westbound for some sections. | Limited potential to widen however it is an existing bus route serving multiple bus lines and provides a direct route into the town centre section to connect with other bus routes; as a result this is a feasible section. | Pass |
| DL 19 | Kill Avenue (R830), Bakers Corner to Jct of Kill Ave/Oliver Plunkett Road/Mounttown Lower/Highthorn Park/Glenageary Road Upper. | Suburban Bus lane westbound and cycle lane eastbound. Dun Laoghaire Fire Station and IADT located along route. | Potential to widen road to provide/improve facilities; as a result this is a feasible section. | Pass |
| DL 20 | Mounttown Lower, Jct of Kill Ave/Oliver Plunkett Road/Mounttown Lower/Highthorn Park/Glenageary Road Upper and Mounttown Road Upper/Tivoli Road/York Road | Suburban Existing bus route. Some on-street parking occurs | Limited potential to widen road due to large number of residential properties, however it is an existing bus route and provides connection between other links; as a result this is a feasible section. | Pass |
| DL 21 | York Road, Mounttown Lower/Upper/Tivoli Road to Cumberland St/Clarence Street/George Street Lower. | Suburban Narrow carriageway with double yellow lines. Existing bus route. | Limited potential to widen road due to large number of residential properties, as a result this is not a feasible section. | Fail |
| DL 22 | Clarence Street, Cumberland Street/York Road/George Street Lower to Old Dunleary Road/Crofton Road | Suburban Wide carriageway with existing bus facilities. | Wide carriageway which provides a direct link to DART line; as a result, this is a feasible route section. | Pass |
| DL 23 | Kill Lane, Bakers Corner to Deansgrange Road/Kill Lane (R830)/Clonkeen Road | Suburban Wide carriageway with existing cycle facilities. Short sections of bus lane provided. | Route is travelling away from key attractors, leading to a circuitous route; as a result this is not a feasible route section. | Fail |
| DL 24 | Deansgrange Road, Kill Lane (R830), Clonkeen Road to Brookville Park, Deansgrange Road | Suburban On-street parking. In sections wide grass verge provided with trees. Existing bus route | Route is travelling away from key attractors, leading to a circuitous route; as a result this is not a feasible route section. | Fail |
| DL 25 | Abbey Road, Bakers Corner to Stradbrog Roundabout | Suburban Existing bus route. | Wide carriageway with grass verge on one side where bus and cycle lanes could be provided; as a result, this is a feasible section. | Pass |

| Section No. | Description | Area Characteristics | Comment | Pass/Fail |
|-------------|--|--|--|-----------|
| DL 26 | Oliver Plunkett Rd/Monkstown Farm, Kill Ave/Glenageary Rd Upper/Mounttown Lower to Monkstown Ave | Suburban Existing bus route. On-street parking in parts. | At southern end, on-street parking provided. Road carriageway narrows considerably as route progresses, with residential properties bounding either side of the road. Limited capacity to widen in some locations, as a result this is not a viable section. | Fail |
| DL 27 | Mounttown Road Upper, York Road/Tivoli Road/Mounttown Lower to Mounttown Roundabout. | Suburban On-street parking for residential properties with no alternative. On-road cycle lanes provided. Existing bus route. | Generally wide carriageway with potential to provide facilities, however a number of residential units with on-street parking and no alternative. This has been taken forward as a feasible route at this stage. | Pass |
| DL 28 | Cumberland Street (R119)-Monkstown Crescent, George Street Upper/York Street to Clifton Avenue Carrickbrennan Road | Suburban On-street parking provided. Existing bus route. | Provision of facilities would result in a loss of a large volume of parking; as a result this is not a viable route section. | Fail |
| DL 29 | Old Dunleary Road (N31), Crofton Road/York Road to Clifton Avenue. | Suburban Wide carriageway with double yellow lines. | Limited capacity to widen in places, and would result in loss of some on-street parking, however provides direct link to DART services; as a result this is a viable route section. | Pass |
| DL 30 | Monkstown Avenue, Monkstown Roundabout to Oliver Plunkett Rd/Monkstown Farm | Suburban Existing bus route. | Single carriageway with grass verges provided along route where bus and cycle lanes could be provided, as a result, this is a viable route. | Pass |
| DL 31 | Carrickbrennan Road, Stradbrook Roundabout to Monkstown Road/Clifton Avenue/Monkstown Crescent (R119) | Suburban On-street parking. Existing bus route. | Single carriageway road with potential to widen, will result in some loss of parking in village; as a result this route is a viable section. | Pass |
| DL 32 | Monkstown Avenue, Oliver Plunkett Rd/Monkstown Farm to Stradbrook Rd/Abbey Rd | Suburban Existing Bus Route | Single carriageway with grass verges provided along route where bus and cycle lanes could be provided, as a result, this is a viable route. | Pass |
| DL 33 | Stradbrook Road (R828), Stradbrook Roundabout to Rowan Park (R827) | Suburban Wide carriageway with grass verge in places. | Single carriageway with central hatching provided over much of its length which could be removed to provide sufficient space for bus and cycle lanes; as a result this route is a viable section. | Pass |

| Section No. | Description | Area Characteristics | Comment | Pass/Fail |
|-------------|--|--|---|-----------|
| DL 34 | Rockford Park, Stradbrook Roundabout to Brookville Park/Deansgrange Road (R827) | Suburban Verges provided between parallel roads. | Single carriageway with grass verge provided between parallel roads which could be removed for the provision of bus and cycle lanes, as a result, this is a viable route section. | Pass |
| DL 35 | Brookville Park/Rowanbyrn, Deansgrange Road (R827)/Rockfield Park to Newtownpark Avenue (R113) /Annville Terrace | Suburban Existing bus lanes. Some traffic calming provided. | Existing facilities provided over much of the route, as a result, this is a feasible section. | Pass |
| DL 36 | Deansgrange Road-Rowan Park (R827), Brookville Park/Rockford Park to Jct of Rowan Park/Stradbrook Road. | Suburban Existing bus route. | Limited capacity to widen at the northern end of the link, as a result this is not a feasible section. | Fail |
| DL 37 | Monkstown Road (R119), Clifton Avenue/Monkstown Crescent/Carrickbrennan Road to Temple Hill (R113) Tempe Crescent. | Suburban | Limited capacity to widen over much of its length, however possibility to use a combined route with Seapoint Avenue, as a result, this is a viable section. | Pass |
| DL 38 | Clifton Avenue, Monkstown Road (R119) to Longford Terrace/Clifton Lane (N31) | Suburban | Potential to widen however parking provided for commercial units, as a result, this is not viable section. | Fail |
| DL 39 | Seapoint Avenue (N31), Clifton Avenue to Newtown Avenue. | Suburban | Limited potential to widen in some locations due to railway line however provides key link to DART services and is a key link between other feasible links, may also be used in combination with Monkstown Road; as a result, this is a viable section. | Pass |
| DL 40 | Stradbrook Road (R827), Rowan Park/Stradbrook Road(R828) to Newtownpark Avenue (R113)/Temple Hill (R113). | Suburban Existing bus route. Cycle facilities in some sections. | Single carriageway, wide in parts, bounded on the east by wall, behind which is a grass verge where cycle facilities could be provided, as a result this is a viable route section. | Pass |
| DL 41 | Newtownpark Avenue (R113), Annville Terrace/Rowanbyrn to Stradbrook Road (R827)/Temple Hill (R113) | Suburban Existing bus route. | Single carriageway with potential to widen, however a number of key pinch points, as well as a being circuitous; as a result, this is not a viable route section. | Fail |
| DL 42 | Annville Terrace-Fleurville, Newtownpark Avenue/Rowanbyrn to Stillorgan Park Road (R825)/Craysfort Avenue (R825). | Suburban Existing bus route. Off-road cycle facilities. | Single carriageway travelling away from key attractors and leading to circuitous route and greater journey time, as a result, this is not a feasible section. | Fail |

| Section No. | Description | Area Characteristics | Comment | Pass/Fail |
|-------------|--|--|---|-----------|
| DL 44 | Temple Hill (R113), Newtownpark Avenue (R825)/Stradbroke Road (R827) to Monkstown Road (R119)/Temple Crescent. | Suburban Existing bus route. Cycle facilities. | Wide road with two lanes in each direction, as a result, this is a viable route section. | Pass |
| DL 45 | Temple Hill (R113), Monkstown Road (R119)/Temple Crescent to Newtown Avenue/Temple Road (N31). | Suburban Wide carriageway | Dual carriageway, with 2-3 lanes in each direction, as a result, this is a viable section. | Pass |
| DL 47 | Newtown Avenue (N31), Temple Road (R113-N31) to Seapoint Avenue (N31) | Suburban On-street parking. | Single carriageway, with limited on-street parking and wide footpaths, which could be reduced in width to provide space for bus and cycle lanes; as a result, this is a viable route. | Pass |

Following the 'Stage 1' sift, 29 of the 45 route sections assessed passed the initial sifting stage.

Though routes DL 2, 5, 16, 30, 32, 34 and 35 all passed, they were not progressed to the next assessment stage as they do not link with the other passing route sections.

The 22 route sections which progressed to Stage 2 are presented in Figure 5.4.2.



Figure 5.4.2: Route Sections passing Stage 1 'Sift' in SAS 3

6. Stage 2: Scheme Options Assessment

6.1 Introduction

The first step in the Stage 2 assessment involves combining shorter route sections which passed the Stage 1 assessment, to form longer end-to-end potential routes within each SAS.

After developing routes options, each was explored using different design concepts to identify potential scheme options for each route. The scheme options for each route within each SAS are described in this report Section.

6.2 SAS 1: City Centre to Booterstown

6.2.1 Introduction

Following the 'Stage 1' sift for SAS 1/Northern Terminus study area, the remaining 15 route sections were combined to form two cohesive route options as shown in Figure 6.2.1 below.

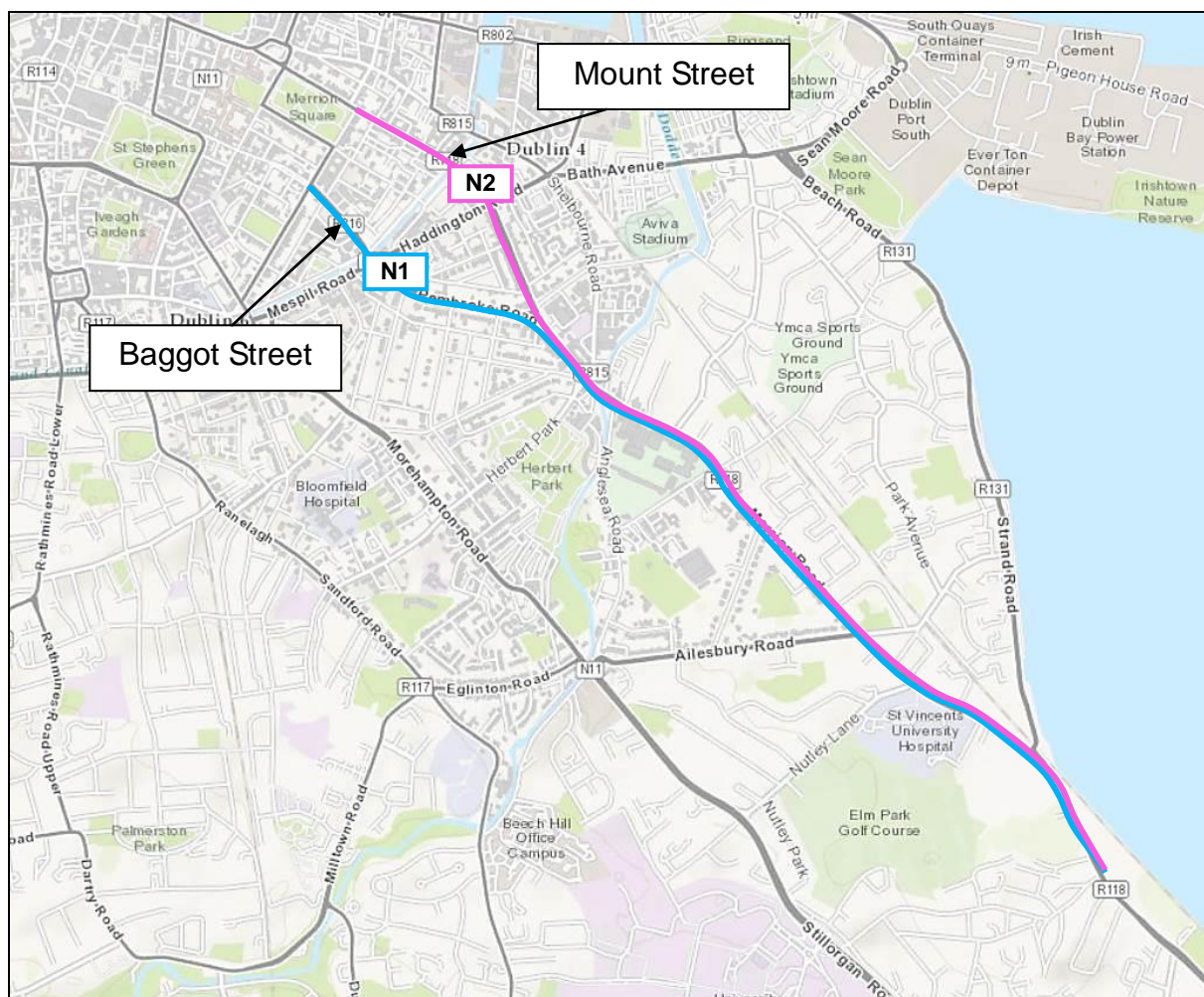


Figure 6.2.1: SAS 1 / Northern Terminus Cohesive Route Options

- N1: A route option via Merrion Road, Pembroke Road and Baggot Street Lower; and
- N2: A route option via Merrion Road, Northumberland Road and Merrion Square North.

Two scheme options have been developed for each of the route options in SAS 1; see Table 6.1.

Table 6.1: Study Area Section1 Scheme options

| | | |
|-------|-----------------------|----------|
| SAS 1 | N1 (Baggot Street) | Option 1 |
| | | Option 2 |
| | N2 (Mount Street) | Option 1 |
| | | Option 2 |

6.2.1 N1 – Booterstown to Merrion Street Upper Route

Figure 6.2.2 below illustrates the population residing within the 5, 10 and 15 minute catchment zones of the existing and proposed bus stops along route N1.

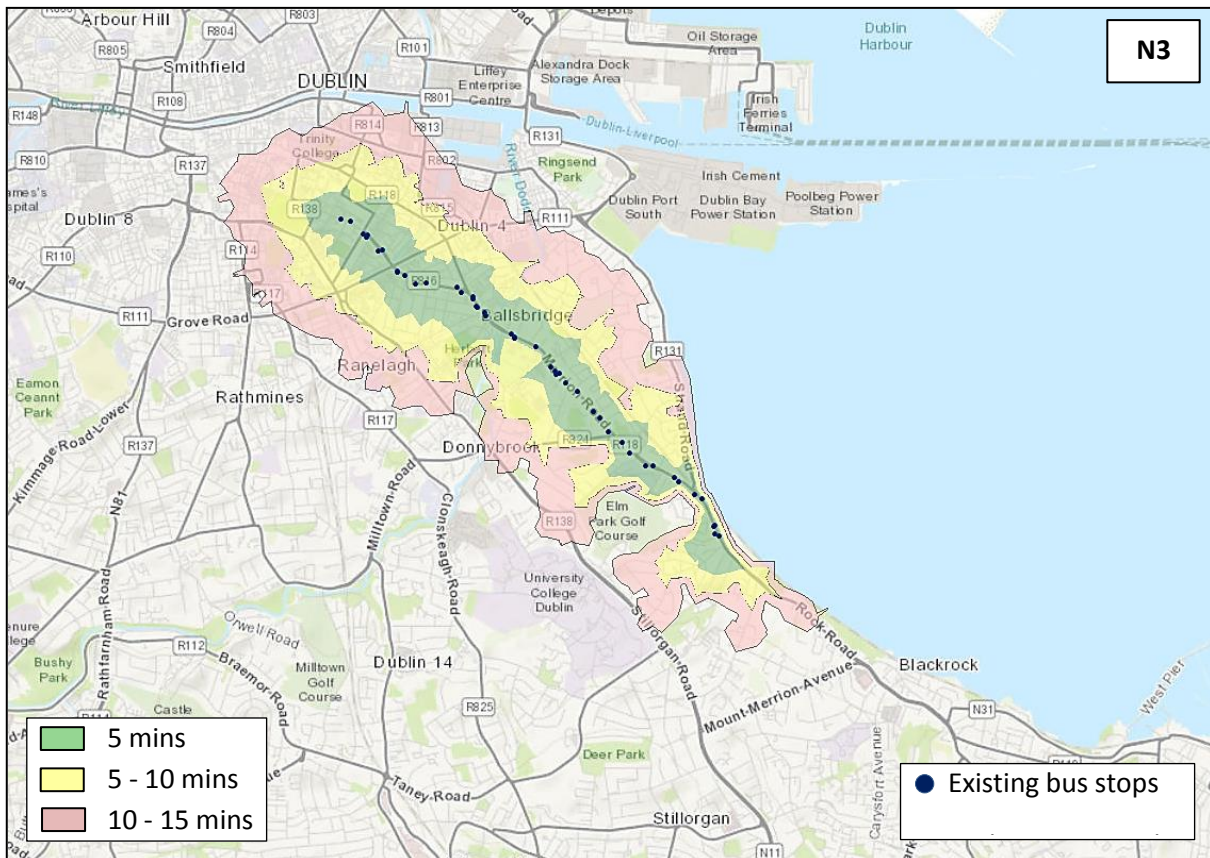


Figure 6.2.2: Walking distance catchment zones for route N1 bus stops

Inbound: This route option would connect Booterstown to Merrion Street Upper via Merrion Road, Pembroke Road and Baggot Street Lower.

Outbound: Southbound, buses would travel the same route as taken by inbound vehicles. This route is approximately 4.4 km in each direction.

Stops: 16 inbound and 17 outbound bus stops would be provided in each direction along this route. See Figure 6.2.2. Bus stop locations have been optimised to

facilitate the route geometry and optimise catchment based on population and employment destinations.

Catchment: The outermost isochrone contour defines the perimeter within which the nearest bus stop could be reached by pedestrians in 15 minutes or less at a typical walking pace. The population residing within each of the isochrone contour areas is summarised below:

- 5 minutes walking distance – 8,300 residents
- 5-10 minutes walking distance – 12,000 residents
- 10-15 minutes walking distance – 23,000 residents
- Total catchment within 15 minutes walking distance – 43,300 residents

These figures are based on the Census 2011 Small Area Population Statistics (SAPS).

Junctions: There are a total of 15 signalised junctions and 4 pedestrian crossings along this route option. ITS measures may be required to deliver the level of bus priority required for additional bus services.

Constraints: The following constraints would need to be considered if this route option is progressed:

- The replacement of parallel parking along Merrion Road and Baggot Street Lower;
- The presence of trees along Merrion Road;
- The presence of numerous entrances to existing residential properties and commercial establishments along the route option;
- Bridge crossing of River Dodder;
- Bridge crossing of Grand Canal (Baggot Street Bridge);
- Limited potential for widening along certain sections of Merrion Road to provide segregated bus and cycle facilities in each direction.

Environmental Impact: The impacts are summarised in the MCA table in Appendix A and in discussed in greater detail in the Environmental Impact Report in Appendix H

6.2.2 N1 – Booterstown to Merrion Street Upper Scheme Options

Two scheme options have been developed along route N1; Option 1 and Option 2. N1 Option 1 and N1 Option 2 are illustrated in Figure 6.2.3 and Figure 6.2.4 respectively.

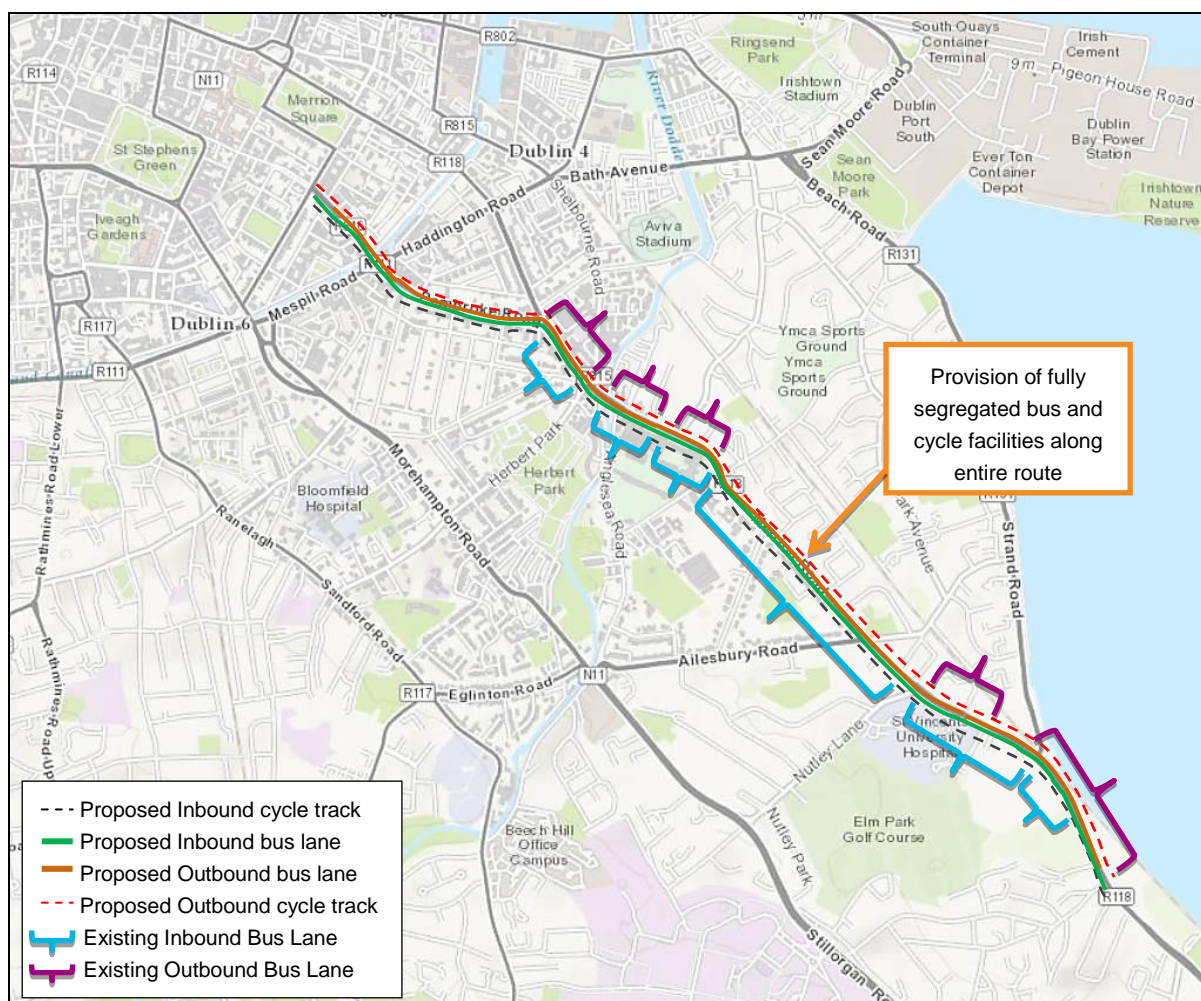


Figure 6.2.3: Route N1 Option 1

At present, there are existing bus facilities both inbound and outbound along the majority of the route along Merrion Road. There are no segregated bus or cycle facilities along Pembroke Road (from the Israeli Embassy towards the City Centre) and Baggot Street. The facilities to be provided by the proposed scheme option are shown above. Analysis of the traffic impact of the proposed works in comparison to the existing conditions has shown that:

- Merrion Road - Provision of full bus and cycle facilities to consolidate existing cycle and bus lanes although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact
- Pembroke Road (from Ballsbridge Park to U.S Embassy) - Provision of full bus and cycle facilities to consolidate existing cycle and bus lanes although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact
- Pembroke Road (from U.S Embassy to Israeli Embassy) - Provision of additional cycle lanes and consolidation of existing bus lanes - minor positive impact

- **Pembroke Road (from Israeli embassy to City Centre) - Provision of full bus and cycle facilities where none presently exist – Major positive impact**
- **Baggot Street - Provision of full bus and cycle facilities where none presently exist – Major positive impact**

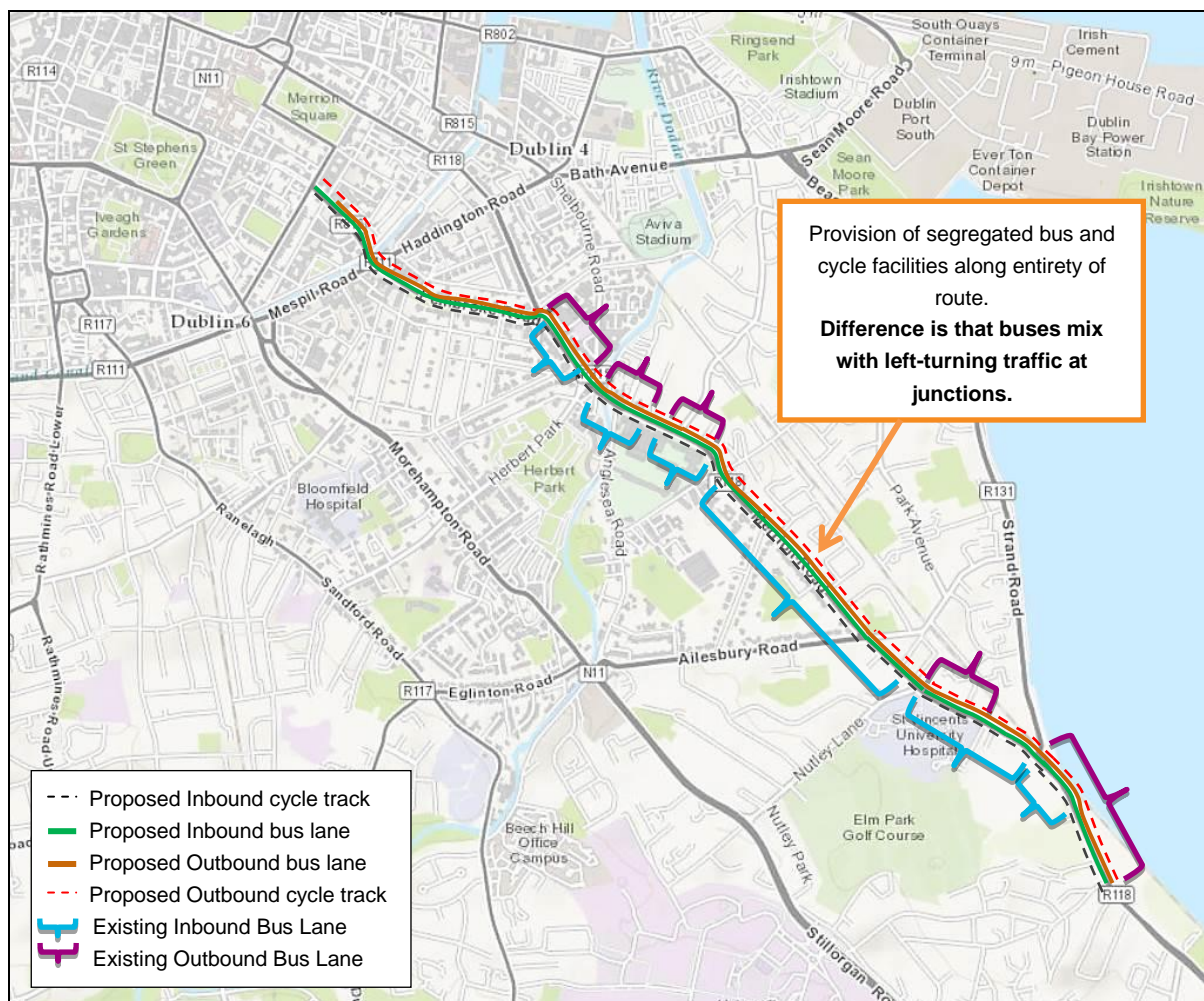


Figure 6.2.4: Route N1 Option 2

At present, there are existing bus facilities both inbound and outbound along the majority of the route along Merrion Road. There are no segregated bus or cycle facilities along Pembroke Road (from the Northumberland Road junction to the City Centre) and Baggot Street. The facilities to be provided by the proposed scheme option are shown above. Analysis of the traffic impact of the proposed works in comparison to the existing conditions has shown that:

- **Merrion Road - Provision of full cycle facilities and bus lanes along the majority of the route to consolidate existing cycle and bus lanes although this will require converting lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact.**
- **Pembroke Road (from Ballsbridge Park to Elgin Road junction) - Provision of full bus and cycle facilities to consolidate existing cycle and bus lanes although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact**

- Pembroke Road (from Northumberland Road junction to Elgin Road junction) - Provision of additional cycle lanes and consolidation of existing bus lanes - minor positive impact
- Pembroke Road (from Israeli embassy to City Centre) - Provision of full bus and cycle facilities where none presently exist – Major positive impact
- Baggot Street - Provision of full bus and cycle facilities where none presently exist – Major positive impact

As both options follow the same inbound and outbound route the constraints are the same, as are the number of bus stops and junctions. The two options differ in terms of the length and location of bus and cycle lane provisions along the route, which consequently impacts the journey time and cost.

Table 6.2: N1 Scheme Options Comparison

| N1 Scheme Option | Inbound Journey Time | Outbound Journey Time | Total Cost | Infrastructure costs | Land acquisition costs |
|------------------|----------------------|-----------------------|------------|----------------------|------------------------|
| Option 1 | 26 minutes | 26 minutes | €13.5M | €12.5M | €1M |
| Option 2 | 31 minutes | 31 minutes | €12.9M | €12.1M | €0.8M |

6.2.3 N1 – Booterstown to Merrion Street Upper Design Impacts on Existing Infrastructure

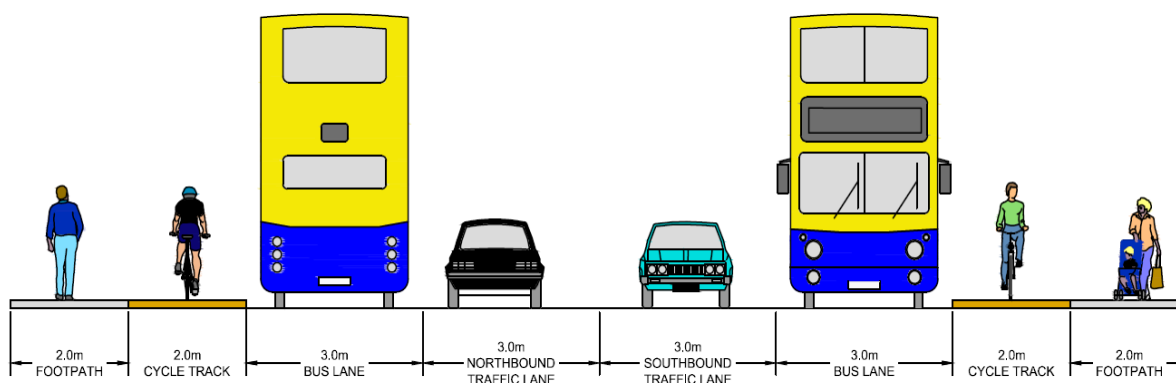
Bus stop locations have been optimised for N1 Option 1 and 2 to facilitate the route geometry and optimise catchment based on population and employment destinations. Additionally, junctions were designed to DMURS standards (e.g. kerb buildouts, raised tables) to improve pedestrian friendliness.

6.2.3.1 N1 Option 1

Summary

N1 Option 1 would optimise bus, cycle and pedestrian facilities along the entire route by applying the following lane widths for each direction of traffic, as recommended by DMURS:

- 3.0 m Bus lane;
- 3.0 m Traffic Lane;
- 2.0 m Footpath; and
- 2.0 m Cycle Track



N1 Option 1 would also provide indented bus stops (2.8m width) along its route.

Between Fitzwilliam Place and Grand Canal

Inbound left-turning traffic would get a separate traffic phase to inbound buses on Baggot Street Lower at the Fitzwilliam Street junction. The optimised footpath, bus and cycle lane widths as well as indented bus stops would be provided within the existing cross section of Baggot Street Lower. Existing trees would be retained – i.e. no impact between Ch.0m and Ch. 350m. Parking would be removed on the west side of the road between Fitzwilliam Place and Grand Canal. On the east side, parking would be formalised and a buffer would be provided in between the parking bays and cycle lane.

Between Grand Canal and Lansdowne Road

Leeson Street Bridge would need to be widened to provide sufficient space for the optimised (20m) cross section. Inbound left-turning traffic would get a separate traffic phase to inbound buses on Baggot Street Lower at the Mespil Road junction and at the Waterloo Road junction. Existing trees and parking would need to be removed between Ch.635m and Ch. 960m for the optimised footpath, bus and cycle lane widths and indented bus stops. This would also encroach on properties along

Pembroke Road. Parking would be removed on the west side of the road and along most of the east side. A left turning lane for traffic would need to be provided for inbound traffic on Pembroke Road at the Lansdowne Road.

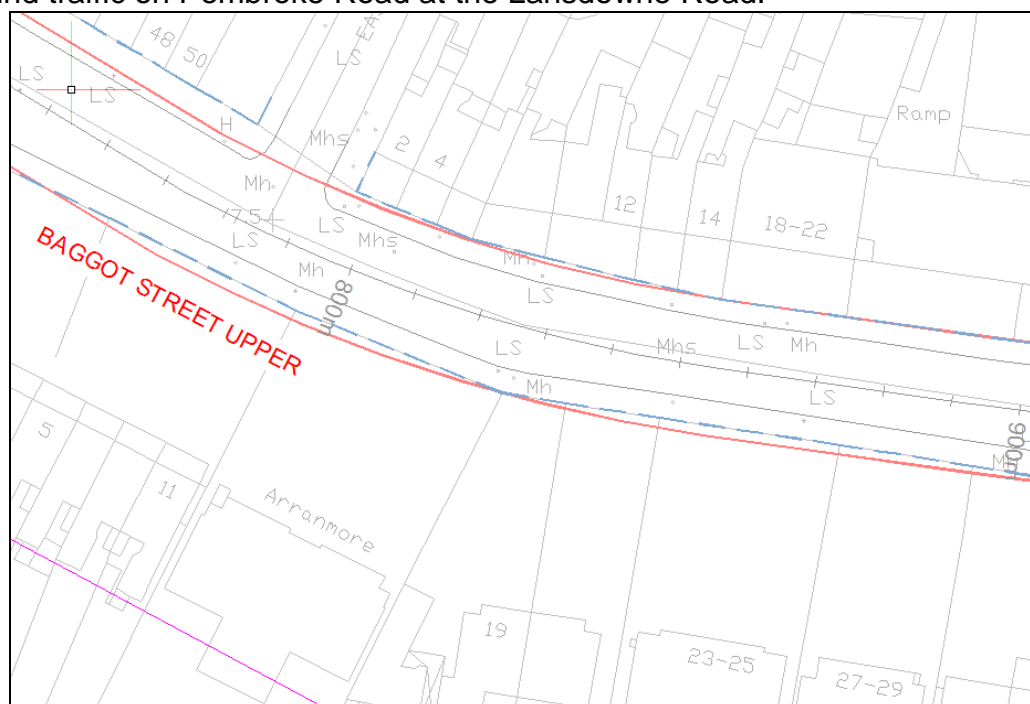


Figure 6.A: N1 Option 1 boundary (red) against existing building line (blue)

Between Lansdowne Road and River Dodder

A single compact junction is proposed for Northumberland Road / Lansdowne Road / Pembroke Road and also for Pembroke Road / Herbert Park / Shelbourne Road. A left turning lane would need to be provided for inbound traffic on Pembroke Road at the Lansdowne Road. A cul-de-sac is proposed on Elgin Road at the Pembroke Road end. Optimised footpath, bus and cycle lane widths and indented bus stops would fit along this section without impacting on existing properties or trees. Right turn from Pembroke Road to Shelbourne Road would be prohibited - Shelbourne Road would be accessible from Pembroke Road via Lansdowne Road.

Between River Dodder and Nutley Lane

The optimised footpath, bus and cycle lane widths (20m cross section) would encroach on a number of existing properties between Simmonscourt Road and Nutley Lane. Furthermore, indented bus stops and left-turning traffic lanes at junctions would further impact on property throughout this section. Some existing trees would be impacted. Parking will not be impacted along this section. Pedestrian facilities, as per DMURS, would be applied to the majority of minor arm junctions along this section.

Between Nutley Lane and Strand Road

Continuous median would be provided between Nutley Lane and St Vincent's Hospital with pedestrian crossing facilities. No existing trees would be impacted though all parking spaces would be removed and the optimised 20m cross section would encroach on property between St Vincent's Hospital and Strand Road on the west side of the road. The proposed indented bus stops and left-turning traffic lanes at junctions would not impact on property. Raised tables would be provided at the following minor arm junctions; Merrion Avenue, Herbert Avenue and Estate Avenue.

Between Strand Road and Elm Park

A median would be provided along this section with pedestrian crossing facilities. A 70m parking bay would be provided at the Strand Road end of this section, on the east side of the road. A cul-de-sac is proposed on Strand Road where it currently connects to Merrion Road. Traffic on Merrion Road would reach Strand Road via a new road proposed through the carparks of Our Lady Queen of Peace Church and Sandymount Gym (Body Rock Performance) office block. The optimised 20m cross-section and indented bus stops would not impact on trees or properties along this section.

Between Elm Park and Trimleston Avenue

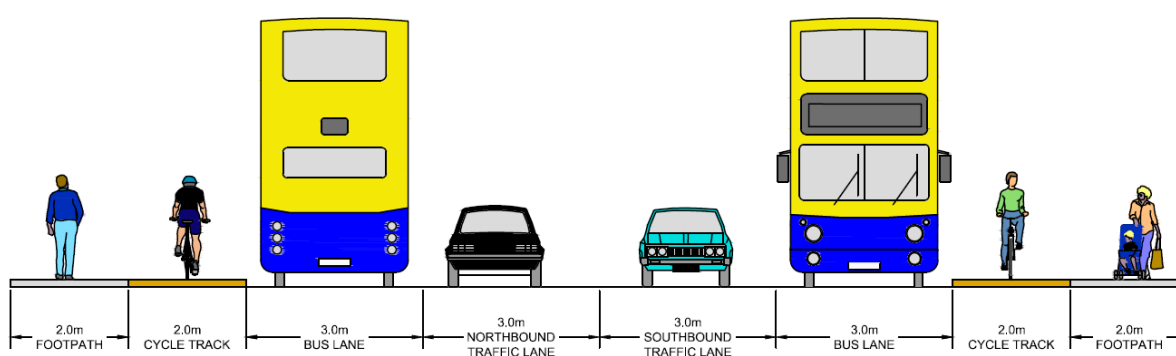
The optimised footpath, bus and cycle lane widths and indented bus stops would impact on properties along this section. Furthermore, left-turning lanes for inbound traffic would require land acquisition at the Elm Park and Trimleston Avenue junctions. There is no existing parking or trees which would be impacted. A raised table would be provided at the Trimleston Avenue junction.

6.2.3.2 N1 Option 2

Summary

N1 Option 2 would provide bus priority where practical as well as cycle and pedestrian facilities along the entire route by applying the following lane widths for each direction of traffic, as recommended by DMURS:

- 3.0 m Bus lane;
- 3.0 m Traffic Lane;
- 2.0 m Footpath; and
- 2.0 m Cycle Track



The difference between N1 Option 1 and Option 2 is that Option 2 would provide some indented bus stops (2.8m width) and some in-line bus stops along its route. Also, with Option 2, buses would merge with left-turning traffic at junctions.

Between Fitzwilliam Place and Grand Canal

Inbound left-turning traffic would get a separate traffic phase to inbound buses on Baggot Street Lower at the Fitzwilliam Street junction. Continuous bus and cycle lanes would be provided along this section, which would require the removal of the median between Ch.35m and Ch. 60m. Fixed cross sections would be applied continuously by building out from the existing kerb; maximising pedestrian facilities to accommodate increased pedestrian activity along this section. Existing trees would be retained - no impact. However, bus stops would not be indented as that would involve encroachment into existing properties i.e. would involve demolition.

Parking would be removed on the west side of the road between Fitzwilliam Place and Grand Canal. On the east side, parking would be formalised and a buffer would be provided in between the parking bays and cycle lane.

Between Grand Canal and Lansdowne Road

Continuous bus and cycle lanes would be provided along Baggot Street Upper and Pembroke Road – no cycle lanes are proposed on Leeson Street Bridge. Inbound left-turning traffic would get a separate traffic phase to inbound buses on Baggot Street Lower at the Mespil Road junction and at the Waterloo Road junction. Footpath widths would need to be reduced to provide sufficient space for fixed cross sections and indented parking bays on the east side of the road – requires the removal of one existing tree. Parking would be removed on the west side of the road and along most of the east side. Potentially, some of the properties would be impacted.

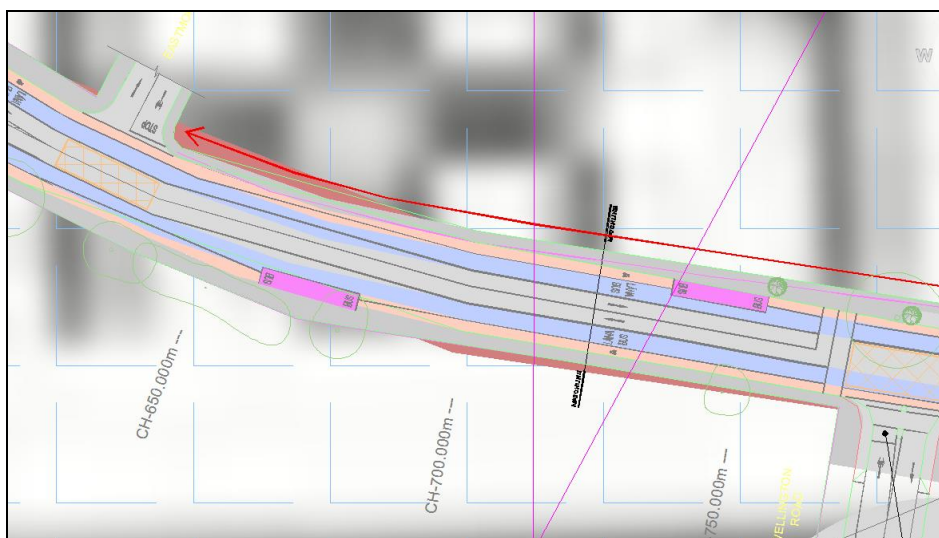


Figure 6.B: N1 Option 2 boundary (red) against existing building line (blue)

Between Lansdowne Road and River Dodder

A single compact junction is proposed for Northumberland Road / Lansdowne Road / Pembroke Road and also for Pembroke Road / Herbert Park / Shelbourne Road. Left-turning inbound traffic would share the bus lane on Pembroke Road at the Lansdowne Road junction (approx. 85m) and also at the Herbert Park junction (approx. 24m). Left-turning outbound traffic would share the bus lane on Pembroke Road at the Shelbourne Road junction (approx. 42m).

A cul-de-sac is proposed on Elgin Road at the Pembroke Road end of this section. Continuous bus and cycle lanes would be provided along Pembroke Road. Design would not impact on existing trees or properties. Right turn from Pembroke Road to Shelbourne Road would be prohibited – Shelbourne Road would be accessible from Pembroke Road via Lansdowne Road.

Between River Dodder and Nutley Lane

Left-turning inbound traffic would share the bus lane on Merrion Road at the Anglesea Road (approx. 60m) junction, at the Simmonscourt Road junction (approx. 24m) and also at the Ailesbury Road junction (approx. 18m). Left-turning inbound traffic would get a separate traffic phase to inbound buses at the Shrewsbury Road junction. Left-turning outbound traffic would share the bus lane on Merrion Road at the Ballsbridge Park junction (approx. 35m), Serpentine Avenue junction (approx. 30m), Sandymount Avenue (approx. 25m) and the Ailesbury Road junction (approx. 26m).

Continuous bus and cycle lanes would be provided along this section, requiring the existing footpath widths to be reduced. Some existing trees would be impacted. Parking will not be impacted along this section. Some existing trees would be impacted. Parking will not be impacted along this section. Pedestrian facilities, as per DMURS, would be applied to the majority of minor arm junctions along this section. Potentially, some of the properties would be impacted on the west side of the road between Ailesbury Road and Nutley Lane (as shown on Dun Laoghaire to City Centre CBC Sheet 9 of 20).

Between Nutley Lane and Strand Road

Continuous bus and cycles lanes would be provided, requiring the existing footpath widths to be reduced along this section. Continuous median would be provided between Nutley Lane and St Vincent's Hospital with pedestrian crossing facilities. No existing trees would be impacted though all parking spaces would be removed and property would be encroached on between St Vincent's Hospital and Strand Road on the west side of the road. Raised tables would be provided at the following minor arm junctions; Merrion Avenue, Herbert Avenue and Estate Avenue. Left-turning outbound traffic would share the bus lane on Merrion Road at the Merrion Avenue junction (approx. 50m).

Between Strand Road and Elm Park

Continuous bus and cycles lanes would be provided, requiring the existing footpath widths to be reduced. A central median would be provided along this section with pedestrian crossing facilities. A 70m parking bay would be provided at the Strand Road end of this section (between Ch.3855m and Ch.3925m as shown on Dun Laoghaire to City Centre CBC Sheet 11 of 20), on the east side of the road. A cul-de-sac is proposed on Strand Road where it currently connects to Merrion Road. Traffic on Merrion Road would reach Strand Road via a new road proposed through the carparks of Our Lady Queen of Peace Church and Sandymount Gym (Body Rock Performance). The cycle facility would be two-way on the east side of the road and one-way on the west side.

Between Elm Park and Trimleston Avenue

Continuous bus and cycles lanes would be provided, requiring the existing footpath widths to be reduced along certain sections. The existing parking and trees would be maintained though property and private land would be impacted on (as shown on Dun Laoghaire to City Centre CBC Sheet 12 of 20). The cycle facility would be two-way on the east side of the road and one-way on the west side. A raised table would be provided at the Belview Avenue junction. Inbound buses would get a separate phase to traffic at the Elm Park junction to eliminate conflict with inbound left turning traffic.

6.2.4 N2 – Booterstown to Merrion Square West Route

Figure 6.2.5 below illustrates the population residing within the 5, 10 and 15 minute catchment zones of the existing and proposed bus stops along route N2.

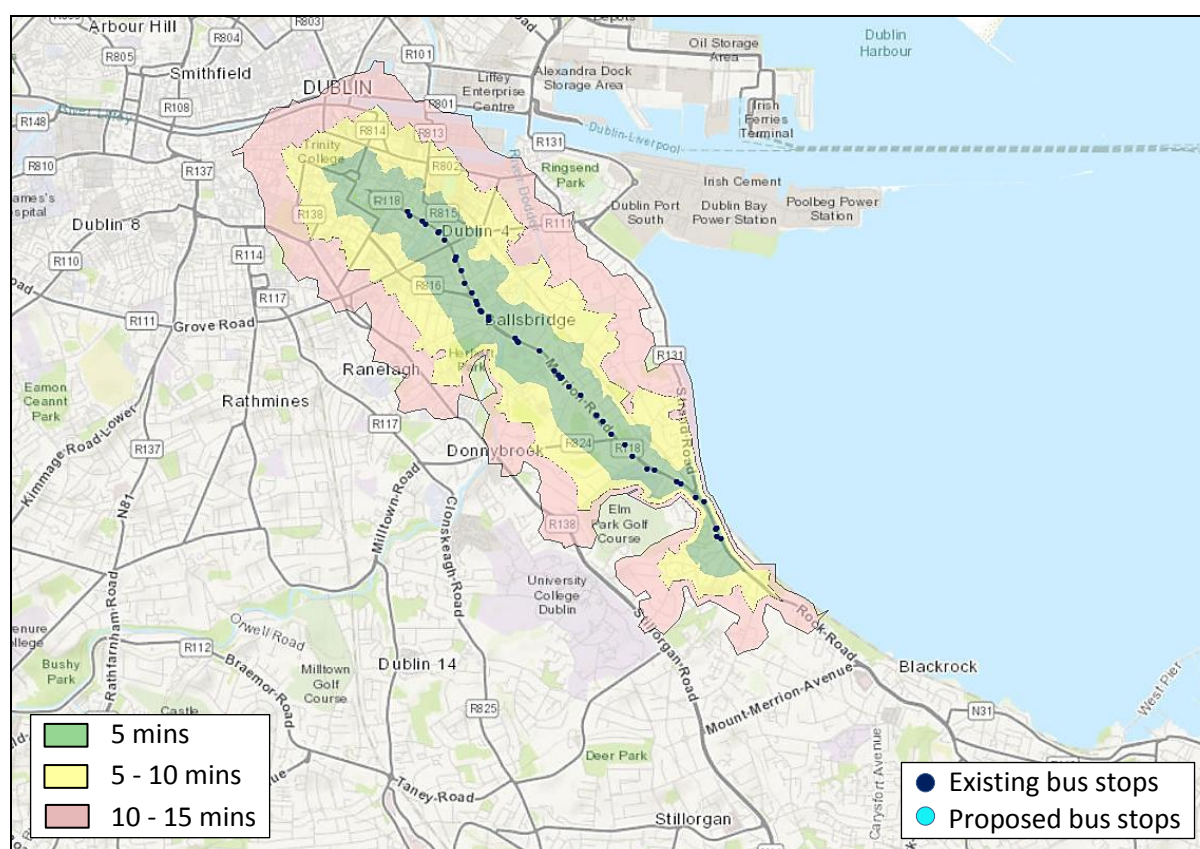


Figure 6.2.5: Walking distance catchment zones for route N2 bus stops

Inbound: This route option would connect Booterstown to Merrion Square West via Merrion Road, Northumberland Road and Merrion Square North.

Outbound: Southbound, buses would travel the same route as taken by inbound vehicles. This route is approximately 4.5 km in each direction.

Stops: 16 inbound and 17 outbound bus stops would be provided in each direction along this route. See Figure 6.2.2. Bus stop locations have been optimised to facilitate the route geometry and optimise catchment based on population and employment destinations.

Catchment: The outermost isochrone contour defines the perimeter within which the nearest bus stop could be reached by pedestrians in 15 minutes or less at a typical walking pace. The population residing within each of the isochrone contour areas is summarised below:

- 5 minutes walking distance – 10,200 residents
- 5-10 minutes walking distance – 14,700 residents
- 10-15 minutes walking distance – 21,200 residents
- Total catchment within 15 minutes walking distance – 46,100 residents

These figures are based on the Census 2011 Small Area Population Statistics (SAPS).

Junctions: There are a total of 16 signalised junctions and 4 pedestrian crossings along this route option. ITS measures may be required to deliver the level of bus priority required for additional bus services.

Constraints: The following constraints would need to be considered if this route option is progressed:

- The replacement of parallel parking along Merrion Road and Merrion Square North;
- The presence of trees along Merrion Road;
- The presence of numerous entrances to existing residential properties and commercial establishments along the route option;
- Bridge crossing of River Dodder;
- Bridge crossing of Grand Canal (Northumberland Road Bridge);

Limited potential for widening along certain sections of Merrion Road to provide segregated bus and cycle facilities in each direction.

Environmental Impact: The impacts are summarised in the MCA table in Appendix A and in discussed in greater detail in the Environmental Impact Report in Appendix H

6.2.5 N2 – Booterstown to Merrion Square West Scheme Options

Two scheme options have been developed along route N2; Option 1 and Option 2. N2 Option 1 and N2 Option 2 are illustrated in Figure 6.2.6 and Figure 6.2.7 respectively.

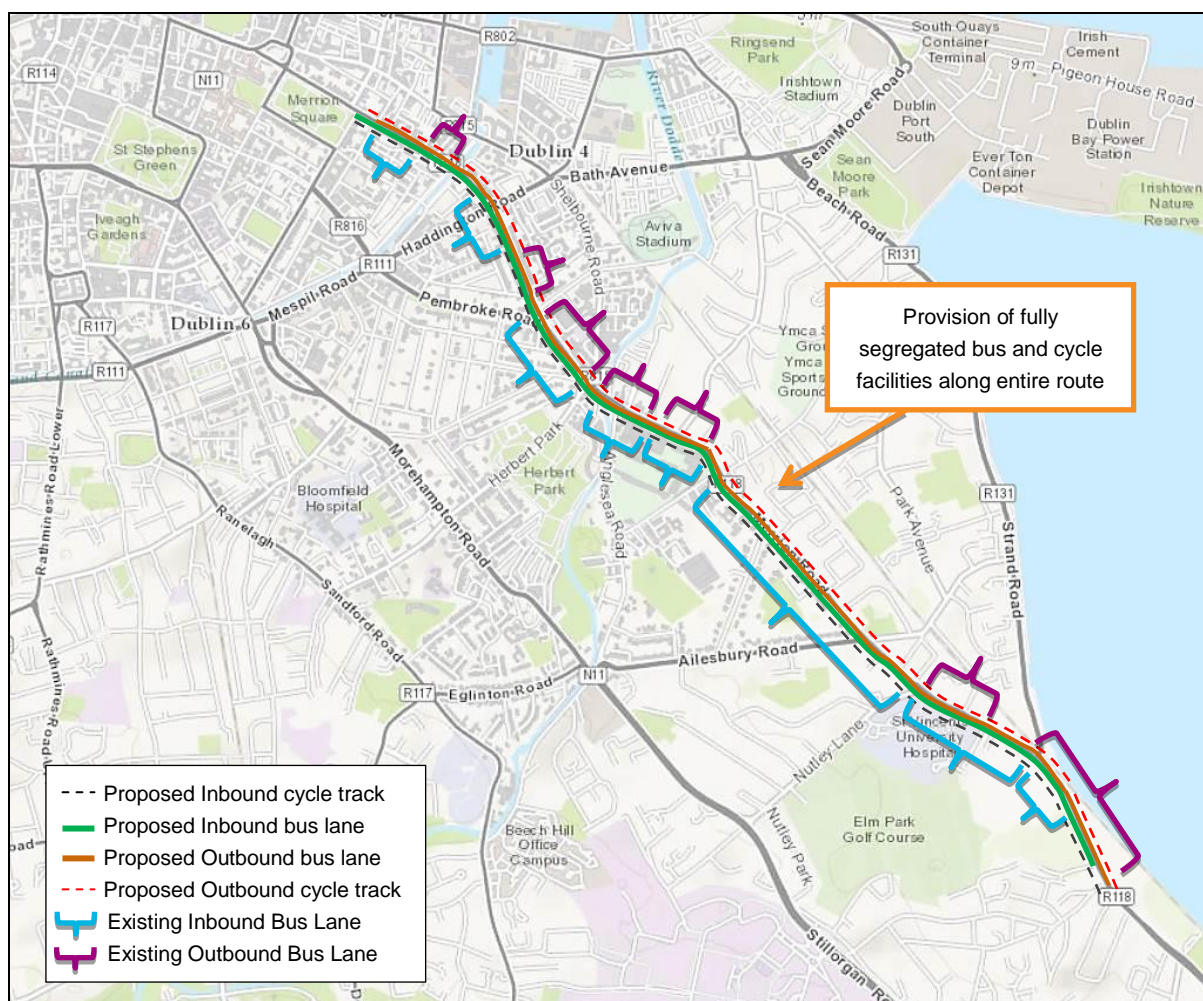


Figure 6.2.6: Route N2 Option 1

At present, there are existing bus facilities both inbound and outbound along the majority of the route along Merrion Road. There are existing bus and cycle lanes along Northumberland Road and Mount Street Lower (alternating between inbound and outbound). The facilities to be provided by the proposed scheme option are shown above. Analysis of the traffic impact of the proposed works in comparison to the existing conditions has shown that:

- Merrion Road - Provision of full bus and cycle facilities to consolidate existing cycle and bus lanes (inbound and outbound) although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact.
- Pembroke Road (from Ballsbridge Park to U.S Embassy) - Provision of full bus and cycle facilities to consolidate existing cycle and bus lanes although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact.
- Northumberland Road - Provision of full bus and cycle facilities to consolidate existing cycle and bus lanes (inbound and outbound) although this will require

converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact.

- Mount Street Lower - Provision of full bus and cycle facilities to consolidate existing cycle and bus lanes (inbound and outbound) although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact.

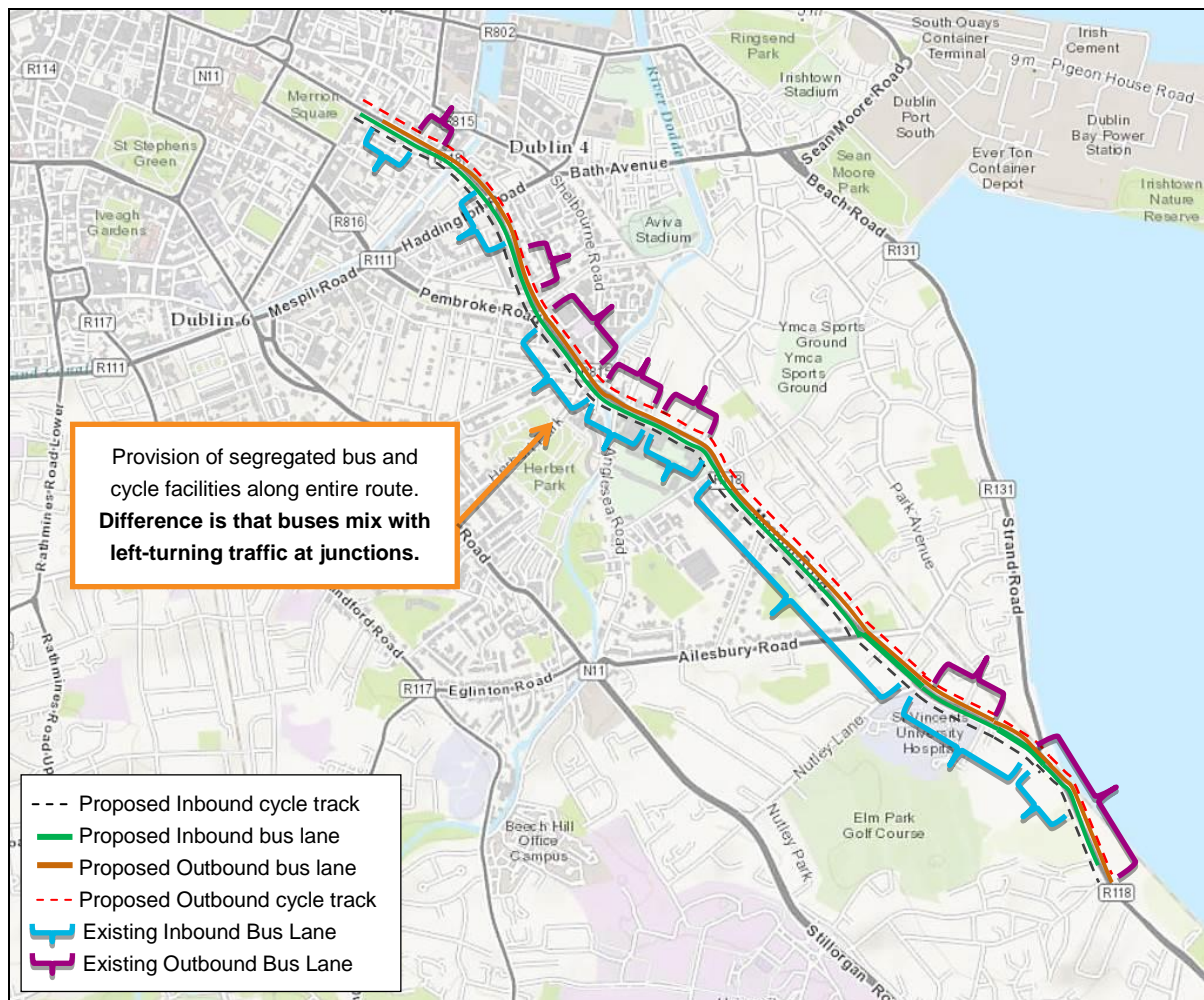


Figure 6.2.7: Route N2 Option 2

At present, there are existing bus facilities both inbound and outbound along the majority of the route along Merrion Road. There are existing bus and cycle lanes along Northumberland Road and Mount Street Lower (alternating between inbound and outbound). The facilities to be provided by the proposed scheme option are shown above. Analysis of the traffic impact of the proposed works in comparison to the existing conditions has shown that:

- Merrion Road - Provision of full bus and cycle facilities to consolidate existing cycle and bus lanes (inbound and outbound) although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact.
- Pembroke Road (from Ballsbridge Park to U.S Embassy) - Provision of full bus and cycle facilities to consolidate existing cycle and bus lanes although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact.

- Northumberland Road - Provision of full bus and cycle facilities to consolidate existing cycle and bus lanes (inbound and outbound) although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact.
- Mount Street Lower - Provision of full bus and cycle facilities to consolidate existing cycle and bus lanes (inbound and outbound) although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact.

As both options follow the same inbound and outbound route the constraints are the same, as are the number of bus stops and junctions. The two options differ in terms of the length and location of bus and cycle lane provisions along the route, which consequently impacts the journey time and cost.

Table 6.3: N2 Scheme Options Comparison

| N2 Scheme Option | Inbound Journey Time | Outbound Journey Time | Total Cost | Infrastructure costs | Land acquisition costs |
|------------------|----------------------|-----------------------|------------|----------------------|------------------------|
| Option 1 | 27 minutes | 27 minutes | €14.6M | €11.9M | €2.7M |
| Option 2 | 31 minutes | 32 minutes | €13.5M | €11.4M | €2.1M |

6.2.6 N2 – Booterstown to Merrion Square West Design Impacts on Existing Infrastructure

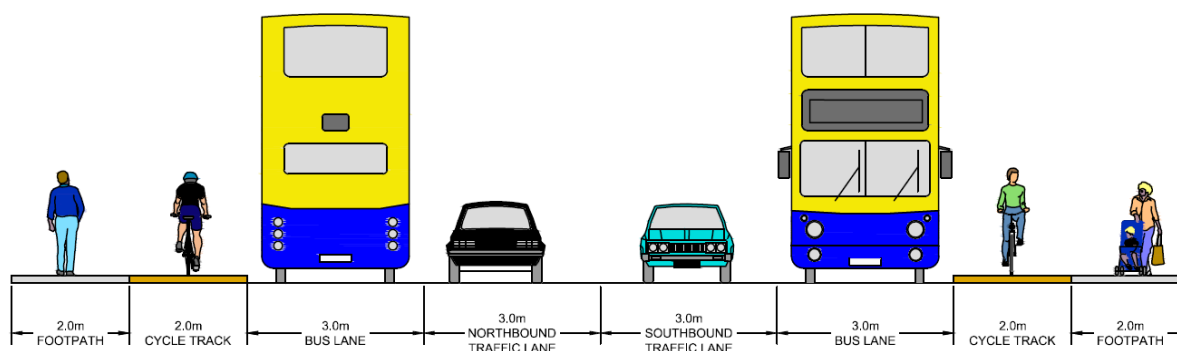
Bus stop locations have been optimised for N2 Option 1 and 2 to facilitate the route geometry and optimise catchment based on population and employment destinations. Additionally, junctions were designed to DMURS standards (e.g. kerb buildouts, raised tables) to improve pedestrian friendliness.

6.2.6.1 N2 Option 1

Summary

N2 Option 1 would optimise bus, cycle and pedestrian facilities along the entire route by applying the following lane widths for each direction of traffic, as recommended by DMURS:

- 3.0 m Bus lane;
- 3.0 m Traffic Lane;
- 2.0 m Footpath; and
- 2.0 m Cycle Track



N2 Option 1 would also provide indented bus stops (2.8m width) along its route.

Between Fitzwilliam Place and Lansdowne Road

Inbound left-turning traffic would get a separate traffic phase to inbound buses on Mount Street Lower at the Fitzwilliam Street junction. The optimised footpath, bus and cycle lane widths as well as indented bus stops would not fit within the existing cross section of Mount Street Lower, as illustrated below. An increased number of existing trees and parking would be removed on Mount Street Lower. Details of tree type; condition etc., contained within tree survey conducted October 2016.

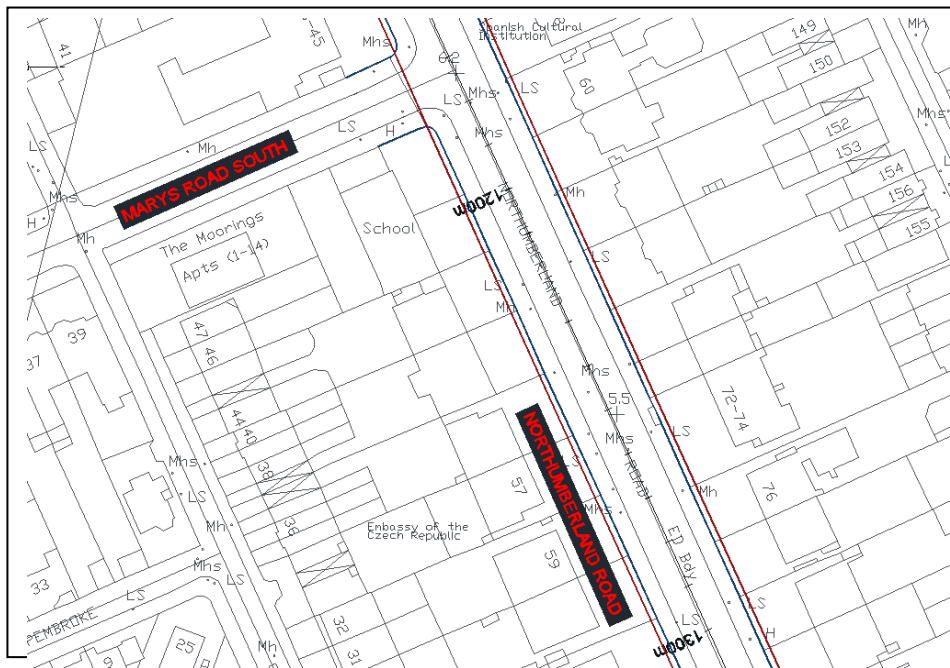


Figure 6.C: N2 Option 1 boundary (red) against existing building line (blue)

Between Lansdowne Road and River Dodder

Existing situation does not achieve objectives and benefits nor includes required bus priority. Therefore, the following have been assessed.

A single compact junction is proposed for Northumberland Road / Lansdowne Road / Pembroke Road and also for Pembroke Road / Herbert Park / Shelbourne Road.

A left turning lane would need to be provided for inbound traffic on Pembroke Road at the Lansdowne Road. A cul-de-sac is proposed on Elgin Road at the Pembroke Road end. Optimised footpath, bus and cycle lane widths and indented bus stops would fit a long this section without impacting on existing properties or trees. Right turn from Pembroke Road to Shelbourne Road would be prohibited - Shelbourne Road would be accessible from Pembroke Road via Lansdowne Road.

Between River Dodder and Nutley Lane

The optimised footpath, bus and cycle lane widths (20m cross section) would encroach on a number of existing properties between Simmonscourt Road and Nutley Lane. Furthermore, indented bus stops and left-turning traffic lanes at junctions would further impact on property throughout this section. Most of the existing trees and parking spaces would be impacted. Pedestrian facilities, as per DMURS, would be applied to the majority of minor arm junctions along this section.

Between Nutley Lane and Strand Road

Continuous median would be provided between Nutley Lane and St Vincent's Hospital with pedestrian crossing facilities. No existing trees would be impacted though all parking spaces would be removed and the optimised 20m cross section would encroach on property between St Vincent's Hospital and Strand Road on the west side of the road. The proposed indented bus stops and left-turning traffic lanes at junctions would not impact on property. Raised tables would be provided at the following minor arm junctions; Merrion Avenue, Herbert Avenue and Estate Avenue.

Between Strand Road and Elm Park

A median would be provided along this section with pedestrian crossing facilities. A 70m parking bay would be provided at the Strand Road end of this section, on the east side of the road. A cul-de-sac is proposed on Strand Road where it currently connects to Merrion Road. Traffic on Merrion Road would reach Strand Road via a new road proposed through the carparks of Our Lady Queen of Peace Church and Sandymount Gym (Body Rock Performance) office block. The optimised 20m cross-section and indented bus stops would not impact on trees or properties along this section.

Between Elm Park and Trimleston Avenue

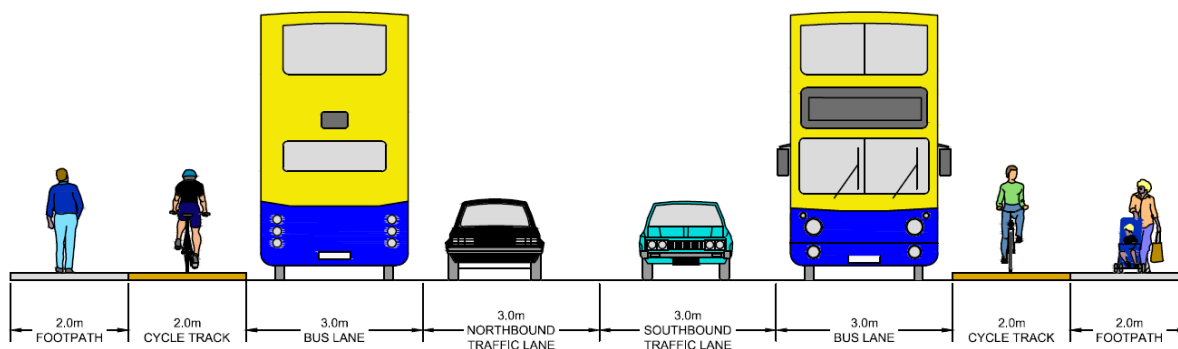
The optimised footpath, bus and cycle lane widths and indented bus stops would impact on properties along this section. Furthermore, left-turning lanes for inbound traffic would require land acquisition at the Elm Park and Trimleston Avenue junctions. There is no existing parking or trees which would be impacted. A raised table would be provided at the Trimleston Avenue junction.

6.2.6.2 N2 Option 2

Summary

N2 Option 2 would provide bus priority where practical as well as cycle and pedestrian facilities along the entire route by applying the following lane widths for each direction of traffic, as recommended by DMURS:

- 3.0 m Bus lane;
- 3.0 m Traffic Lane;
- 2.0 m Footpath; and
- 2.0 m Cycle Track



The difference between N2 Option 1 and Option 2 is that Option 2 would provide some indented bus stops (2.8m width) and some in-line bus stops along its route. Also, with Option 2, buses would merge with left-turning traffic at junctions.

Between Fitzwilliam Place and Lansdowne Road

Inbound left-turning traffic would get a separate traffic phase to inbound buses on Mount Street Lower at the Fitzwilliam Street junction. The proposed bus and cycle lanes in each direction would not fit within the existing cross section of Mount Street Lower or Northumberland Road. Existing trees and parking (as detailed in Appendix

E) would be removed on these streets. An increased number of existing trees and parking would be removed on Mount Street Lower. Details of tree type; condition etc., contained within tree survey conducted October 2016.

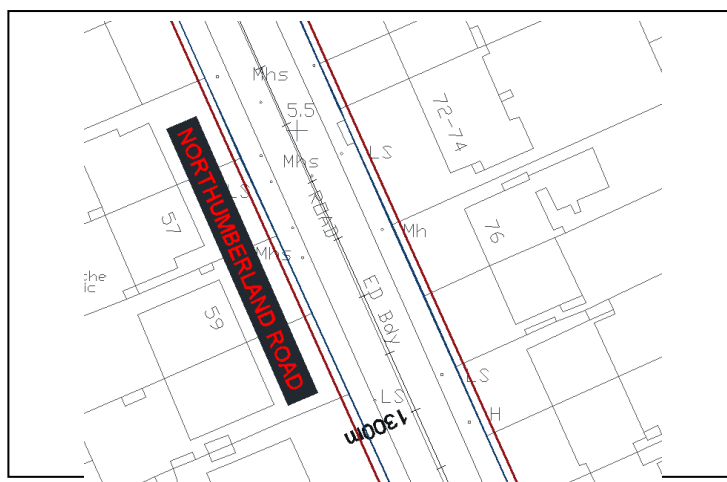


Figure 6.D: N2 Option 2 boundary (red) against existing building line (blue)

Between Lansdowne Road and River Dodder

A single compact junction is proposed for Northumberland Road / Lansdowne Road / Pembroke Road and also for Pembroke Road / Herbert Park / Shelbourne Road. Left-turning inbound traffic would share the bus lane on Pembroke Road at the Lansdowne Road junction (approx. 85m) and also at the Herbert Park junction (approx. 24m). Left-turning outbound traffic would share the bus lane on Pembroke Road at the Shelbourne Road junction (approx. 42m).

A cul-de-sac is proposed on Elgin Road at the Pembroke Road end of this section. Continuous bus and cycle lanes would be provided along Pembroke Road. Design would not impact on existing trees or properties. Right turn from Pembroke Road to Shelbourne Road would be prohibited – Shelbourne Road would be accessible from Pembroke Road via Lansdowne Road.

Between River Dodder and Nutley Lane

Left-turning inbound traffic would share the bus lane on Merrion Road at the Anglesea Road (approx. 60m) junction, at the Simmonscourt Road junction (approx. 24m) and also at the Ailesbury Road junction (approx. 18m). Left-turning inbound traffic would get a separate traffic phase to inbound buses at the Shrewsbury Road junction. Left-turning outbound traffic would share the bus lane on Merrion Road at the Ballsbridge Park junction (approx. 35m), Serpentine Avenue junction (approx. 30m), Sandymount Avenue (approx. 25m) and the Ailesbury Road junction (approx. 26m)

Continuous bus and cycle lanes would be provided along this section, requiring the existing footpath widths to be reduced. Some existing trees would be impacted. Parking will not be impacted along this section. Pedestrian facilities, as per DMURS, would be applied to the majority of minor arm junctions along this section. Potentially, some of the properties would be impacted on the west side of the road between Ailesbury Road and Nutley Lane (as shown on Dun Laoghaire to City Centre CBC Sheet 9 of 20)

Between Nutley Lane and Strand Road

Continuous bus and cycles lanes would be provided, requiring the existing footpath widths to be reduced along this section. Continuous median would be provided between Nutley Lane and St Vincent's Hospital with pedestrian crossing facilities. No existing trees would be impacted though all parking spaces would be removed and property would be encroached on between St Vincent's Hospital and Strand Road on the west side of the road. Raised tables would be provided at the following minor arm junctions; Merrion Avenue, Herbert Avenue and Estate Avenue. Left-turning outbound traffic would share the bus lane on Merrion Road at the Merrion Avenue junction (approx. 50m).

Between Strand Road and Elm Park

Continuous bus and cycles lanes would be provided, requiring the existing footpath widths to be reduced. A central median would be provided along this section with pedestrian crossing facilities. A 70m parking bay would be provided at the Strand Road end of this section (between Ch.3855m and Ch.3925m as shown on Dun Laoghaire to City Centre CBC Sheet 11 of 20), on the east side of the road. A cul-de-sac is proposed on Strand Road where it currently connects to Merrion Road. Traffic on Merrion Road would reach Strand Road via a new road proposed through the carparks of Our Lady Queen of Peace Church and Sandymount Gym (Body Rock Performance). The cycle facility would be two-way on the east side of the road and one-way on the west side.

Between Elm Park and Trimleston Avenue

Continuous bus and cycles lanes would be provided, requiring the existing footpath widths to be reduced along certain sections. The existing parking and trees would be maintained though property and private land would be impacted on. The cycle facility would be two-way on the east side of the road and one-way on the west side. A raised table would be provided at the Belview Avenue junction. Inbound buses would get a separate phase to traffic at the Elm Park junction to eliminate conflict with inbound left turning traffic.

6.2.7 SAS 1 Stage 2 Assessment Summary

A summary of the MCA results for the SAS1 scheme options is presented in Table 6.4. Neutral scoring sub-criteria are omitted from the summary table i.e. where scheme options score neutrally to other options.

In terms of economy, a differentiator between scheme options is the capital cost. Route N2 Option 1 would cost considerably more than other options, largely due to the quantity of private land-take required. Conversely, N1 Option 2 is the lowest costing due to the reduced level of land acquisition required. In terms of transport reliability and quality of service, Option 1 for each route scored highest due to the level of service reliability and journey time savings achievable through full segregation of bus lanes along the entirety of each route.

In terms of Integration, route N2 would serve a larger residential, employment and school/college catchment than route N1. Route N1 and N2 have similar potential for interchange with other transport services i.e. the DART and N11 QBC. Both routes also have been identified as primary cycle routes in the GDA Cycle Network Plan. Route N1 is deemed to have a greater positive impact on traffic compared with route N2.

As both route N1 and N2 primarily follow the same route (between Booterstown and Lansdowne Road), there are no significant differences between options in terms of accessibility and social inclusion and also road safety.

All options scored similarly under the environmental sub-criteria; route N1 options scored higher under land use character due to the lesser impact on existing on-street parking.

Each sub-criterion in the MCA table is evenly weighted. Of all the SAS1 scheme options, route N1 Option 2 received the highest average score overall. Hence, N1 Option 2 will form part of the overall EPO for the Dun Laoghaire to City Centre CBC.

Table 6.4: SAS 1 Route Options Assessment Summary (Main Criteria)

| MCA criteria | Assessment Sub-Criteria | N1 Option 1 | N1 Option 2 | N2 Option 1 | N2 Option 2 |
|--------------|---|-------------|-------------|-------------|-------------|
| Economy | 1.a. Capital Cost | Green | Red | Yellow | Green |
| | 1.b. Transport Reliability and Quality (Journey Time) | Green | Yellow | Green | Yellow |
| | 2.b. Residential Population and Employment Catchments | Yellow | Yellow | Green | Green |
| | 2.e. Traffic Network Integration | Green | Green | Yellow | Yellow |
| | 6.i. Land Use Character | Green | Red | Yellow | Yellow |

The full MCA table including a justification for the sub-criteria scoring awarded to each scheme option is presented in Appendix A.

6.3 SAS 2: Booterstown to Blackrock Route Options

6.3.1 Introduction

Following the 'Stage 1' sift for the SAS 2/Middle section study area, the remaining 4 route sections were combined to form one cohesive route option (M1) as shown in Figure 6.3.1 below.

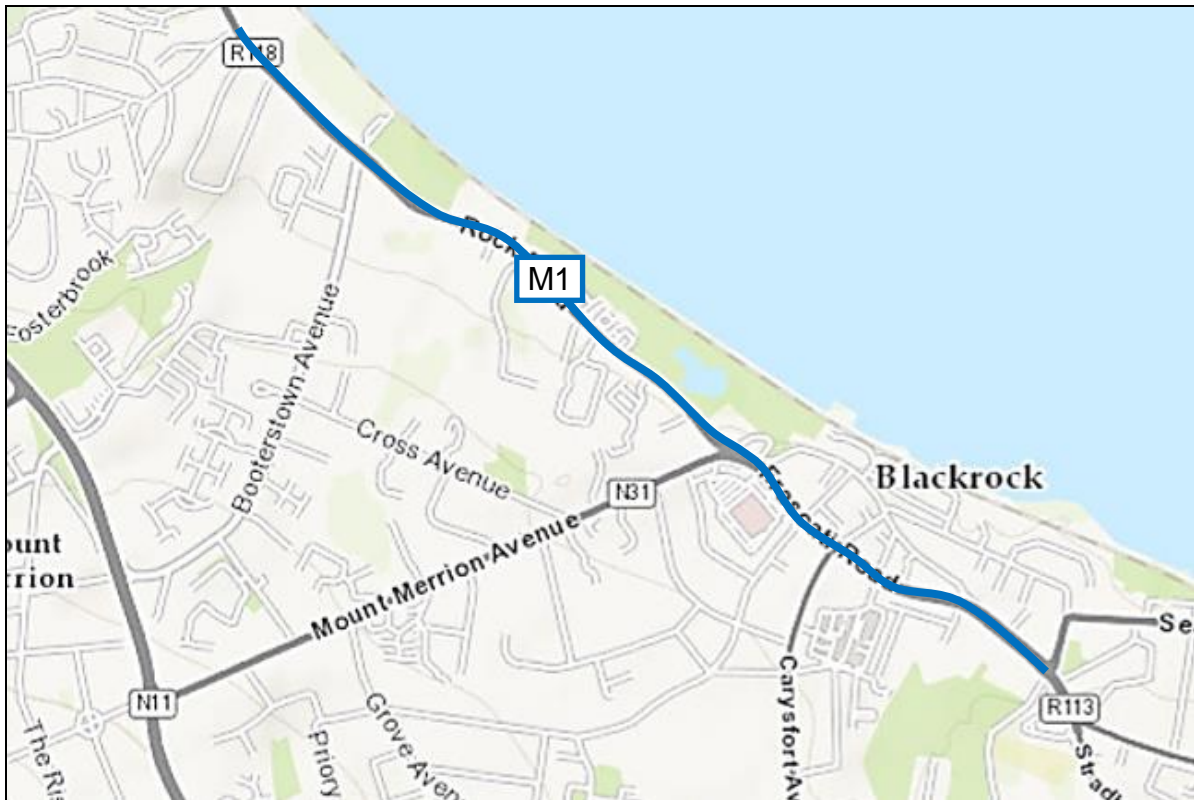


Figure 6.3.1: M1 / Middle Section Cohesive Route Option

- M1: A route option via Frascati Road (N31) and Rock Road (R118)

Two scheme options have been developed for the single route option in SAS 2; see Table 6.5.

Table 6.5: Study Area Section 2 Scheme options

| SAS 2 | M1 | Option 1 |
|-------|----|----------|
| | | Option 2 |

6.3.2 M1 – Booterstown to Blackrock Route

Figure 6.3.2 below illustrates the population residing within the 5, 10 and 15 minute catchment zones of the existing and proposed bus stops along route M1.

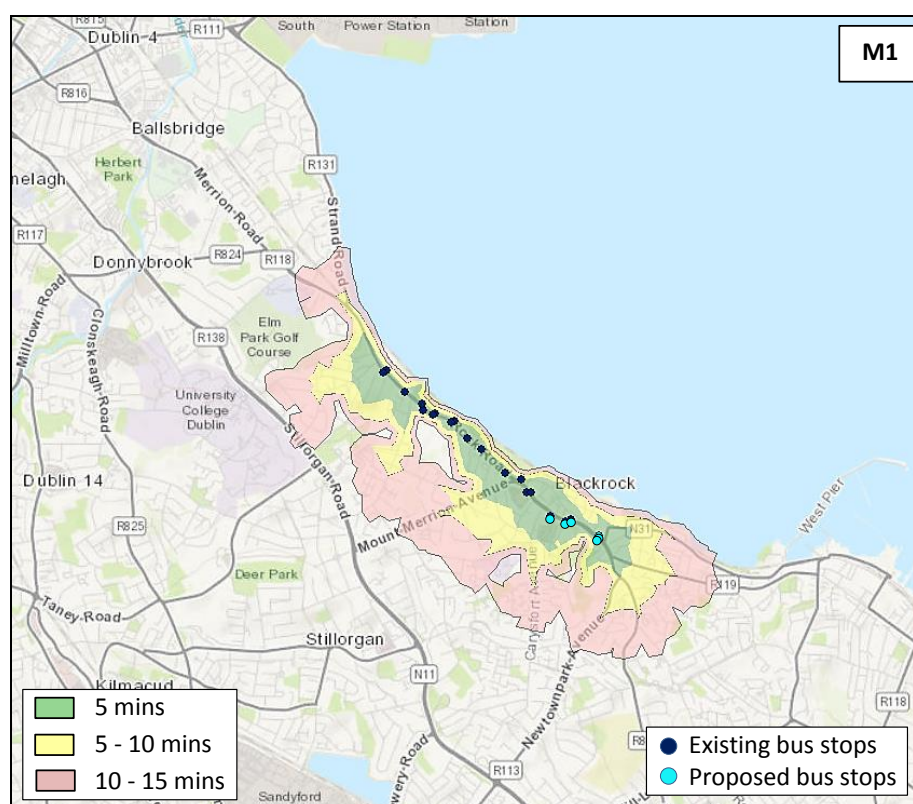


Figure 6.3.2: Walking distance catchment zones for route M1 bus stops

Inbound: This route option would connect Blackrock to Booterstown via Frascati Road and Rock Road.

Outbound: Southbound, buses would travel the same route as taken by inbound vehicles. This route is approximately 2.57km in each direction.

Stops: 9 stops would be provided in each direction along this route. Bus stop locations have been optimised to facilitate the route geometry and optimise catchment based on population and employment destinations.

Catchment: The outermost isochrone contour defines the perimeter within which the nearest bus stop could be reached by pedestrians in 15 minutes or less at a typical walking pace. The population residing within each of the isochrone contour areas is summarised below:

- 5 minutes walking distance – 2,700 residents
- 5-10 minutes walking distance – 4,000 residents
- 10-15 minutes walking distance – 9,600 residents
- Total catchment within 15 minutes walking distance – 16,300 residents

These figures are based on the Census 2011 Small Area Population Statistics (SAPS).

Junctions: There are a total of 9 signalised junctions and 2 pedestrian crossings along this route option. ITS measures may be required to deliver the level of bus priority required for additional bus services.

Constraints: There are no significant constraints associated with this option.

Environmental Impact: The impacts are summarised in the MCA table in Appendix A and in discussed in greater detail in the Environmental Impact Report in Appendix H

6.3.3 M1 – Booterstown to Blackrock Scheme Options

Two scheme options have been developed along M1; see Figure 6.3.3 below.

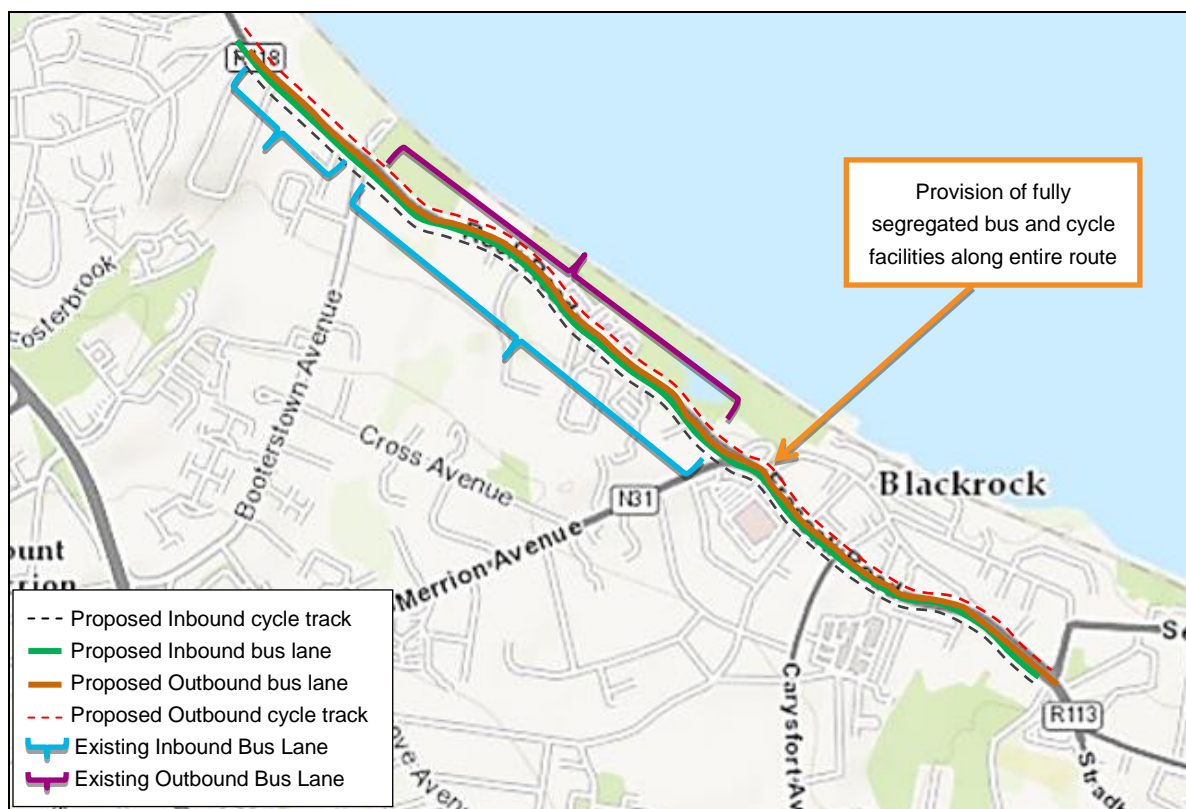


Figure 6.3.3: Route M1 Option 1

At present, there are existing cycle lanes along Frascati Road and Temple Road (alternating between inbound and outbound). There are existing bus facilities both inbound and outbound along Rock Road. The facilities to be provided by the proposed scheme option are shown above. Analysis of the traffic impact of the proposed works in comparison to the existing conditions has shown that:

- Temple Road - Provision of full bus and cycle facilities to consolidate existing cycle lanes although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact
- Frascati Road - Provision of full bus and cycle facilities to consolidate existing cycle lanes although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact
- Rock Road - Provision of full bus and cycle facilities to consolidate existing bus and cycle lanes although this will require converting small lengths of shared traffic lanes to segregated bus lanes – Minor negative impact

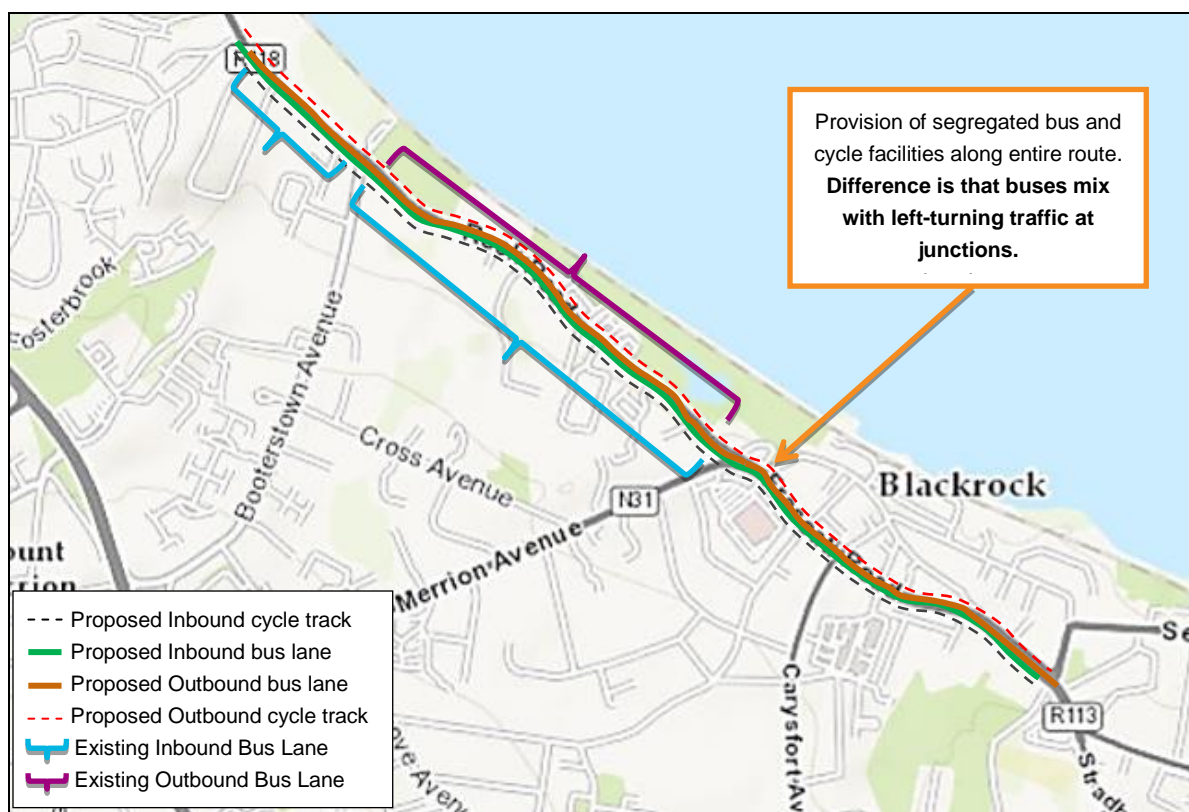


Figure 6.3.4: Route M1 Option 2

At present, there are existing cycle lanes along Frascati Road and Temple Road (alternating between inbound and outbound). There are existing bus facilities both inbound and outbound along Rock Road. The facilities to be provided by the proposed scheme option are shown above. Analysis of the traffic impact of the proposed works in comparison to the existing conditions has shown that:

- Temple Road - Provision of full bus and cycle facilities to consolidate existing cycle lanes although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact
- Frascati Road - Provision of full bus and cycle facilities to consolidate existing cycle lanes although this will require converting significant lengths of shared traffic lanes to segregated bus lanes – Moderate negative impact
- Rock Road - Provision of full bus and cycle facilities to consolidate existing bus and cycle lanes although this will require converting small lengths of shared traffic lanes to segregated bus lanes – Minor negative impact

Table 6.6 M1 Scheme Options comparison

| M1 Scheme Option | Inbound Journey Time | Outbound Journey Time | Total Cost | Infrastructure costs | Land acquisition costs |
|------------------|----------------------|-----------------------|------------|----------------------|------------------------|
| Option 1 | 14 minutes | 14 minutes | €4.6M | €4.3M | €0.3M |
| Option 2 | 14 minutes | 15 minutes | €3.8M | €3.8M | €0 |

6.3.4 M1 – Booterstown to Blackrock Route Design Impacts on Existing Infrastructure

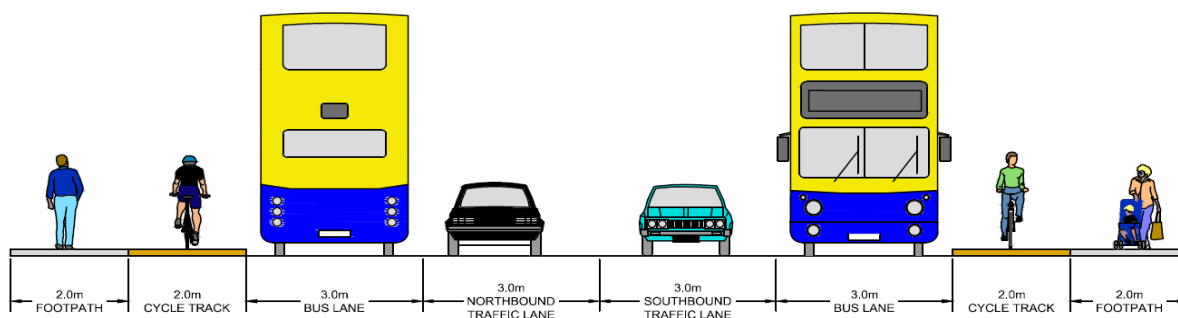
Bus stop locations have been optimised for M1 Option 1 and 2 to facilitate the route geometry and optimise catchment based on population and employment destinations. Additionally, junctions were designed to DMURS standards (e.g. kerb buildouts, raised tables) to improve pedestrian friendliness.

6.3.4.1 M1 Option 1

Summary

M1 Option 1 would optimise bus, cycle and pedestrian facilities along the entire route by applying the following lane widths for each direction of traffic, as recommended by DMURS:

- 3.0 m Bus lane;
- 3.0 m Traffic Lane;
- 2.0 m Footpath; and
- 2.0 m Cycle Track



M1 Option 1 would also provide indented bus stops (2.8m width) along its route.

Trimleston Avenue to Booterstown Avenue

The provision of this option along the Rock Road between Trimleston Avenue and Booterstown Avenue would require the removal of 29 parking spaces including 1 disabled. Some sections of footpaths and ancillaries (tactile paving, kerbs etc.) would be removed along with the relocation of all associated services where necessary. The footpaths would be replaced with new 2m footpaths on both sides. The design would incorporate a 2 metre wide segregated inbound cycle lane on the western carriageway and a two-way segregated cycle lane on the eastern carriageway up to the Booterstown Station turn. Raised tables would be retained across the entrances to St. Helen’s Road residential estate and a new raised treatment would be installed at the entrance to Booterstown station.

The scheme option proposal would require that continuous bus lanes would be provided throughout the scheme. Due to the proximity of Trimleston Lodge to the Rock Road at the Trimleston junction a re-alignment of the road geometry would be required on the approach to the Trimleston Avenue junction to ensure provision of these designated bus lanes along with designated traffic turning lanes. To accommodate this road re-alignment the proposal would require approximately 50 square metres of land take from Booterstown Nature Reserve on the approach to

this junction along with the relocation of the boundary wall, signage and public lighting.

Although no geometrical changes would be required on the northbound approach to both entrances to St. Helen's Road, residential land take would be required to ensure the necessary road width to accommodate the designated traffic turning lanes. Approximately 70 square metres of land take would also be required from the Booterstown Nature Reserve to ensure the provision of a designated left hand turn into Booterstown station along with the relocation of a boundary wall, 4 adjacent parking spaces from the car park of Booterstown Station, the relocation of road signage and CCTV pole.

Booterstown Avenue junction to Castledawson Avenue/Seafort junction

The scheme option 1 proposal for this section would include removing the existing merging lane leaving the Booterstown station junction on the eastern carriageway which would allow the provision of a continuous bus lane from Booterstown Station to Seafort Parade and beyond.

To ensure the provision of a designated turning lane onto Booterstown Avenue approximately 160m of land take would be required from Blackrock Park, along with the relocation of the boundary wall, traffic bollards and traffic control cabinet. A proposed change to the existing road layout for 36m on the northbound approach to the Booterstown Avenue/Booterstown station junction would facilitate the inclusion of a designated right turning lane allowing motorists to turn into Booterstown station from this approach.

Some sections of footpath and ancillaries (tactile paving, kerbs etc.) would be removed along this section along with the relocation of all associated services where necessary. The existing footpaths would be replaced with new footpaths and cycle lanes alongside both carriageways. As a traffic calming measure and to aid pedestrians and cyclists to navigate across minor roads, raised tables would be installed at the entrances/exits to Blackrock College, Carroll & Kinsella, Seafort Parade and Castledawson Avenue. Additional landtake is required from Blackrock College. As a result of the landtake, the proposal would require the removal of approximately 35 trees –Details of tree type; condition etc., contained within tree survey conducted October 2016.

Castledawson Avenue/Seafort junction to Merrion Avenue junction

To ensure the full road geometry of the proposed scheme option some residential land take would be required on the northbound approach to Castledawson Avenue. This land take would require the relocation of a stone wall demarking the boundary of a residential property and would also require the relocation or possibly the removal of private parking spaces in the Blackrock Clinic car park. Further land take would be required on the eastern carriageway between Ch. 5720m and Ch.5960m to ensure adequate space to provide the full geometric design i.e. the designated turning lane into Castledawson residential estate. This land take would require the removal or relocation of the wall and entrance gates including ancillaries (piers, copings etc.) along the boundary of Blackrock Park, the relocation of adjacent car parking spaces in the park and the removal/relocation of approximately 15 trees along the boundary of Blackrock Park (number to be confirmed by engineer on site). The proposed scheme option also would require the removal of 13 formal car

parking spaces from the eastern carriageway (8 along Phoenix Terrace and 5 along the carriageway between Seafort Parade and Emmet square).

As a traffic calming measure and to aid pedestrians and cyclists to navigate across minor roads, raised tables would be installed or upgraded at the entrances/exits to Emmet Square, Phoenix Terrace, Castledawson residential estate and Ben Inagh Park. Some sections of footpath and ancillaries (tactile paving, kerbs etc.) would be removed between Castledawson Avenue and Merrion Avenue on both sides of the carriageway along with the relocation of all associated services where necessary. These sections of existing footpaths would be replaced with new continuous footpaths and cycle lanes alongside both carriageways. A new pedestrian crossing to complement the existing crossing at the Blackrock Clinic would be installed as part of the design proposal.

The proposed design would require changes to the traffic lane alignment between the entrance to Blackrock clinic and Castledawson Avenue on the western carriageway and the eastern carriageway between Seafort Avenue and Emmet Square. These changes would facilitate the provision of the continuous bus lane in the eastern carriageway, a designated turning lane into Blackrock Clinic approaching from the eastern carriageway and also a designated turning lane into Seafort Parade approaching from the western carriageway. The proposed scheme option would also require the removal of the ghost island in the median at the Phoenix Terrace junction to facilitate a designated turning lane into same.

To accommodate a designated turning lane into Castledawson residential estate from the southbound approach, traffic islands would be required in the median of the road between Ch. 5735 and Ch.5855m. To ensure a continuous segregated cycle lane on the western carriageway and also to provide a boarding/alighting area for passengers at the bus stop located at Ch. 5985m, the proposed design would require the construction of a section of a 2m footpath between Ch. 5955m and Ch.6030m. A reduction in the number of lanes would be required on approach to the Merrion Avenue junction on the eastern carriageway to facilitate the continuous bus lane.

Merrion Avenue junction to Temple Road/Barclay Court junction

The provision of a continuous designated bus lane from the Merrion Avenue junction to the Temple Road junction and vice versa would require some changes to the existing traffic lane alignment. The most significant change would be the reduction in the number of traffic lanes throughout to accommodate the bus lanes. Land take would be required on the southbound approach to Rock Hill to allow traffic approaching on the eastern carriageway to take the left turn. Land take would be also required on the southbound approach to Carysfort Avenue. This land take would require the removal of 16 parking spaces from the car park of Zurich Life Assurance. Land take would also be required to provide all turning lanes into the Frascati Shopping Centre, onto Merrion Avenue and Sweetman Avenue.

Temple Road/Barclay Court junction to Stradbroke Road

To ensure continuity of the bus lane from the Temple Road/Barclay Road junction through to the Newtownpark junction, the scheme option proposal would require that the amount of traffic lanes be reduced to accommodate this design. The proposals would require residential land take at the Craigmole Gardens junction to enable traffic to turn into the residential estate. From the Temple Park Avenue junction the

design proposes 70 metres of designated bus lane between Temple Park Avenue and the Temple Crescent/Monkstown Road junction on the eastern carriageway. The design proposals would include the provision of a designated bus lane on the western carriageway from Ch.7240m to Ch.7085m. As this lane is designated for buses only, land take would be required to accommodate a designated left turning lane into St. Vincents Park. Continuous segregated cycle lanes and footpaths with a minimum width of 2m would be provided alongside both carriageways throughout this section.

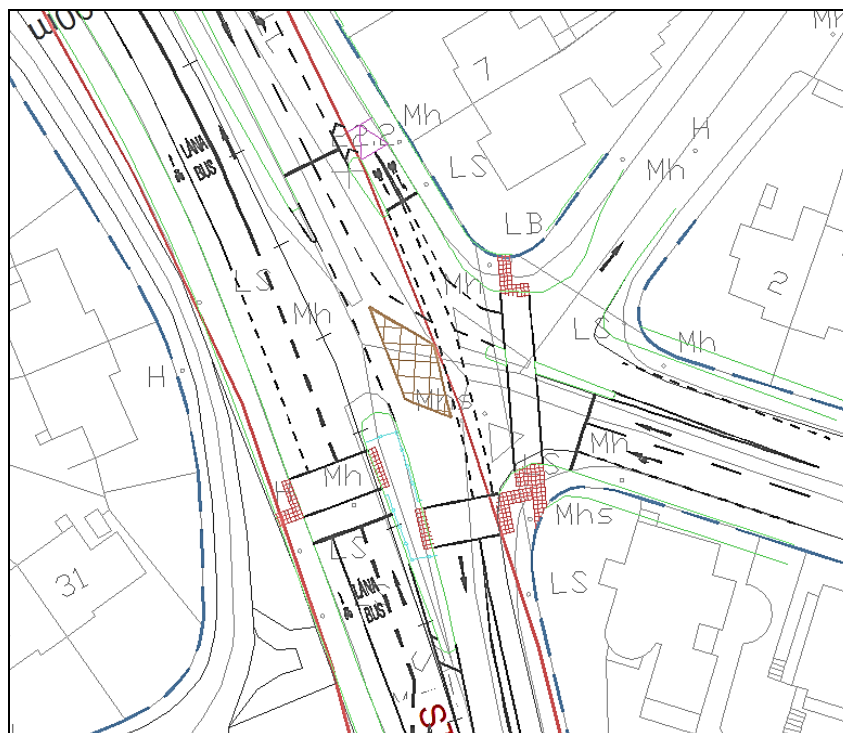


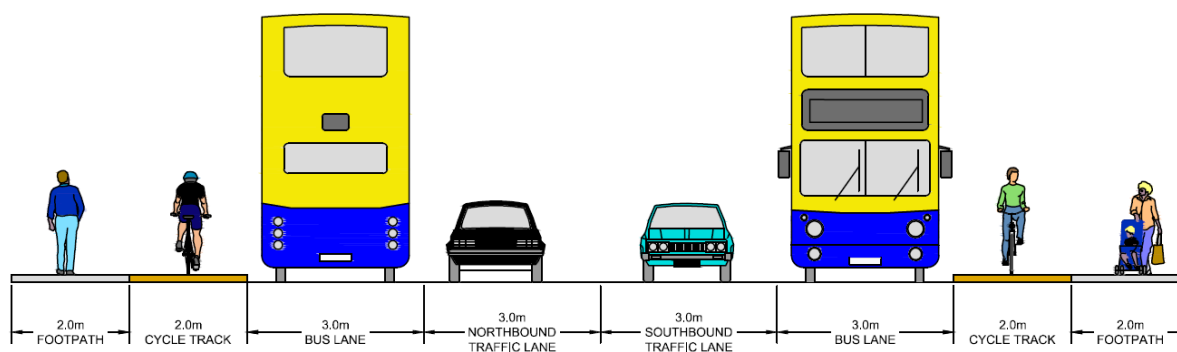
Figure 6.E: Scheme M1 Option 1 boundary (red) against existing building line (blue) at the Monkstown Avenue / Stradbroke Road junction

6.3.4.2 M1 Option 2

Summary

M1 Option 2 would provide bus priority where practical as well as cycle and pedestrian facilities along the entire route by applying the following lane widths for each direction of traffic, as recommended by DMURS:

- 3.0 m Bus lane;
- 3.0 m Traffic Lane;
- 2.0 m Footpath; and
- 2.0 m Cycle Track



The difference between M1 Option 1 and Option 2 is that Option 2 would provide some indented bus stops (2.8m width) and some in-line bus stops along its route. Also, with Option 2, buses would merge with left-turning traffic at junctions.

Trimleston Avenue to Booterstown Avenue

The provision of this option along the Rock Road between Trimleston Avenue and Booterstown Avenue would require the removal of 29 parking spaces including 1 disabled. Some sections of footpaths and ancillaries (tactile paving, kerbs etc.) would be removed along with the relocation of all associated services where necessary. The footpaths would be replaced with new 2m footpaths on both sides. The proposed design incorporates a 2 metre wide segregated inbound cycle lane on the western carriageway and a two-way segregated cycle lane on the eastern carriageway up to Booterstown Station turn. Raised tables would be retained across the entrances to St. Helen's Road residential estate and a new raised treatment installed at the entrance to Booterstown station.

In a slight change to the existing traffic alignment on the western carriageway, the proposal would require that the 50 metres of designated left hand turning lane into Trimleston Avenue shall be converted to a bus lane until 17 metres before the junction where the buses shall share with other traffic turning left onto Trimleston Avenue. Buses are not allowed to turn left from the Rock Road onto Trimleston Avenue at this junction. On the eastern carriageway the proposal would require the provision of a continuous bus lane from the Trimleston Avenue junction to the Booterstown station junction, although buses must share the lane for approximately 40 metres on approach to the junction with traffic turning left into Booterstown station. Continuous segregated cycle lanes would be provided along both carriageways. The proposal would require some land take in this section, the location of which may be viewed on Sheet No. 14 of 20 Dun Laoghaire to City Centre CBC, and also that no trees would be removed.

Booterstown Avenue junction to Castledawson Avenue/Seafort junction

The scheme option 2 proposals for this section would include removing the existing merging lane leaving the Booterstown station junction on the eastern carriageway to allow the provision of a continuous bus lane from Booterstown Station to Seafort Parade and beyond. On the western carriageway a continuous bus lane would be provided between the Castledawson Avenue junction and the Booterstown Avenue junction. A proposed reduction to the width of the central median for approximately 36 metres on approach to the Booterstown Avenue junction would facilitate the inclusion of a designated right turning lane allowing motorists to turn into Booterstown station from this approach.

Some sections of footpath and ancillaries (tactile paving, kerbs etc.) would be removed along this section along with the relocation of all associated services where necessary. The existing footpaths would be replaced with new footpaths and cycle lanes on both carriageways. As a traffic calming measure and to aid pedestrians and cyclists to navigate across minor roads, raised tables would be installed at the entrances/exits to Blackrock College, Carroll & Kinsella, Seafort Parade and Castledawson Avenue. The proposal would require some land take in this section, the location of which may be viewed on Dun Laoghaire to City Centre CBC Dwg Sheet. No 15 and 16. As a result of the landtake the proposal would require the removal of approximately 35 trees – Details of tree type; condition etc., contained within tree survey conducted October 2016.

Castledawson Avenue/Seafort junction to Merrion Avenue junction

To ensure the full road geometry of the scheme option, some land take would be required between Ch. 5590m and Ch. 5795m, the location of which can be found on Dun Laoghaire to City Centre Dwg. Sheet No. 16. This land take would require the removal of a stone wall demarking the boundary of a residential property and would also require the relocation or possibly the removal of parking spaces in the Blackrock Clinic car park. Further land take would be required on the eastern carriageway between Ch. 5720m and Ch.5960m. This land take would require the removal or relocation of the wall and entrance gates including ancillaries (piers, copings etc.) along the boundary of Blackrock Park, the relocation of adjacent car parking spaces in the park, the removal of 13 formal car parking spaces on the eastern carriageway (8 along Phoenix Terrace and 5 along the carriageway between Seafort Parade and Emmet square) and the removal/relocation of approximately 15 trees along the boundary of Blackrock Park – Details of tree type; condition etc., contained within tree survey conducted October 2016.

As a traffic calming measure and to aid pedestrians and cyclists to navigate across minor roads, raised tables would be installed or upgraded at the entrances/exits to Emmet Square, Phoenix Terrace, Castledawson residential estate and Ben Inagh Park. Some sections of footpath and ancillaries (tactile paving, kerbs etc.) would be removed between Castledawson Avenue and Merrion Avenue on both sides of the carriageway along with the relocation of all associated services where necessary. These sections of existing footpaths would be replaced with new continuous footpaths and cycle lanes alongside both carriageways. A new pedestrian crossing to complement the existing crossing at the Blackrock Clinic would be installed as part of the design proposal.

The proposed design would require changes to the traffic lane alignment between the entrance to Blackrock clinic and Castledawson Avenue on the western carriageway and the eastern carriageway between Seafort Avenue and Emmet Square. These changes would be to facilitate the provision of a continuous bus lane in the eastern carriageway, a designated turning lane into Blackrock Clinic approaching from the eastern carriageway and also a designated turning lane into Seafort Parade approaching from the western carriageway. The proposed scheme option would also require the removal of the ghost island in the median at the Phoenix Terrace junction to facilitate a designated turning lane into same.

To accommodate a designated turning lane into Castledawson residential estate, traffic islands would be required in the median of the road between Ch. 5735 and Ch.5855m. To ensure a continuous segregated cycle lane on the western carriageway and also to provide a boarding/alighting area for passengers at the bus

stop located at Ch. 5985m (see Dun Laoghaire to City Centre CBC Sheet No. 17), the proposed scheme option would require the construction of a section of a 2m footpath between Ch. 5955m and Ch.6030m. A reduction in the number of lanes would be required on approach to the Merrion Avenue junction on the eastern carriageway to facilitate the continuous bus lane.

Merrion Avenue junction to Temple Road/Barclay Court junction

The provision of a continuous designated bus lane from the Merrion Avenue junction to the Temple Road junction and vice versa would require some changes to the existing traffic lane alignment. The most significant change would be the reduction in the number of traffic lanes throughout to accommodate the bus lane. A proposed “keep clear” area in the bus lane on approach to Rock Hill would be provided to allow traffic approaching on the eastern carriageway to take the left turn. Buses would be required to share the lane with traffic turning left onto Temple Road for approximately 20m on approach from the eastern carriageway. To make the turns into the Frascati Shopping Centre, onto Merrion Avenue and Sweetman Avenue from the western carriageway, the proposed design would require traffic to share the bus lanes for 15m, 20m and 25m respectively.

Temple Road/Barclay Court junction to Stradbroke Road

To ensure continuity of the bus lane from the Temple Road/Barclay Road junction through to the Newtownpark junction, the design proposals require that the amount of traffic lanes be reduced to accommodate this design. Bus lanes would be designated for buses only, except at the Craigmore Gardens junction where the buses would share with traffic turning to and from the residential estate for 25 metres. From the Temple Park Avenue junction the scheme option proposes 70 metres of designated bus lane between Temple Park Avenue and the Temple Crescent/ Monkstown Road junction on the eastern carriageway. The scheme option proposals include the provision of a designated bus lane on the western carriageway from Ch.7240m to Ch.7085m. This lane is designated buses only except for approximately 25 metres on where the bus lane would share with traffic turning left into St.Vincents Park. Continuous segregated cycle lanes and footpaths with a minimum width of 2m would be provided alongside both carriageways throughout this section.

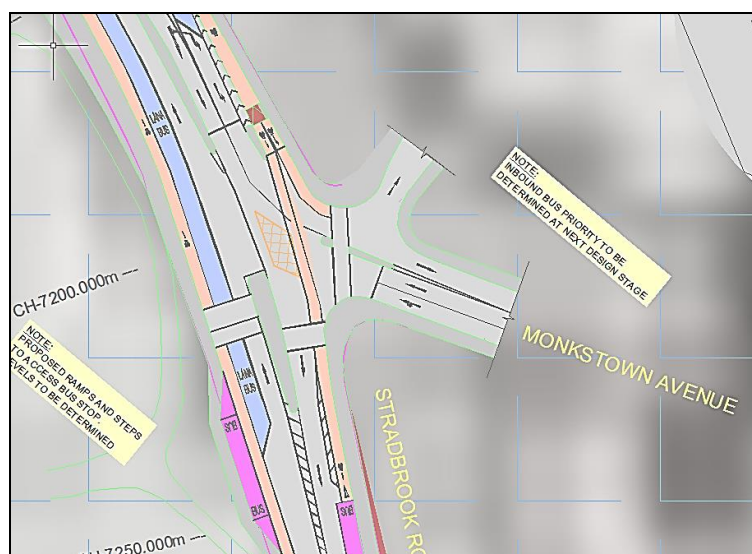


Figure 6.F: Scheme M1 Option 2 design at Monkstown Avenue / Stradbroke Road junction

6.3.5 SAS 2 Stage 2 Assessment Summary

A summary of the MCA results for the SAS2 scheme options is presented in Table 6.4. Neutral scoring sub-criteria are omitted from the summary table i.e. where scheme options score neutrally to other options. The full MCA table including a justification for the sub-criteria scoring awarded to each scheme option is presented in Appendix A. M1 Option 1 and Option 2 primarily consist of the same scheme design with the exception of bus provisions at junctions. M1 Option 1 would provide fully segregated bus lanes throughout the entire route, including junction approaches. M1 Option 2 proposes that buses share the lane with left-turning traffic at junctions. Due to the similarity between the two design options, they score similarly under most of the MCA sub-criteria. Though Option 2 is slightly cheaper due to the lesser amount of land acquisition required, at junctions in particular. Hence, M1 Option 2 will form part of the EPO.

Table 6.7: SAS 2 Route Options Assessment Summary (Main Criteria)

| MCA criteria | Assessment Sub-Criteria | M1 Option 1 | M2 Option 2 |
|--------------------|-------------------------|-------------|-------------|
| Economy | 1.a. Capital Cost | | |
| Environment | 6.i. Land Use Character | | |

6.4 SAS 3: Blackrock to Dun Laoghaire Route Options

Based on the catchment analysis and the information available for SAS3, and prior to the detailed MCA, it was apparent that the CBC route should stop at the southern end of SAS2 because bus services beyond that point would need to diverge within SAS3 to serve two different catchment areas; ultimately achieving two dissimilar purposes.

7. Emerging Preferred Route

7.2 Introduction

This section of the report presents:

- the final conclusions from the assessment process, for the end-to-end route / scheme options considered; and
- recommends an emerging preferred scheme option. A detailed description of the scheme proposals, which include ancillary measures required on other streets.

7.3 Route Options Assessment Conclusions

Within each Study Area Section, where potential route options were considered to be available, they have been assessed in accordance with the methodology set out in Chapter 4 including a ‘Multi-Criteria Analysis’ under the headings of Economy, Integration, Accessibility and Social Inclusion, Safety, Physical Activity and Environment.

7.4 Scheme Description

Based on the conclusions from the route options assessment process, the recommended preferred route for the proposed scheme is presented in Figure 7.4.1.

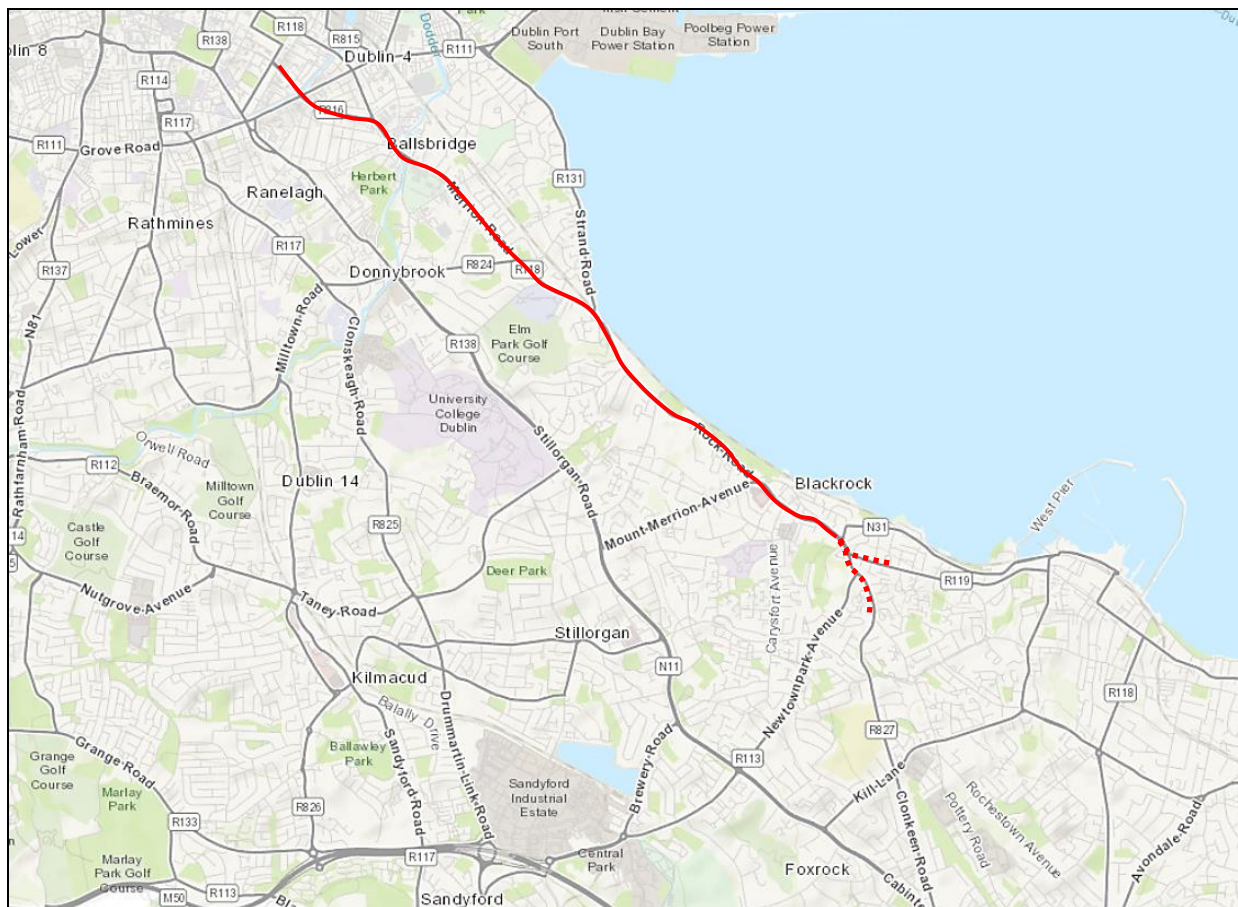


Figure 7.4.1: Dun Laoghaire to City Centre CBC Scheme Preferred Route

Between Fitzwilliam Place and Grand Canal

Inbound left-turning traffic will get a separate traffic phase to inbound buses on Baggot Street Lower at the Fitzwilliam Street junction. Continuous bus and cycle lanes will be provided along this section, which will require the removal of the median between Ch.35m and Ch. 60m. Fixed cross sections will be applied continuously by building out from the existing kerb; maximising pedestrian facilities to accommodate increased pedestrian activity along this section. Existing trees will be retained. Bus stops will not be indented to avoid encroachment into existing properties.

Parking will be removed on the west side of the road between Fitzwilliam Place and Grand Canal. On the east side, parking will be formalised and a buffer will be provided in between the parking bays and cycle lane.

Between Grand Canal and Lansdowne Road

Continuous bus and cycle lanes will be provided along Baggot Street Upper and Pembroke Road – no cycle lanes are proposed on Leeson Street Bridge. Inbound left-turning traffic will get a separate traffic phase to inbound buses on Baggot Street Lower at the Mespil Road junction and at the Waterloo Road junction. Footpath widths will need to be reduced to provide sufficient space for fixed cross sections and indented parking bays on the east side of the road – requires the removal of one existing tree. Parking will be removed on the west side of the road and along most of the east side. Potentially, some of the properties will be impacted.

Between Lansdowne Road and River Dodder

A single compact junction is proposed for Northumberland Road / Lansdowne Road / Pembroke Road and also for Pembroke Road / Herbert Park / Shelbourne Road. Left-turning inbound traffic will share the bus lane on Pembroke Road at the Lansdowne Road junction (approx. 85m) and also at the Herbert Park junction (approx. 24m). Left-turning outbound traffic will share the bus lane on Pembroke Road at the Shelbourne Road junction (approx. 42m). A cul-de-sac is proposed on Elgin Road at the Pembroke Road end of this section. Continuous bus and cycle lanes will be provided along Pembroke Road. The design will not impact on existing trees or properties. The right turn from Pembroke Road to Shelbourne Road will be prohibited – Shelbourne Road will be accessible from Pembroke Road via Lansdowne Road.

Between River Dodder and Nutley Lane

Left-turning inbound traffic will share the bus lane on Merrion Road at the Anglesea Road (approx. 60m) junction, at the Simmonscourt Road junction (approx. 24m) and also at the Ailesbury Road junction (approx. 18m). Left-turning inbound traffic will get a separate traffic phase to inbound buses at the Shrewsbury Road junction. Left-turning outbound traffic will share the bus lane on Merrion Road at the Ballsbridge Park junction (approx. 35m), Serpentine Avenue junction (approx. 30m), Sandymount Avenue (approx. 25m) and the Ailesbury Road junction (approx. 26m). Continuous bus and cycle lanes will be provided along this section, requiring the existing footpath widths to be reduced. No existing trees or parking spaces will be impacted. Pedestrian facilities, as per DMURS, will be applied to the majority of minor arm junctions along this section. Potentially, some of the properties will be impacted on the west side of the road between Ailesbury Road and Nutley Lane (as shown on Dun Laoghaire to City Centre CBC Sheet 9 of 20).

Between Nutley Lane and Strand Road

Continuous bus and cycles lanes will be provided, requiring the existing footpath widths to be reduced along this section. Continuous median will be provided between Nutley Lane and St Vincent's Hospital with pedestrian crossing facilities. No existing trees will be impacted though all parking spaces will be removed and property will be encroached on between St Vincent's Hospital and Strand Road on the west side of the road. Raised tables will be provided at the following minor arm junctions; Merrion Avenue, Herbert Avenue and Estate Avenue. Left-turning outbound traffic will share the bus lane on Merrion Road at the Merrion Avenue junction (approx. 50m).

Between Strand Road and Elm Park

Continuous bus and cycles lanes will be provided, requiring the existing footpath widths to be reduced. A central median will be provided along this section with pedestrian crossing facilities. A 70m parking bay will be provided at the Strand Road end of this section (between Ch.3855m and Ch.3925m as shown on Dun Laoghaire to City Centre CBC Sheet 11 of 20), on the east side of the road. A cul-de-sac is proposed on Strand Road where it currently connects to Merrion Road. Traffic on Merrion Road will reach Strand Road via a new road proposed through the carparks of Our Lady Queen of Peace Church and Sandymount Gym (Body Rock Performance). The cycle facility will be two-way on the east side of the road and one-way on the west side.

Between Elm Park and Trimleston Avenue

Continuous bus and cycles lanes will be provided, requiring the existing footpath widths to be reduced along certain sections. The existing parking and trees will be maintained though property and private land will be impacted on (as shown on Dun Laoghaire to City Centre CBC Sheet 12 of 20). The cycle facility will be two-way on the east side of the road and one-way on the west side. A raised table would be provided at the Belview Avenue junction. Inbound buses will get a separate phase to traffic at the Elm Park junction to eliminate conflict with inbound left turning traffic.

7.5 Summary

7.5.1 Emerging Preferred Scheme Option

This scheme is intended to serve the Dun Laoghaire to City Centre Corridor with stops at key locations along the route (see section 7.4). The preferred route starts on Baggot Street Lower and connects to Booterstown via Pembroke Road and Merrion Road. From Booterstown, the CBC continues southwards to Blackrock via Rock Road and Frascati Road ending at Temple Hill Junction.

It is proposed to include initial bus priority enabling measures along the first 200-300m on both S1 and S3 routes that could future-proof further additional measures along the entire preferred route length.

7.5.2 Proposed Scheme Design along the EPO (refer to the Emerging Scheme Design Drawings)

7.5.2.1 Bus Lanes

The proposed design incorporates the provision of inbound and outbound bus lanes, traffic lanes and cycle lanes whilst also providing inbound and outbound footpath facilities for a distance of approximately 7 kilometres from Baggot Street Lower /Fitzwilliam Street signalised junction to the signalised junction at Temple Hill/Monkstown Road.

Traffic light sequences shall also be amended at existing signalised junctions to allow bus lane priority along the prescribed route. The proposed bus and cycle infrastructure along the CBC is illustrated in Figure 7.3.2 below.

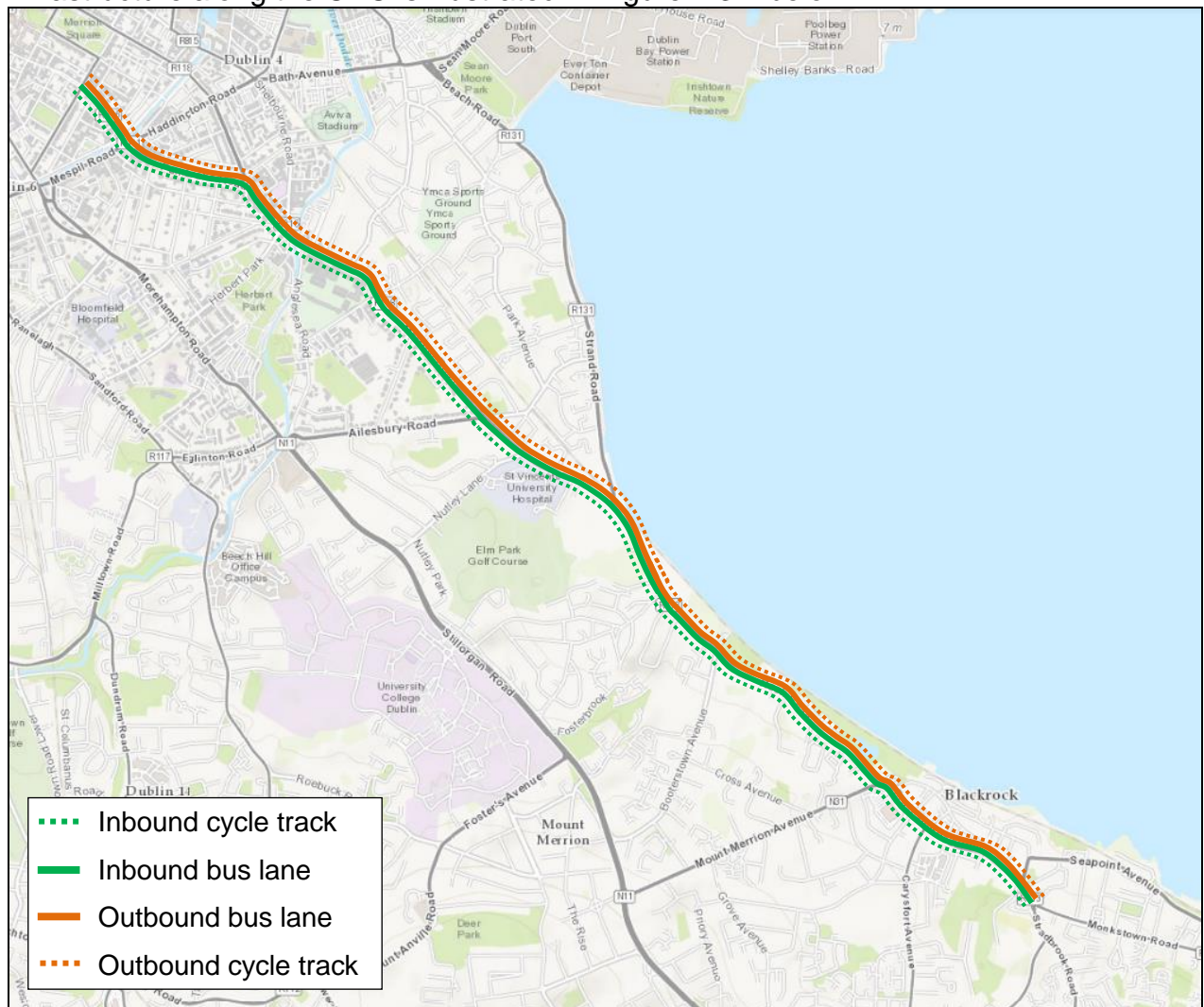


Figure 7.5.1: Bus and cycle infrastructure along the CBC

7.5.2.2 Bus Stops

Bus stop locations have been optimised for the route to facilitate the route geometry and optimise catchment based on population and employment destinations. The CBC stop locations are indicated in Figure 7.5.2. The residential catchment within 5, 10 and 15 minutes walking distance of the proposed stops is also illustrated in Figure 7.5.2. The outermost isochrone contour defines the perimeter within which

the stop can be reached by pedestrians in 15 minutes or less at a typical walking pace. The population residing within each of the isochrone contour areas is summarised below:

- 5 minutes walking distance – 10,479 residents
- 5-10 minutes walking distance – 14,156 residents
- 10-15 minutes walking distance – 27,304 residents
- Total catchment within 15 minutes walking distance – 51,939 residents

These figures are based on the Census 2011 Small Area Population Statistics (SAPS). Furthermore, there are a total of 112,677 people working or attending an educational institution within the 15 minute walking catchment of the CBC stops i.e. 91,202 in employment and 21,475 in education.

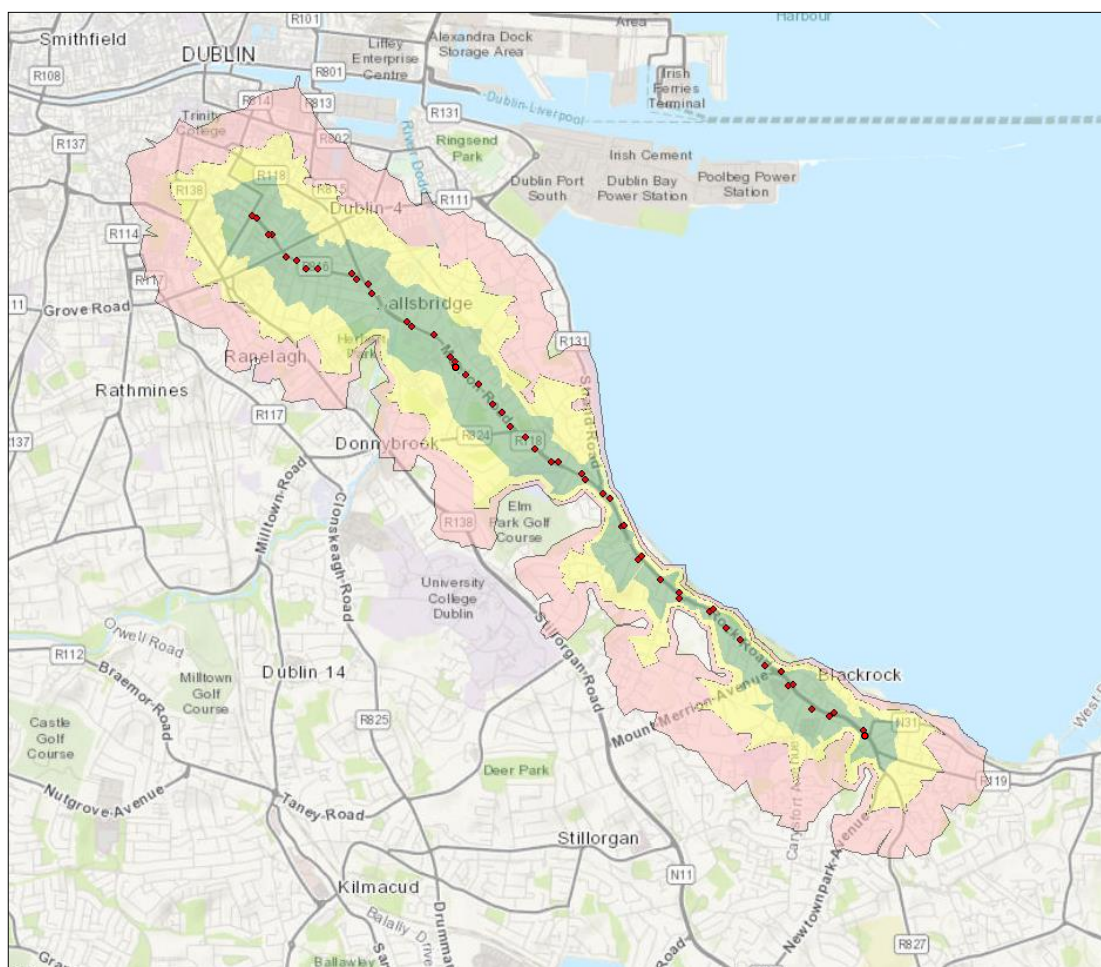


Figure 7.5.2: Walking distance catchment zones for rationalised CBC bus stops

7.5.2.3 Cyclist Facilities

The Greater Dublin Area Cycle Network Plan identifies the EPO corridor as part of a primary cycle network (Route 13) and secondary cycle network (Route 13A); see Figure 7.5.3. Thus, the EPO forms a key part of the strategic cycle network. It is therefore important that CBC design along the corridor takes cognisance of this and it is intended that the proposed scheme incorporates, where practical, the cycle infrastructure required to provide a high quality of service in accordance with the National Cycle Manual, as required for a primary and secondary cycle route. A road segregated cycle track is proposed in each direction along the entirety of the CBC

route (approximately 7 km), as illustrated in Figure 7.5.1. Existing signalised junctions at numerous locations throughout the route shall require upgrading to ensure the provision of cycle and pedestrian facilities at each “all arms” signalised junction.

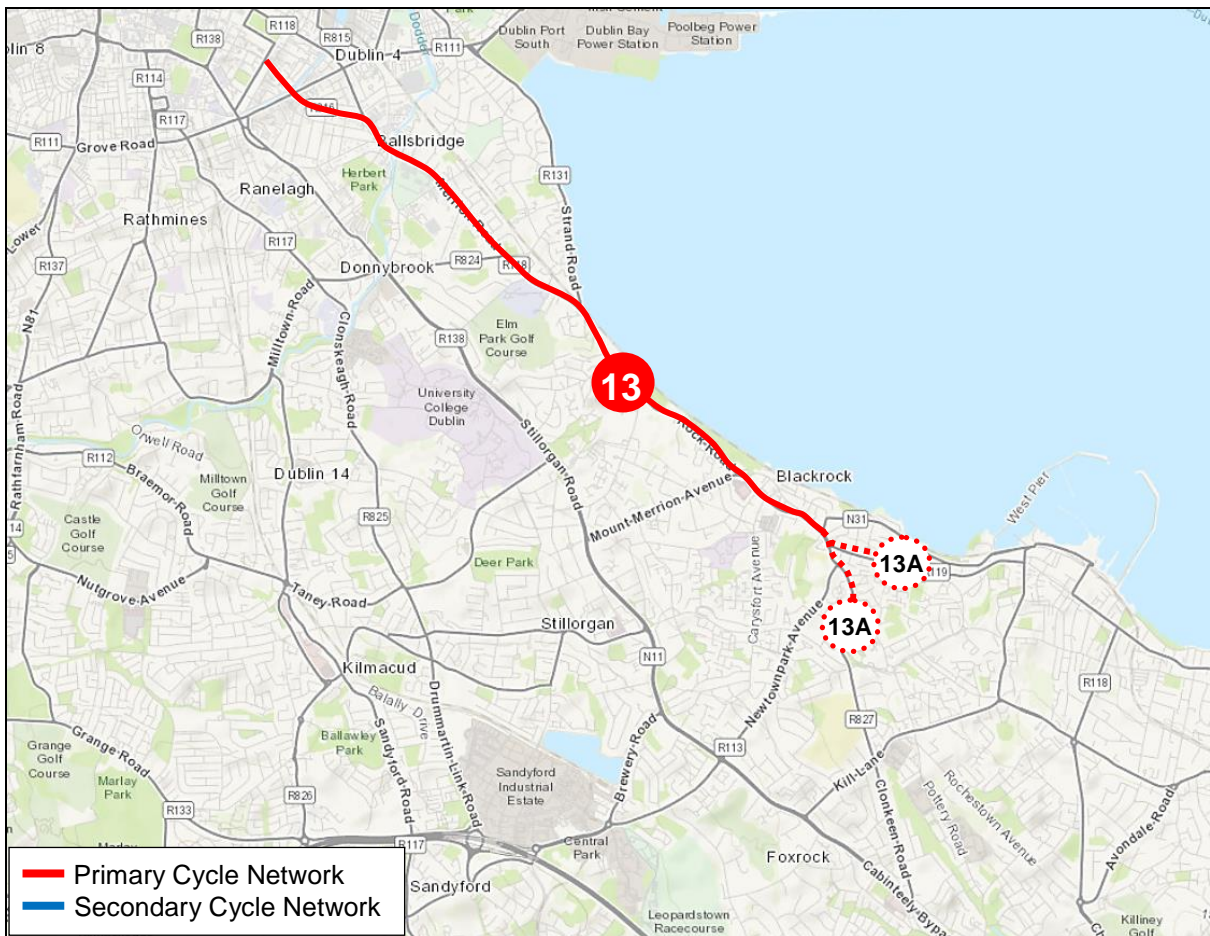


Figure 7.5.3: GDA Cycle Network Plan along the EPO

7.5.2.4 Pedestrian Facilities

The proposed design requires the introduction of entry raised treatments at a number of entrances along the route e.g. the entrances to Helens Road, Grotto Avenue, Booterstown train station, Blackrock College Car Park, main and rear entrances to Willow Terrace, The Willows, Castledawson Avenue, Seafort Parade, Emmett Square, Phoenix Terrace, Sion Hill and Ben Inagh Park to reduce the speed of traffic approaching the route via side street accesses, whilst allowing pedestrians to free flow through junction entry's/exits. All proposed inbound and outbound footpaths exceed the minimum standard width of 1.8 metres.

7.6 Summary

The following summarises the main features of the proposed EPO:

Table 7.1: Summary table of preferred route

| | |
|---|-------------|
| Route length | 7 km |
| Length of bus priority (outbound) | 7 km |
| Length of bus priority (inbound) | 7 km |
| Length of dedicated cycle lane in each direction | 7 km |
| Number of bus stops (outbound) | 26 |
| Number of bus stops (inbound) | 25 |
| Residential catchment area (within 15 mins walking distance of nearest bus stop) | 76,600 |
| Number of people working or attending an educational institution within the 15 minute catchment area | 123,000 |
| Journey Time outbound, peak time * conservative calculation: buses stop at every junction and pedestrian crossing for the maximum time, accordingly, see Appendix C | 44 minutes |
| Journey Time inbound, peak time * conservative calculation: buses stop at every junction and pedestrian crossing for the maximum time, accordingly, see Appendix C | 45 minutes |

8. Feasibility Working Cost Estimate

8.1 High Level Cost Estimate

A cost estimate for the Emerging Preferred Option has been developed for the scheme and is indicated in Table 8.1: below. It was developed primarily based on standard rates that AECOM-ROD have available from similar types of projects in Dublin and includes high level information on the typical urban streetscape construction including:

- Preliminaries;
- Site Clearance;
- Earthworks;
- Pavement;
- Kerbs and Footways;
- Traffic Signs and Markings;
- Other Items (Ramps, Traffic Signals, Pedestrian Crossings, Street Lights, Landscaping, Boundary);
- Design and Construction Supervision Costs; and
- High Level Land Acquisition Costs.

A detailed cost estimate and significant further work would be required to provide a more accurate cost at the subsequent stage of development. This detailed estimate would need to allow for Risk, Contingencies and future inflation etc.

Table 8.1: Feasibility Working Cost Estimate for EPO

| <i>Study Area Section</i> | <i>Total Capital Cost Estimate</i> |
|---------------------------|------------------------------------|
| SAS 1 (N1 Option 2) | €13.6M |
| SAS 2 (M1 Option 2) | €3.8M |
| SAS 3 (First 300 meters) | €2.4M |
| Total | €19.8M |

8.2 Exclusions

The high-level cost estimate for the Dún Laoghaire CBC EPO does not consider:

- Professional Fees;
- Planning Costs;
- Marketing;
- Capital Contributions;
- Inflation;
- VAT;

- Costs associated with neighbouring proposed CBC projects (e.g. Ringsend CBC);
- Potential city centre cellar works and acquisition of private landings;
- Administration and management costs; and
- Maintenance costs.

9. Emerging Preferred Scheme Benefits

The Emerging Preferred Scheme will deliver on-street infrastructure necessary to achieve practical continuous bus priority along the Dun Laoghaire to City Centre Core Bus Corridor, through the provision of enhanced bus lanes. This way, delays that currently occur along specific sections and at constrained locations will be removed/minimised enabling the bus to become a faster and more attractive to car traffic along the route. The bus system is envisaged to become more efficient, as bus stop locations will be optimised and faster bus journeys mean that more people will be moved with the same level of vehicle and driver resources.

The Emerging Preferred Scheme will provide significantly enhanced cycle facilities with high Quality of Service along the route, as also required under the Greater Dublin Area Cycle Network Plan.

The Emerging Preferred Scheme design fully integrates with existing and future planned development and transport infrastructure schemes in the vicinity of the study area.

The Emerging Preferred Scheme design incorporates sophisticated traffic management techniques to maximise level of services for all road users, following the principles included in the Design Manual of Urban Streets and Roads and taking into account issues such as permeability, personal security, traffic conditions, mobility impaired access, and safe crossing of roads.

In summary, the Emerging Preferred Scheme will have the following benefits:

- Increased reliability and faster journey times due to bus priority in the vast majority of locations;
- Reduction of commuting time;
- Reduction of car congestion and enhancement of attractiveness of urban centres;
- Provision of safe cycling facilities and the opportunity for more people to cycle along the Dun Laoghaire to City Centre Core CBC;
- Reconfiguration of existing junctions, which will provide considerable benefits for pedestrian accessibility and bus priority, making the bus routes more attractive;
- Proposed new bus stops, which increase the attractiveness and catchment area of the bus route in this Study Area;
- Interchange with DART – including complementary footpath upgrade and wayfinding proposals as part of the scheme design;
- Ability to extend bus services southwards; and
- Serving important trip attractors.

10. Next Steps

This report has identified an emerging preferred option for the bus infrastructure along this Dun Laoghaire to City Centre Core Bus Corridor for which a concept design has been developed. The next project stage (The development of a Preliminary Design) will further refine and update the initial concept design along the route. Further account will be taken of likely public transport service levels, particularly the bus service patterns and any changes to the overall bus network which may arise from the separate bus network review process. The proposals will be amended, if and as required, to integrate any resultant changes. The Preliminary Design will define the final practically achievable scheme for the CBC, taking into account more detailed studies of constraints, impacts and environmental assessment required at a local level.

Prior to finalisation of the Dun Laoghaire CBC scheme design, a public consultation process will be undertaken, with inputs and feedback received incorporated where practical and appropriate to do so. This Preliminary Design will form the basis of the planning consent process for the scheme, which will require a development consent application to be made directly to An Bord Pleanála, due to the nature and extent of the proposed works.