The background is a vibrant yellow. It is decorated with several abstract geometric shapes in shades of blue, teal, and white. These include circles, teardrop shapes, and rounded rectangles, some of which are partially cut off by the edges of the page. The shapes are arranged in a way that creates a sense of movement and depth.

Chapter 03 Consideration of Reasonable Alternatives

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3. Consideration of Reasonable Alternatives

3.1 Environmental Impact Assessment Directive Requirements

Article 5(1)(d) of Directive 2011/92/EU as amended by Directive 2014/52/EU “the EIA Directive”) requires that an Environmental Impact Assessment Report (EIAR) contains ‘a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and the main reasons for the option chosen, taking into account the effects of the project on the environment’.

In addition, Annex IV to the EIA Directive, provides that the EIAR shall include:

“A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.”

In addition, given the proposed road development for which approval is sought in this instance, section 50(2)(b)(iv) of the Roads Act 1993, as amended (“the Roads Act”) states that that the EIAR shall contain the following information:

‘...a description of the reasonable alternatives studied by the road authority or the Authority, as the case may be, which are relevant to the proposed road development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed road development on the environment’

Section 50(2)(b)(vi) of the Roads Act also requires that “any additional information specified in Annex IV [quoted above] that is relevant to the specific characteristics of the particular proposed road development or type of proposed road development and to the environmental features likely to be affected” also be included in the EIAR.

Accordingly, this Chapter of the EIAR describes the reasonable alternatives studied and the main reasons for the selection of the proposed Belfield / Blackrock to City Centre Scheme (hereafter referred to as the “Proposed Scheme” or “proposed development”) taking into account the effects on the environment.

It considers the alternatives at three levels:

- Strategic Alternatives;
- Route Alternatives; and
- Design Alternatives.

The reasonable alternatives studied which are relevant to the Proposed Scheme and its specific characteristics are described in the subsequent sections of this chapter.

3.2 Strategic Alternatives

3.2.1 GDA Transport Strategy

The Transport Strategy for the Greater Dublin Area 2016-2035 (“**GDA Transport Strategy**”) was prepared by the NTA pursuant to Section 12 of the Dublin Transport Authority Act 2008 and approved by the Minister for Transport, Tourism and Sport in February 2016 in accordance with sub-section 12(13) of that Act.

The GDA Transport Strategy provides a comprehensive framework to guide the development of transport across the Greater Dublin Region over the period of the strategy. Careful consideration was undertaken of the transport requirements across the seven counties of the GDA and the GDA Transport Strategy then formulated the appropriate transport responses to those requirements.

Various studies and reports were undertaken in the development of the GDA Transport Strategy, including:

- Area-based studies covering the GDA area;
- Demand Management Study;
- Core Bus Network Study;
- Park & Ride Study;
- Transport Modelling Analysis; and
- Environmental reports.

Specifically, a Strategic Environmental Assessment (SEA) was undertaken on the GDA Transport Strategy (NTA 2016). As set out in the Environmental Report, in respect of which the SEA of the GDA Transport Strategy was undertaken, a number of reasonable alternative strategies were devised and assessed, taking into account the objectives and the geographical scope of the strategy. The provisions of the GDA Transport Strategy (including bus-based transport modes), were evaluated for potential significant effects, and measures integrated into the Strategy on foot of SEA recommendations in order to ensure that potential adverse effects were mitigated. In considering the alternative modes on a corridor basis, the environmental assessment undertaken considered that bus-based projects could contribute towards facilitating the achievement of Ireland's greenhouse gas emission targets in terms of emissions per passenger per kilometre.

In addition to direct studies and analyses undertaken as part of the strategy preparation work, the GDA Transport Strategy also took into account prior reports and plans in relation to transport provision. These prior studies included, *inter alia*, the following:

- GDA Cycle Network Plan (2013);
- Bus Rapid Transit – Core Network Report (2012);
- Fingal / North Dublin Transport Study (2015);
- Review of the DART Expansion Programme (2015);
- Various prior Luas studies (including Line B2 (Bray), Line D1 (Finglas), Line F1, and F2 (Lucan and Liberties), and Line E (2008); and
- Analysis carried for a 2011 Draft Transport Strategy.

Given the importance of bus transport as the main public transport mode for the overall region, the delivery of an efficient and reliable bus system forms an important element of the GDA Transport Strategy, integrated appropriately with the other transport modes. As Dublin is a low-density city with a large geographic footprint, there are few areas with the size and concentration of population necessary to support rail-based public transport, and the bus system remains essential to serve the needs of much of the region.

The bus system has continued to remain an essential element of the public transport infrastructure since the publication of the GDA Transport Strategy. The bus system in the Dublin metropolitan area carried 159 million passengers in 2019 (the last full year before the COVID-19 pandemic), compared with 48 million passengers on Luas and 36 million passengers on the DART and rail commuter services over the same year. Converting to percentage figures, the bus system accounts for 65% of public transport passenger journeys in the Dublin region, roughly two thirds of all public transport passengers, with Luas carrying 20% and DART and commuter rail services delivering the remaining 15%.

The area-based studies referenced above provided an appraisal of existing and future land use and travel patterns, including identifying trends and issues, within eight transport corridors as presented Image 3.1 (Figure 3.8 in the GDA Transport Strategy). These corridors were also divided into Outer Hinterland, Outer Metropolitan, and Inner Metropolitan areas in terms of character.

- Recovery is occurring in public transport use, but not in its mode share;
- Encouraging non-car use for trips to education is a significant challenge;
- There is no spare capacity on the M50 Motorway;
- Protecting and enhancing access to the ports and Dublin Airport is a strategic priority; and
- Current economic growth will mean that within the next few years, overall levels of travel demand are likely to exceed the travel demand experienced in 2006 and 2007 prior to the downturn.

Congestion throughout the GDA is particularly high with the number of cars on the road increasing and significant daily traffic delays. Without intervention, potential impacts could worsen for the region including:

- Continued growth of traffic congestion;
- Impacts on the ability of the region to grow economically due to increased congestion;
- Longer journey times and increased travel stress will diminish quality of life; and
- Environmental emissions targets will not be met.

Ultimately, few areas within the GDA have the size and concentration of population to support rail-based public transport. For most transport corridors in Dublin, bus transport represents the most appropriate transport solution.

In terms of the out-workings of a strategic “Do Nothing” Alternative, it should be noted that, currently, the bus network is characterised by discontinuity, whereby corridors have dedicated bus lanes along less than one third of their lengths on average which means that for most of the journey, buses and cyclists are competing for space with general traffic and are negatively affected by the increasing levels of congestion. This lack of segregated space for different road users results in delayed buses and unreliable journey times for passengers. Issues related to frequency, reliability and a complex network have persisted for many years and will continue to do so without further intervention. In the absence of enhanced frequencies, journey time and reliability the ability to attract new passengers is limited, particularly from private car and also impacts on the ability of the bus network to retain passengers and acts as a demotivator to travel by bus. Within the extents of the Belfield / Blackrock to City Centre Core Bus Corridor Scheme, bus lanes are currently provided on approximately 35% and 39% of route outbound and inbound routes respectively of which significant portions of the route are shared with cyclists and or parking lanes, which can in turn impact on bus reliability.

Adopting a Do Nothing approach to infrastructure improvements, would be likely to result in an exacerbation of the problems arising from discontinuity – such as delayed buses and unreliable journey times. The capacity and potential of the public transport system would remain restricted by the existing deficient and inconsistent provision of bus lanes and the resulting sub-standard levels of bus priority and journey-time reliability. As such, in addition to the continuation of issues relating to existing bus services, future bus services, including the Bus Network Redesign currently being implemented as part of the wider BusConnects Programme, would also suffer from the same lack of journey-time reliability. This would severely impact the attractiveness of public transport as an alternative to private car usage for those who need to travel to/from various locations along the route of the Proposed Scheme.

In addition, without the provision of safe cycling infrastructure, intended as part of the Proposed Scheme, there would also continue to be an insufficient level of safe segregated provision for cyclists who currently, and in the future would be otherwise attracted to use the route of the Proposed Scheme. Whilst, in the “Do Nothing” Alternative, ongoing improvements may be provided along the route of the existing corridor extents, this is likely to be piecemeal and disconnected without the wide-strategic benefits to be derived from the Proposed Scheme.

In addition, with the “Do Nothing” Alternative, there would not be significant strategic investment in improvements to the pedestrian environment. Rather, improvements would be limited to relatively limited interventions, for example, ongoing maintenance of existing footpaths and adjacent public spaces. The “Do Nothing” Alternative would not result in improvements to encourage more journeys generally at a local level by active travel, including connecting to and from bus stops for all pedestrians, and in particular improving facilities for the mobility and visually impaired.

For all of these reasons, and having regard to these environmental considerations in particular, a Do Nothing alternative is not considered to be a viable reasonable alternative relative to the outcomes which can be realised by the Belfield / Blackrock to City Centre Core Bus Corridor Scheme.

3.2.3 Bus Rapid Transit (BRT) Alternative

Bus Rapid Transit (BRT) has emerged in recent years as an effective, cost efficient and high-quality public transport system. As BRT is a relatively new mode of transport there are various definitions and interpretations as to what BRT comprises and there are many different forms of BRT systems in operation worldwide. Definitions of BRT range from a Quality Bus Corridor (QBC) to being a fully guided, fully segregated bus system.

A Bus Rapid Transit (BRT) – Core Network Report, prepared in 2012 (NTA 2012) at feasibility study level, investigated the demand, technical, environmental, and economic feasibility of a proposed core BRT network. The feasibility study recommended that further and more detailed work should proceed on two cross city corridors, one of which being the Blanchardstown to University College Dublin (UCD) which is pertinent to the Proposed Scheme.

Prior to the completion of these studies, the GDA Transport Strategy identified the development of a number of Core Bus Corridors as BRT schemes, including a BRT network linking to the upgraded metro at Bride's Glen or Sandyford. These BRT routes formed part of the overall Core Bus Corridor network set out in the GDA Transport Strategy. As design and planning work progressed on the Core Bus Corridors, it became clear that the level of differentiation between the BRT corridors and the other Core Bus Corridors would, ultimately, be limited, and that all the corridors should be developed to a consistent standard, providing a more integrated, legible and coherent overall bus system.

By way of illustration of the similarities between the BRT option and Core Bus Corridors, all of the Core Bus Corridors are proposed to be developed to provide a high level of priority for the bus vehicles, which is an essential component of a BRT system. Integrated, cashless ticketing systems are planned under the overall BusConnects Programme, delivering the type of functionality often required for a BRT system. While different type vehicles are used around the world on BRT schemes, the longer routes present in Dublin, due to the low density nature of the city, favours the use of double deck vehicles on both BRT and conventional bus corridors, given the better ratio of seated to standing passengers on such vehicles.

Accordingly, it is intended that all of the Core Bus Corridor Infrastructure Works, including the Proposed Scheme, will be developed to provide a BRT level of service, rather than establishing a separate mode on some corridors. Consequently the Proposed Scheme as a separate BRT mode was not progressed given the limited differentiation from the Core Bus Corridors and the advantages identified above of a unified integrated bus system.

Environmentally the BRT option compared to the Core Bus Corridor proposal would be more impactful in terms of construction impacts, including flora and fauna, heritage, air and noise. BRT typically requires continuous unbroken physical lane infrastructure to achieve high-priority. This would involve significantly more landtake and potentially involve demolition of buildings at pinch-points. In the case of the Core Bus Corridor proposals bus-priority can be achieved through short lengths at pinch-points by the use of signal-control priority.

3.2.4 Light Rail Alternative

The appropriate type of public transport provision in any particular case is predominantly determined by the likely quantum of passenger demand along the particular public transport route.

For urban transport systems, bus-based transport is the appropriate public transport mode for passenger demand levels of up to 4,000 passengers per hour per direction. (UITP 2009). Light rail provision would generally be appropriate to cater for passenger demand of between 3,500 and about 7,000 passengers per hour per direction. Passenger demand levels above 7,000 passengers per hour per direction would generally be catered for by heavy rail or metro modes, which would usually be expected to serve a number of major origins or destinations along a particular corridor. In the case of both the bus and light rail modes, higher levels of passenger demand than the above stated figures can be accommodated under specific conditions.

The development of the GDA Transport Strategy considered the likely public transport passenger demand levels across the region using the NTA's transport model and took into account the other studies referenced above, in addition to studies that had been carried out to investigate a potential light rail scheme within the area of this corridor. Likely passenger flows were identified to be within the capacity of bus transport, without reaching the quantum of passenger demand which would support the provision of higher capacity rail solutions.

Section 3.2.1 set out various studies undertaken for the GDA Transport Strategy. Arising from these studies and the specific assessment and transport modelling work undertaken for the Strategy, it was concluded that a bus-based transport system would be the proposed public transport solution in the corridor of the Proposed Scheme. The proposed transport solution would be supplemented by the upgrade of the Luas Green line to Metro, to provide more passenger capacity as well as the extension of the Luas Green line from Cherrywood to Bray Town Centre. It was considered that there would be insufficient demand to justify the provision of an additional light rail alternative above what is proposed above, particularly given the low to medium density nature of development in this corridor.

Similar to BRT, environmentally the light rail option compared to the Core Bus Corridor proposal would be more impactful in terms of construction impacts, including flora and fauna, heritage, air and noise. Light rail requires continuous unbroken physical lane infrastructure to achieve high-priority. This would involve significantly more land take and potentially involve demolition of buildings at pinch-points. In the case of the Core Bus Corridor proposals bus-priority can be achieved through short lengths at pinch-points by the use of signal-control priority.

3.2.5 Metro Alternative

As highlighted above, when considering the appropriate transport systems to meet the expected transport demand, metro systems are a higher capacity form of light rail, generally designed for peak hour passenger numbers exceeding about 7,000 passengers per hour per direction, and often catering for multiples of that level.

Given the consideration of light rail provision, and the level of likely public passenger use along this overall corridor assessed in the transport modelling work, the development of the GDA Transport Strategy identified that a metro solution would not be economically justified within the area covered by this corridor. Accordingly, the GDA Transport Strategy included for the implementation of Metro South – Luas Green Line Capacity Upgrade as the appropriate public transport arrangement.

In addition, the development of an underground metro would not remove the need for additional infrastructure to serve the residual bus needs of the area covered by the Proposed Scheme, nor would it obviate the need to develop the cycling infrastructure required along the route of the Proposed Scheme.

Environmentally the metro option compared to the Core Bus Corridor proposal would be more impactful in terms of construction impacts, including flora and fauna, heritage, air and noise. Metro systems require unbroken physical lane infrastructure to achieve high-priority. This would involve significantly more land take and potentially involve demolition of buildings at pinch-points. In the case of the Core Bus Corridor proposals bus-priority can be achieved through short lengths at pinch-points by the use of signal-control priority.

3.2.6 Heavy Rail Alternative

Commuter heavy rail systems are generally designed for high levels of passenger demand, usually designed to carry in excess of 10,000 passengers per hour per direction. Where a surface corridor does not already exist in a built-up urban area, there are major challenges in creating sufficient surface space for such provision, requiring large amounts of property acquisition and building demolition.

For those reasons, new heavy rail projects running at surface level are rarely developed in built-up urban areas. Instead, underground rail links, including metro schemes, are deployed to avoid the severe impacts that would accompany a new surface rail line. Environmentally the heavy rail option compared to the CBC proposal would be more impactful in terms of construction impacts, including flora and fauna, heritage, air and noise. Heavy rail requires unbroken physical lane infrastructure to achieve high-priority. This would involve significantly more land take and potentially involve demolition of buildings at pinch-points.

The appropriate locations for new heavy rail provision were carefully considered in the development of the GDA Transport Strategy. Having regard to the level of likely public passenger use (demand) along the overall corridor of the Proposed Scheme assessed in the transport modelling work, the GDA Transport Strategy did not consider that a new heavy rail solution would be required along this corridor and would not be economically justifiable.

In relation to underground provision, this issue was considered as part of the metro analysis, given the similarity of underground heavy rail and underground metro schemes. Similar to the metro considerations, the provision of an underground heavy rail solution would not remove the need for additional infrastructure to serve the residual

bus needs of the area covered by the Proposed Scheme, nor would it obviate the need to develop the cycling infrastructure required along the route of the Proposed Scheme.

In addition to a new heavy rail solution the potential upgrade of the existing DART South East Line which is contained within the broader corridor was considered as part of the development of the GDA Strategy. In 2015, the NTA carried out a review of the key transport infrastructure projects that were proposed to support the growth of the Greater Dublin Region. This included a review of the DART Expansion which included DART Underground, the Fingal/North Dublin Study and a study of the orbital movements around Dublin all designed to inform the GDA Transport Strategy. Image 3.2 below shows the various projects in the DART Expansion Programme.

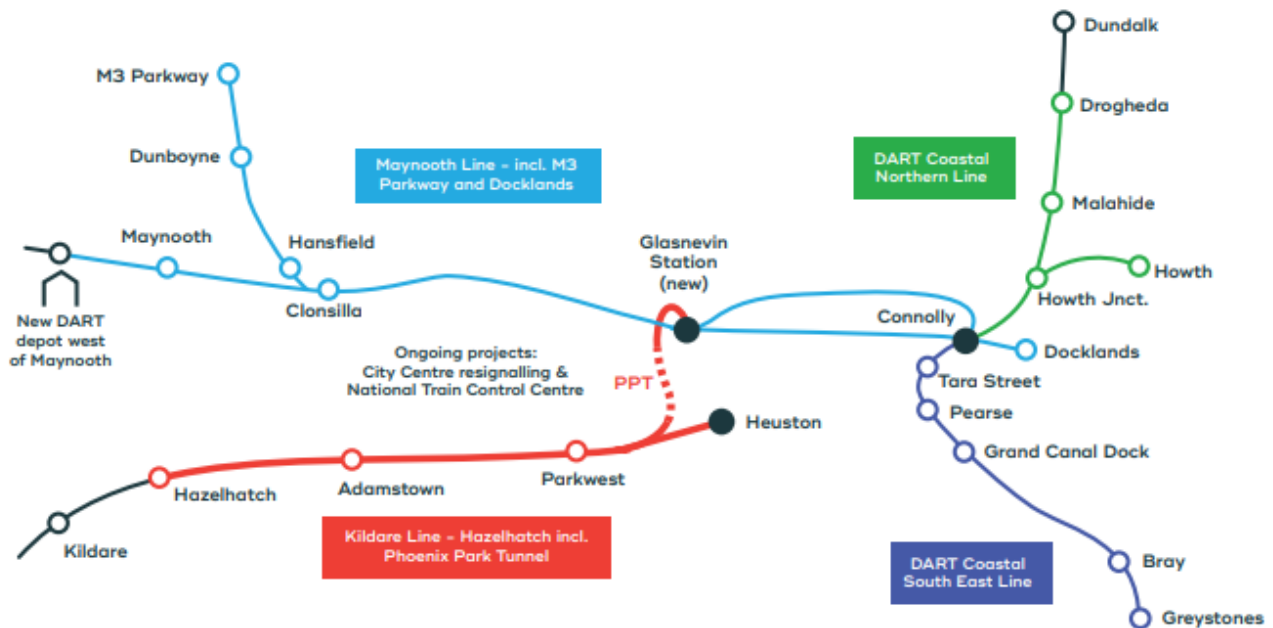


Image 3.2 DART Expansion Programme (Source: Irish Rail Website)

Accordingly, the GDA Transport Strategy included the upgrade of the DART South East Line, as part of a phased delivery of DART Expansion, supplemented with the light rail expansion through the implementation of Luas Green Line Capacity Enhancement and Metro South projects, with a higher quality bus solution along this Transport Strategy Corridor as the appropriate public transport configuration. Environmentally the combination of a rail upgrade involving limited construction works and the Proposed Scheme to achieve high-quality bus priority and safer cycling and walking infrastructure represents a balanced strategy by limiting the overall construction impact while enhancing the capacity for sustainable people-movement options.

3.2.7 Demand Management Alternative

One of the primary aims of the GDA Transport Strategy is to significantly reduce demand for travel by private vehicles, particularly during the commuter peaks, and to encourage use of walking, cycling and public transport. One of the mechanisms to achieve such reduction of private vehicle use is the use of measures to discourage travel by car – i.e. demand management.

Demand management can take many different forms from restricting car movement or car access through regulatory signage and access prohibitions, to parking restrictions, to fiscal measures such as tolls, road pricing, congestion charging, fuel/vehicle surcharges and similar. All of these approaches discourage car use through physical means or by adding additional costs to car use such that it becomes more expensive and alternative modes become more attractive. A key success factor of demand management is greater use of alternative travel modes, in particular public transport.

However, in the case of Dublin, the existing public transport system does not currently have sufficient capacity to cater for larger volumes of additional users. In the case of the bus system, the increasing levels of traffic

congestion over recent years prior to the COVID-19 pandemic added to bus delays and means that additional bus fleet and driver resources have been utilised simply to maintain existing timetables, rather than adding overall additional capacity. The objective of the GDA Transport Strategy is to significantly increase the capacity, and subsequent use, of the public transport system, focussing on the overall BusConnects Programme in the case of the bus system, the DART+ Programme in the case of heavy rail, and the Luas/Metro programme in the case of light rail.

Congestion is a significant contributor to GHG emissions and the related negative environmental impacts associated with poor air quality, noise levels, and related health and quality of life consequences. Demand management measures need to be associated with positive environmental benefits that can be achieved when commuters change modes to high-quality public transport, walking, and cycling that can help reduce GHG emissions and bring associated health benefits. The objective of the GDA Transport Strategy to significantly increase the capacity, and subsequent use of these alternative modes requires that the necessary physical infrastructure is necessary to deliver the efficiencies to make the mode-shift attractive and environmentally beneficial.

In advance of a significant uplift in overall public transport capacity in the Dublin metropolitan area, the implementation of major demand management measures across that area would be unsuccessful. Effectively constraining people from making journeys by car and requiring them to use other modes, without those modes having the necessary capacity to cater for such transfer, would not deliver an effective overall transport system. Instead, the capacity of the public transport system needs to be built up in advance of, or in conjunction with, the introduction of major demand management measures in the Dublin metropolitan area. This is especially true in the case of the bus system where a major increase in bus capacity through measures such as the Proposed Scheme would be required for the successful implementation of large-scale demand management initiatives.

While the foregoing addresses the dependency of demand management measures on public transport capacity, it is equally correct that the provision of greatly enhanced cycling facilities will also be required to cater for the anticipated increase in cycling numbers, both in the absence of demand management measures and, even more so, with the implementation of such measures. Demand management initiatives by themselves will not deliver the level of segregated cycling infrastructure required to support the growth in that mode. Consequently, the progression of demand management proposals will not secure the enhanced safe cycling infrastructure envisaged under the Proposed Scheme.

Accordingly, the implementation of demand management measures would not remove the need for additional infrastructure to serve the bus transport needs of the corridor covered by the Proposed Scheme, nor would it obviate the need to develop the cycling infrastructure required along the route of the Proposed Scheme.

3.2.8 Technological Alternatives

Technological advances have opened up new areas of potential in the delivery of transport infrastructure. Driverless trains and smart highways are two examples. Some of these initiatives, such as driverless trains, are now in use. Technological advancements relating to car use have the potential to improve road safety by reducing potential for driver error and with the use of global positioning systems to be guided to the most efficient route. A shift to electric vehicles will help reduce GHG emissions, but road space is limited and three typical cars (electric or otherwise) still take the same road space for up to 12 occupants that a typical double-deck bus requires to carry up to 90 occupants. The environmental impact of continuing to build more road space for low-occupancy vehicles is unsustainable from both the construction environmental impact and operational environmental impact perspectives. Despite advancements in road-user technology road congestion is not reducing as populations grow, and old inner-city areas of Dublin do not have space to add more car lanes.

The shift to hybrid and ultimately electric buses will reduce both noise and air quality impacts. The evolution of bike-share schemes and advancements in electric bike technology means that cycling is increasing in attractiveness and for longer distances. This attractiveness is only for the few however if cycling infrastructure in the form of safe segregated facilities is not available.

While road construction is costly and has a negative GHG impact there are little advancements in construction technology that present any viable alternatives when conversion of road infrastructure involves reconfiguration of lanes for bus priority, safer segregated cycle tracks and improved pedestrian facilities, or even more significantly

for rail-related infrastructure. Road right-of-way space is still shared with multiple underground and overhead utilities that may require to be relocated, and road materials require to be resilient to minimise maintenance frequencies.

Ultimately, however, alternatives have to be able to accomplish the objectives of the project in a satisfactory manner, and should also be feasible including in terms of technology and other relevant criteria. In this context, there is no evidence that such developments will displace the need for mass transit, which is essential to the operation of a modern city. Accordingly, the need to improve the overall bus system will still remain.

Overall, while certain technological advances do provide new opportunities in the transport area, particularly in the area of information provision, they do not yet provide viable alternatives to the core need to provide for the movement of more people by non-car modes, including the provision of safe, segregated cycling facilities. Accordingly, there are no viable technological alternatives to meet the transport needs of this sector of the city.

3.3 Route Alternatives

Following on from the strategic alternatives considered earlier, this Section sets out the route alternatives which were considered as part of the process to establish the Proposed Scheme. Development of the Proposed Scheme has evolved in the following stages:

- 1) **Feasibility and Options Reports**, which were associated with the Proposed Scheme (Dún Laoghaire to City Centre Core Bus Corridor Options Study – Feasibility and Options Assessment and Ballsbridge to UCD Bus Corridor Route Options Assessment), were prepared in early 2016 and set out the initial route options and concluded with the identification of an Emerging Preferred Route;
- 2) A first round of non-statutory **Public Consultation** was undertaken on the Emerging Preferred Route from 26 February 2018 to 31 May 2019;
- 3) Development of **Draft Preferred Route Option** (April 2019 to March 2020). Informed by feedback from the first round of public consultation, stakeholder engagement and the availability of additional design information, the design of the Emerging Preferred Route evolved with further alternatives considered;
- 4) A second round of non-statutory **Public Consultation** was undertaken on the Draft Preferred Route Option from 4 March 2020 to 17 April 2020. Due to the introduction of COVID-19 restrictions, some planned in-person information events were cancelled, leading to a decision to hold a third consultation later in the year;
- 5) Further development of an updated **Draft Preferred Route Option** was undertaken subsequent to the second round of public consultation, which took account of submissions received, continuing stakeholder engagement and additional design information;
- 6) A third round of non-statutory **Public Consultation** was undertaken on the updated Draft Preferred Route Option from 4 November 2020 to 16 December 2020; and
- 7) Finalisation of **Preferred Route Option**. Informed by feedback from the overall public consultation process, continuing stakeholder engagement and the availability of additional design information, the Preferred Route Option, being the Proposed Scheme, was finalised.

Alternative route options have been considered in a number of areas during the iterative design of the Proposed Scheme, such as optimising the road layout in constrained locations, including Nutley Lane, Merrion Road and Pembroke Road. The iterative development of the Proposed Scheme has also been informed by a review of feedback and new information received during each stage of public consultation and as data, such as topographical surveys, transport and environmental information was collected and assessed. In addition, the potential for climate impact was considered in all phases of the design process for the Proposed Scheme. As the design progressed climate was indirectly affected in a positive way by refining the design at each stage through reducing the physically footprint of the scheme coupled with the inclusion of technological bus priority measures.

Key environmental aspects have been considered during the examination of reasonable alternatives in the development of the Preferred Route Option for the Proposed Scheme. Environmental specialists have been involved in the iteration of key aspects of the Proposed Scheme with the engineering design team.

The following key environmental aspects were considered:

- **Archaeological, Architectural and Cultural Heritage** – there is the potential for impacts on archaeological, architectural and cultural heritage when providing CBC infrastructure. The assessment had regard to Recorded Monuments and Protected Structures (RMPs), Sites of Archaeological or Cultural Heritage and on buildings listed on the National Inventory of Architectural Heritage adjacent to the corridor;
- **Flora and Fauna** - The provision of the CBC could have negative impacts on flora and fauna, for example, through construction of new infrastructure through green field sites;
- **Soils and Geology** - Construction of infrastructure necessary for the provision of the CBC has the potential to negatively impact on soils and geology. For example, through land acquisition and ground excavation. There is also the potential to encounter ground contamination from historical industries;
- **Hydrology** - The provision of CBC infrastructure may include aspects (for example structures) with the potential to impact on hydrology;
- **Landscape and Visual** - Provision of CBC infrastructure has the potential to negatively impact on the landscape and visual aspects of the area, for example, by the removal of front gardens or green spaces or the altering of streetscapes, character and features;
- **Noise, Vibration and Air** - Provision of CBC infrastructure (e.g., the construction activities), has the potential to negatively impact on noise, vibration and air quality along a scheme. For example, through construction works;
- **Land Use and the Built Environment** - This criterion assesses the impact of each option on land use character, and measured impacts which would prevent land from achieving its intended use, for example through land acquisition, removal of parking spaces or severance of land; and
- **Climate** – Construction works involve negative GHG emissions impacts, while operational efficiencies of public transport, walking and cycling through modal shift from car usage has the potential to reduce GHG impacts.

3.3.1 Initial High Level Route Alternatives

The Feasibility and Options Reports identified feasible options along the corridor, assessed these options and arrived at an Emerging Preferred Route. Two reports were published relating to the Proposed Scheme; the Dún Laoghaire to City Centre Core Bus Corridor Options Study – Feasibility and Options Assessment and Ballsbridge to UCD Bus Corridor Route Options Assessment. These Reports formed the basis for the first phase of public consultation. A summary of the process is described below.

The Feasibility and Options Reports used a two-stage assessment process to determine the Emerging Preferred Route, comprising:

- Stage 1 – an initial high-level route options assessment, or ‘sifting’ process, which appraised routes in terms of ability to achieve scheme objectives and whether they could be practically delivered. The assessment included consideration of the potential high level environmental constraints as well as other indicators such as land take (particularly the impact on residential front gardens); and
- Stage 2 - Routes which passed the Stage 1 assessment were taken forward to a more detailed qualitative and quantitative assessment. All route options that progressed to this stage were compared against one another using a detailed Multi-Criteria Analysis in accordance with the Department of Transport Document “Common Appraisal Framework for Transport Projects and Programmes”.

The study area for the Dún Laoghaire to City Centre corridor comprised of three main sections. Section 1 examined feasible route options from Dún Laoghaire (bounded to the south by Sallynoggin/Gleneageary) to Blackrock, Section 2 examined feasible route options from Blackrock to Booterstown, and Section 3 examined feasible route options from Booterstown to the City Centre.

At the start of the Stage 1 assessment, an initial ‘spider’s web’ of potential route options (consisting of 91 individual links), that could accommodate a Core Bus Corridor was identified for each study area section as shown in Image 3.3 (extracted from the Feasibility and Options Report).

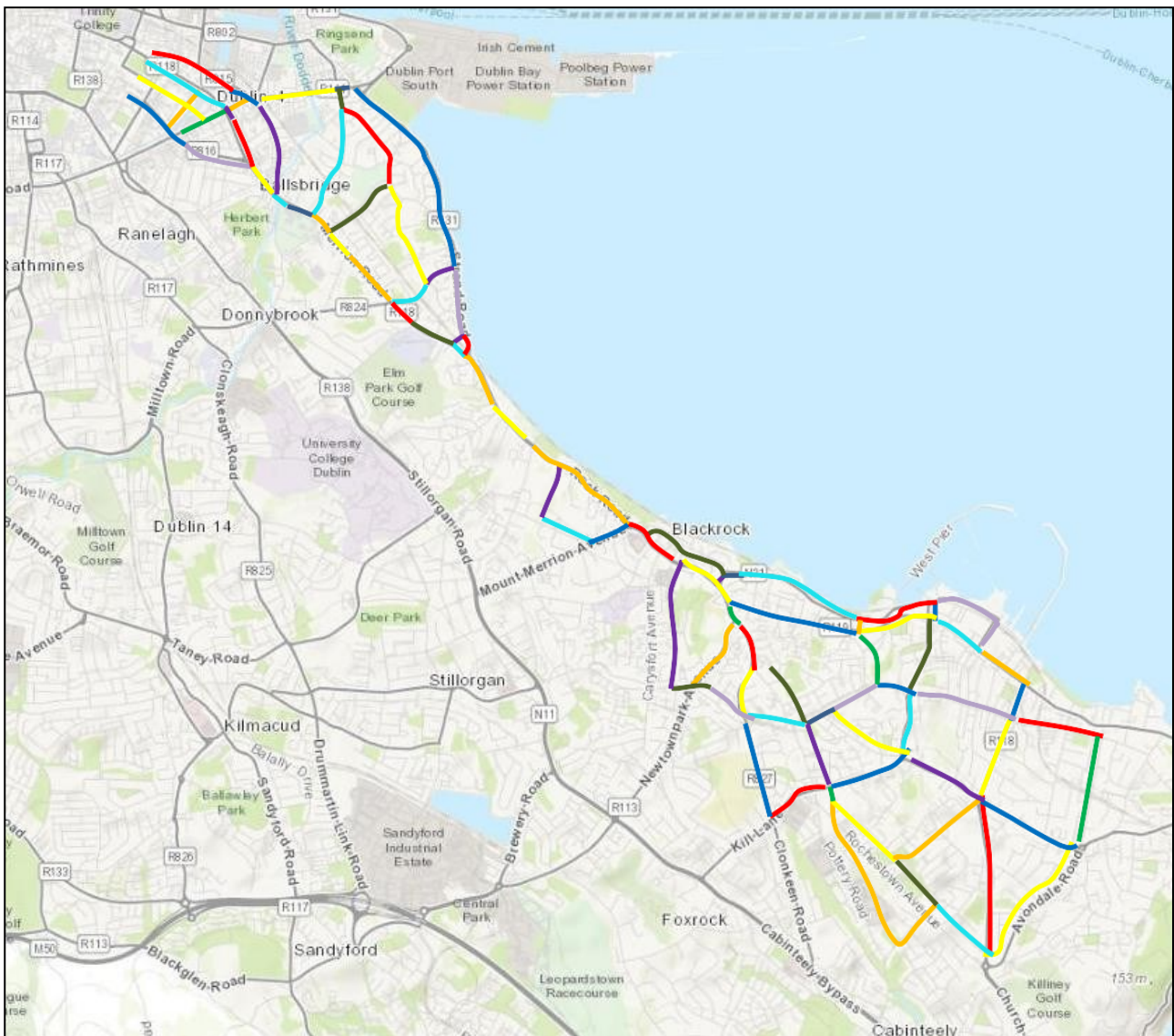


Image 3.3: Spider's Web of Route Options extracted from 'Dún Laoghaire to City Centre Core Bus Corridor Options Study – Feasibility and Options Assessment'

The study area for the Ballsbridge to UCD corridor comprised of a study area generally bounded to the north by Ballsbridge (south of the River Dodder), to south by UCD, and to the east by Booterstown.

At the start of the Stage 1 assessment, an initial 'spider's web' of potential route options (consisting of in excess of 11 individual links), that could accommodate a Core Bus Corridor was identified for each study area section as shown in Image 3.4 (extracted from the Feasibility and Options Report).

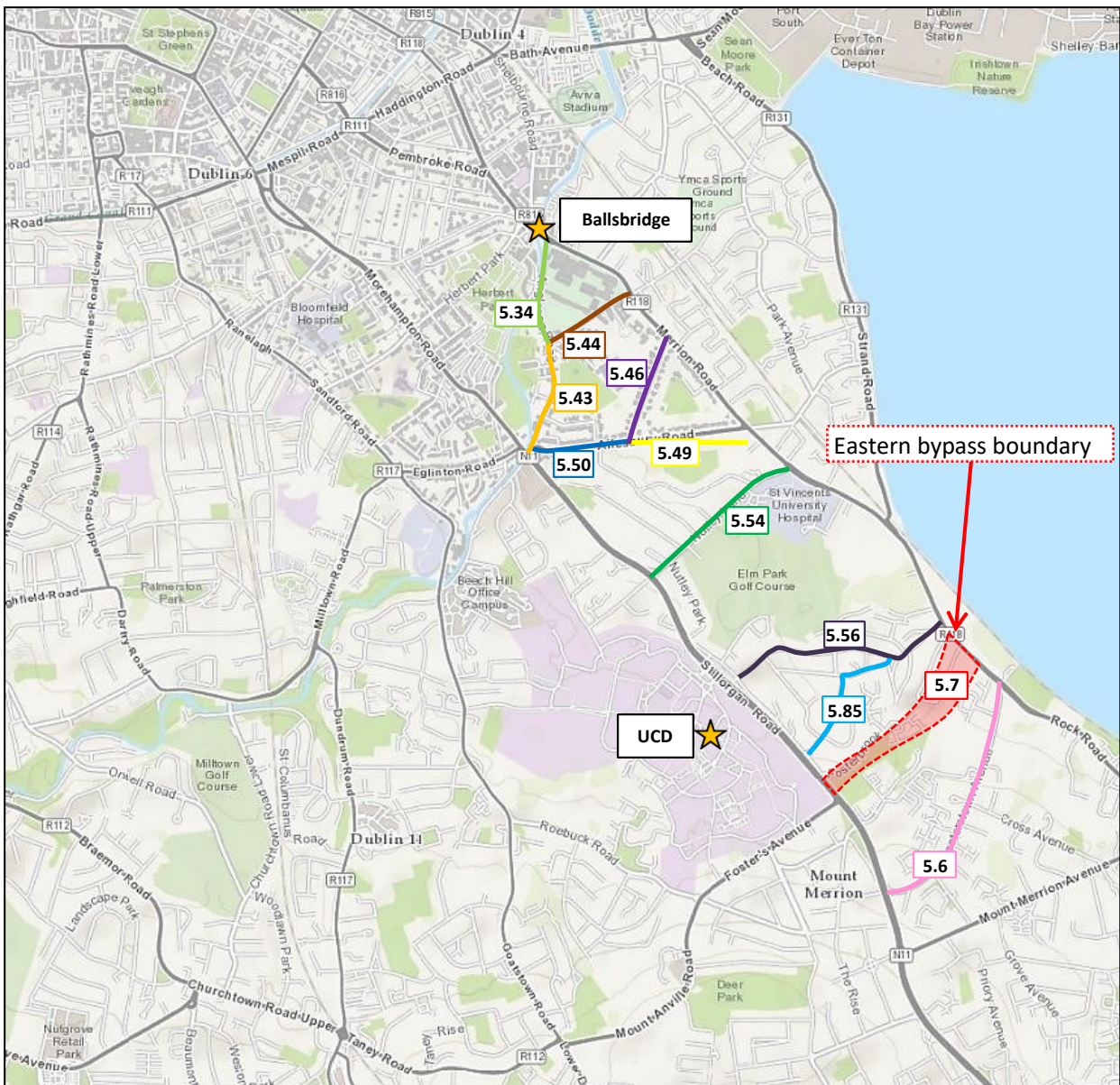


Image 3.4: Spider's Web of Route Options extracted from 'Ballsbridge to UCD Bus Corridor – Route Options Assessment'

The initial 'spider's web' 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. This exercise examined and assessed technically feasible route options, based upon specific objectives. In addition to being assessed on their individual merits, routes were also assessed relative to each other enabling some routes to be ruled out if more suitable alternatives existed.

The Stage 1 assessment considered engineering constraints, high-level environmental constraints and an analysis of population catchments. Numerous links forming part of the 'spider's web' were not brought forward to the Stage 2 assessment due to space constraints, lack of appropriate adjacent linkages to form a coherent end-to-end route, unsuitability of particular routes, in addition to other factors. For example at the junction of Ailesbury Road and Merrion Road, properties on both sides are zoned as Residential Conservation Areas. Provision of bus and cycle facilities would require land take from residential properties on both sides and removal of on-street parking and trees. Due to the land take required from the Residential Conservation Areas and the number of Embassies along this section, this link was considered not viable for the Proposed Scheme.

Arising from consideration of the various permutations possible in respect of the "spider's web", a reduced number of coherent end-to-end options were identified for specific sections for further assessment. In arriving at these

options, those links which failed the initial sifting stage were removed as well as those links that were disconnected and could not clearly form part of the end-to-end options.

The (consolidated) options associated with the Dún Laoghaire to City Centre corridor Sections 1 and 2 are presented in Image 3.5 and Image 3.6 respectively, while the options associated with the Ballsbridge to UCD corridor are presented in Image 3.7.

As noted in the Dún Laoghaire to City Centre Feasibility and Options Report, it was determined that the route being assessed should stop at the southern end of Section 2, as bus services beyond that point would need to diverge within Section 3 to serve two different catchment areas; ultimately achieving two dissimilar purposes. As such Section 3 was not progressed to the Stage 2 assessment.

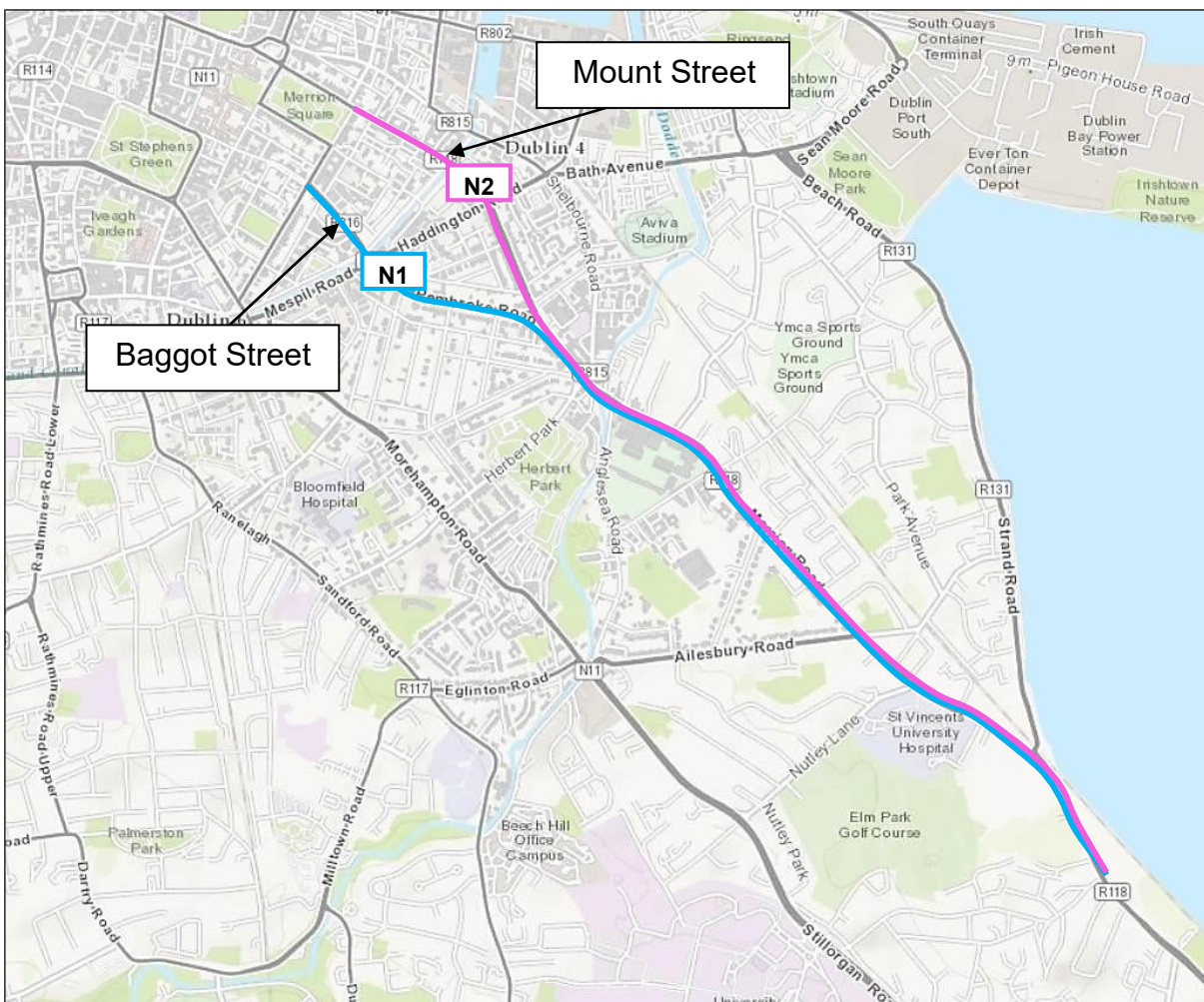


Image 3.5: Route Options from Initial Sift of Section 1 of the Dún Laoghaire to City Centre corridor

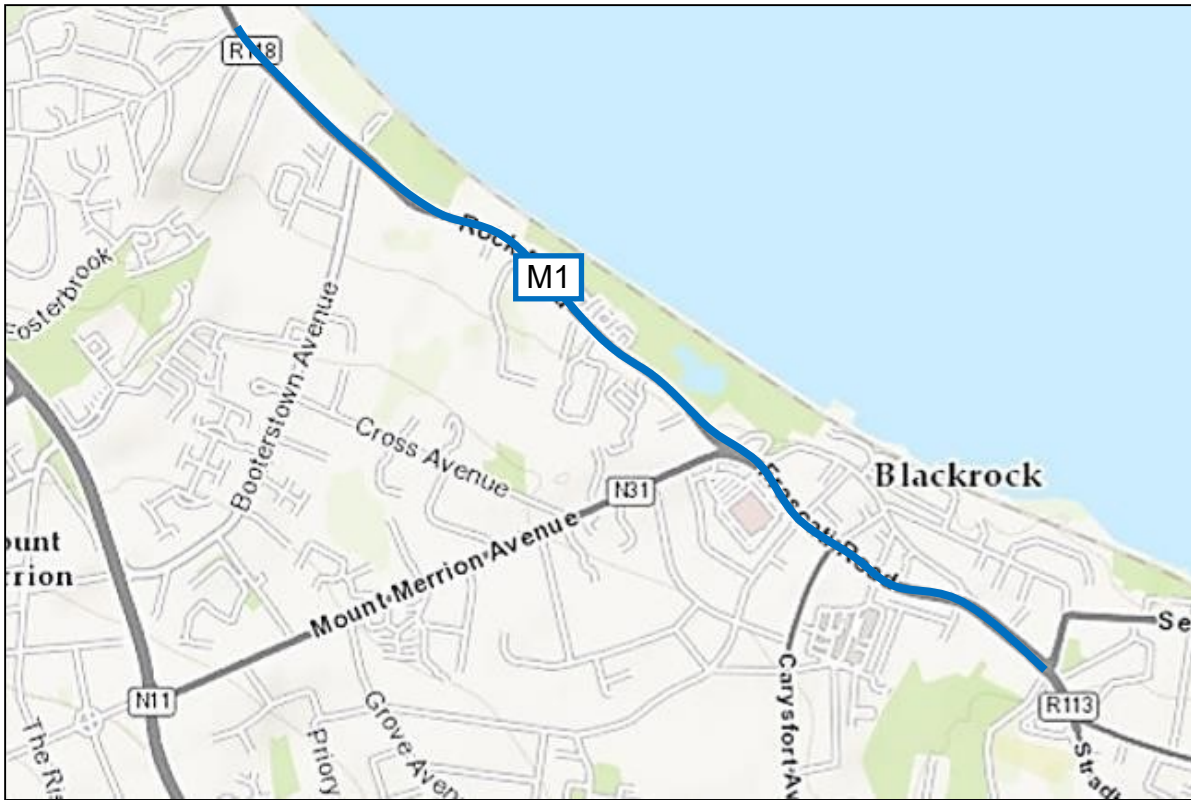


Image 3.6: Route Options from Initial Sift of Section 2 of the Dún Laoghaire to City Centre corridor

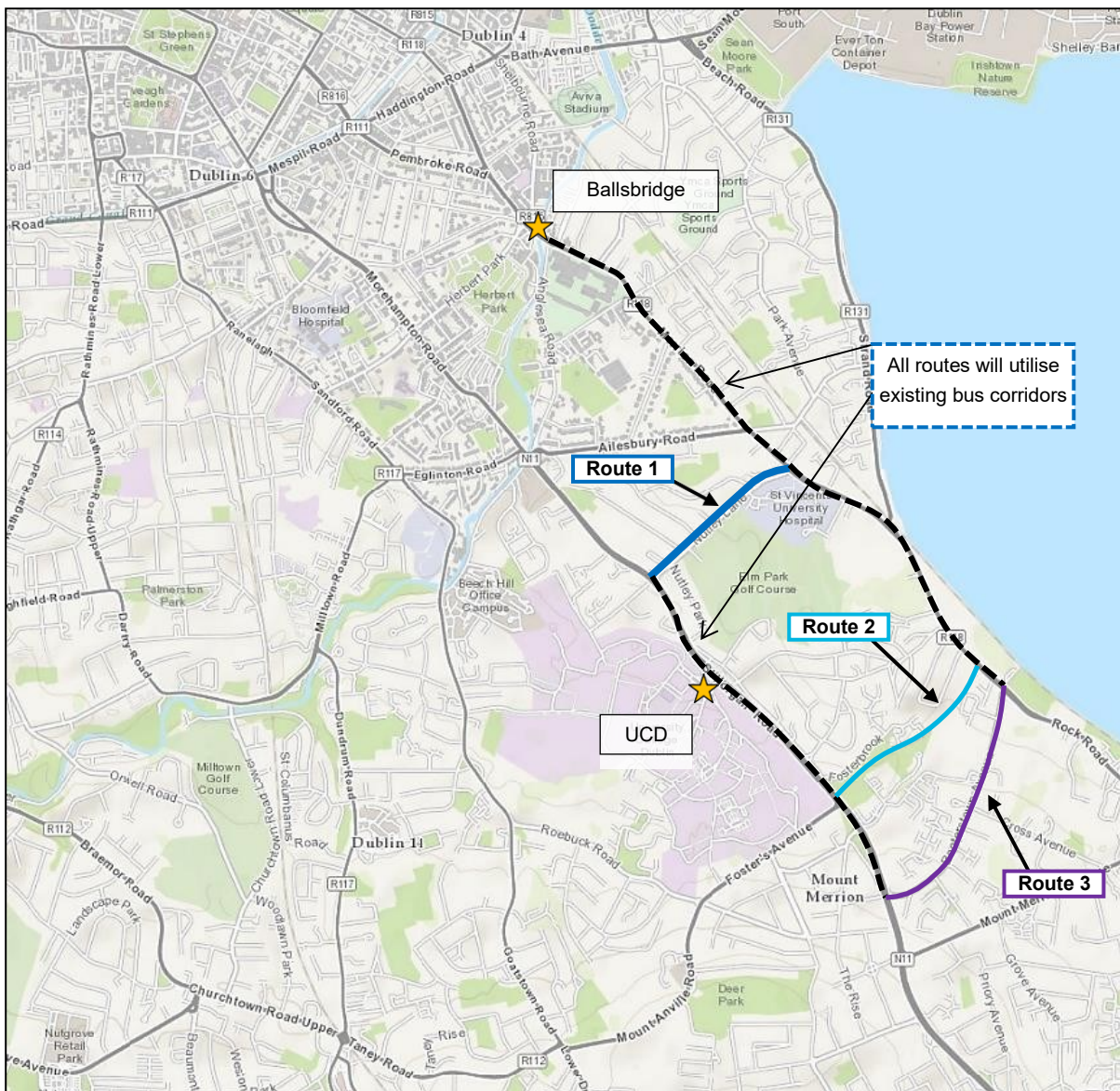


Image 3.7: Route Options from Initial Sift of the Ballsbridge to UCD corridor

3.3.2 Stage 2 – Route Options Assessment

Following completion of Stage 1 initial appraisal, the remaining reasonable alternative options were progressed to Stage 2 of the assessment process. This process involved a more detailed qualitative and quantitative assessment using criteria established to compare the route options.

The indicative scheme for each route option was evaluated using a multi-criteria assessment. 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) which evaluated the route options under the assessment criteria set out below:

1. Economy;
2. Integration;
3. Accessibility & Social Inclusion;
4. Safety; and
5. Environment.

Under each headline criterion, a set of sub-criteria were used to comparatively evaluate the options. For the Environment criterion the following sub-criteria were considered in the assessment to inform the Emerging Preferred Route:

- **Archaeological, Architectural and Cultural Heritage** – there is the potential for impacts on archaeological, architectural and cultural heritage environment when providing CBC infrastructure. The assessment had regard to RMPs, Sites of Archaeological or Cultural Heritage and on buildings listed on the National Inventory of Architectural Heritage along or adjacent to the corridor;
- **Flora and Fauna** - The provision of CBC infrastructure could have negative impacts on flora and fauna, for example, through construction of new infrastructure through green field sites. These impacts were compared for each scheme under this criterion;
- **Soils and Geology** - Construction of infrastructure necessary for the provision of CBC infrastructure has the potential to impact on soils and geology. For example, through land acquisition and ground excavation. These considerations were compared for each scheme under this criterion;
- **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). Any such impacts were considered for each scheme under this criterion;
- **Landscape and Visual** - Provision of CBC infrastructure has the potential to impact on the townscape/streetscape as well as the landscape and visual aspects of the area, for example, by the removal of front gardens or green spaces or the altering of streetscapes, character and features. Different schemes were compared and any negative effects considered under this criterion;
- **Air Quality** - The provision of CBC infrastructure has the potential to impact the air quality along the route. These effects were compared for each scheme option under this criterion in relation to the volumes of traffic and on whether the road is moving closer to a sensitive receptor, for example road widening or new realignment;
- **Noise & Vibration** - Provision of CBC infrastructure (e.g., the construction activities), has the potential to negatively impact on noise and vibration along a scheme. These effects were compared for each scheme option under this criterion. The impact was quantified in relation to the volumes of traffic and on whether the road is moving closer to a sensitive receptor, for example road widening or new realignment; and
- **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.

Route options were compared based on a five-point scale, ranging from having significant advantages to having significant disadvantages over other route options. Route options could also be considered neutral when no apparent advantages or disadvantages are identified across all scheme options.

3.3.2.1 Dún Laoghaire to City Centre Corridor: Route Options Assessment

The Dún Laoghaire to City Centre scheme was divided into three sub-sections for further assessment and refinement (see Image 3.8). As noted the third section, SAS3 was included in the original assessment but subsequently removed from the Proposed Scheme.

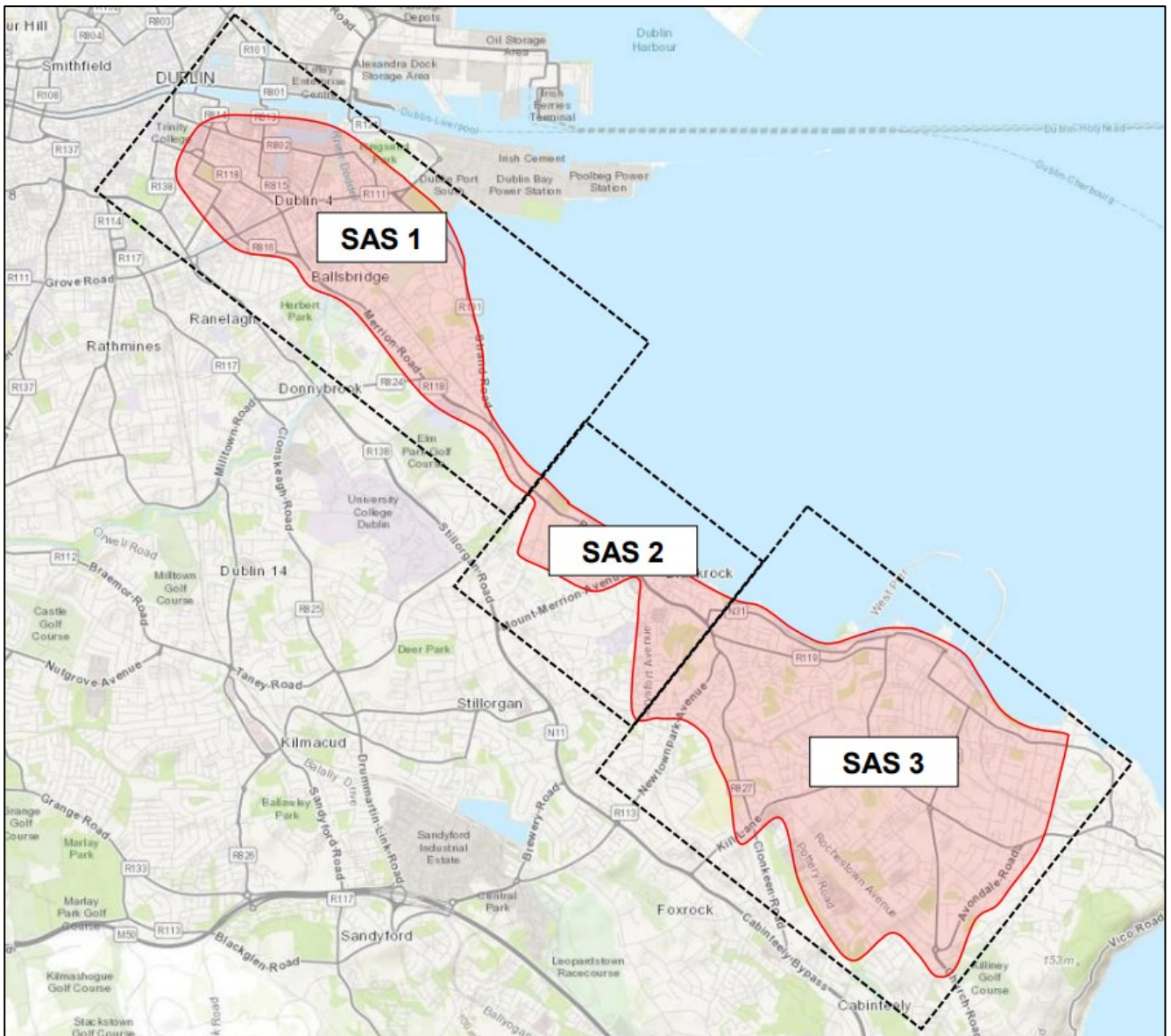


Image 3.8: Stage 2 Route options sub-section division extracted from ‘Dún Laoghaire to City Centre Core Bus Corridor Options Study – Feasibility and Options Assessment’

The area between the R138 Stillorgan Road and Merrion Road was covered in a separate study area in the ‘Ballsbridge to UCD Bus Corridor – Route Options Assessment’ as covered in Image 3.4.

3.3.2.1.1 Sub-Section SAS1: Route Options Assessment

Following the Stage 1 sifting process, two viable route options for sub-section SAS1, were taken forward for assessment and further refinement:

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

These routes are presented in Image 3.9.

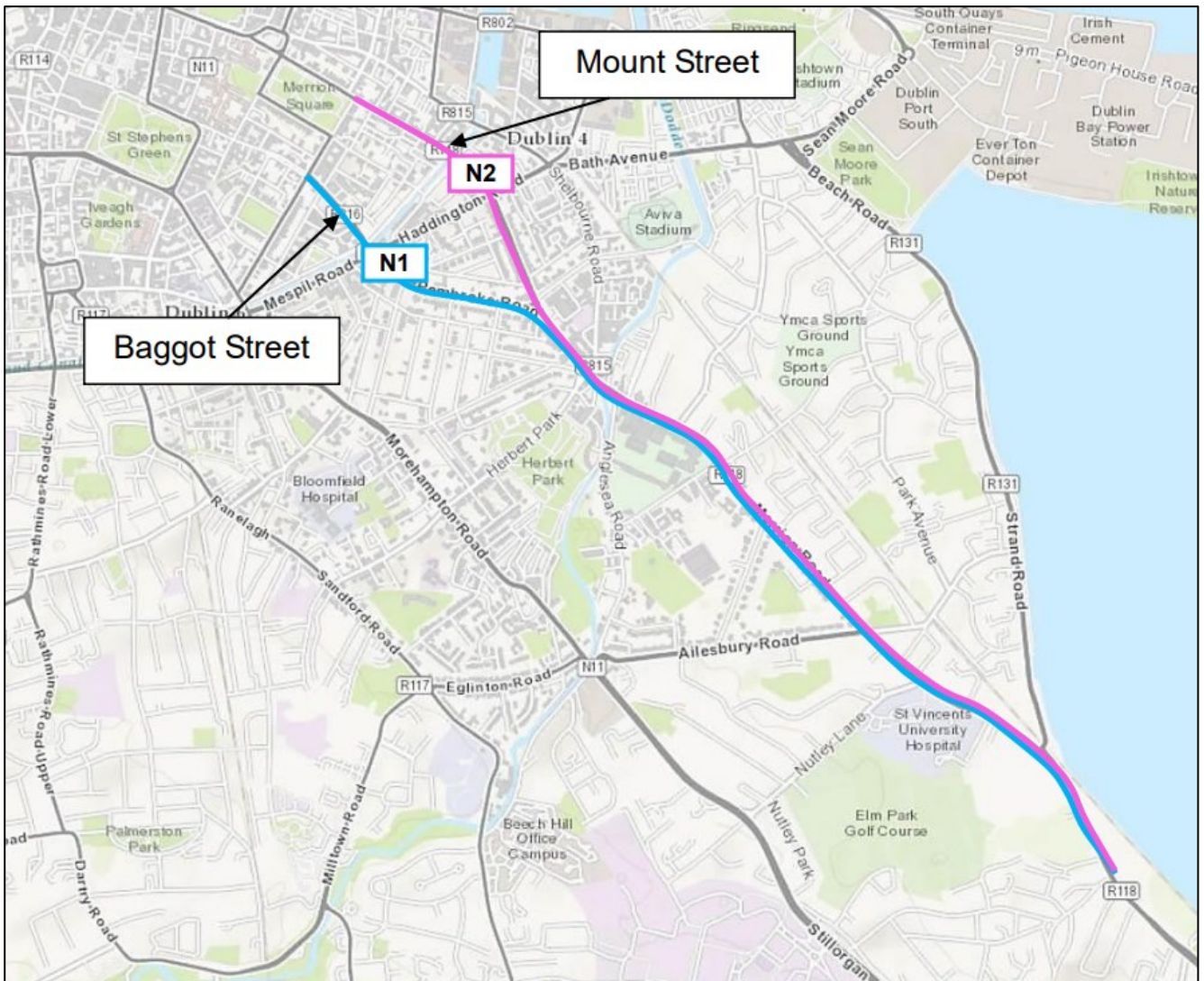


Image 3.9: Sub-section SAS1 Route Options extracted from 'Dún Laoghaire to City Centre Core Bus Corridor Options Study – Feasibility and Options Assessment'

Two scheme options were considered along each route which would provide traffic lanes, bus lanes and cycle tracks in each direction. The primary difference between these scheme options was the treatment at the junctions (Option 2 of each route required buses to share with left-turning traffic at junctions). The assessment sub-criteria which were differentiators between scheme options included Capital Cost, Transport Reliability and Quality, Residential Population and Employment Catchments, Traffic Network Integration and Land Use Character. Route N1 Option 2 was identified as having significant benefits over other options in relation to both Capital Cost and Land Use Character. Following a detailed MCA, route N1 Option 2 was identified as the preferred option for this section and was brought forward into the Emerging Preferred Route.

As mentioned previously each route option was evaluated using a multi-criteria assessment with one of the primary criteria being 'Environment', under which there was a number of sub-criteria which each route option was considered against comparatively.

In terms of potential Archaeological, Cultural Heritage and Architectural Heritage impacts, it was considered that all four route options were considered neutral when compared against one another given the largely equivalent number of recorded monuments and protected structures directly affected or in close proximity.

With regard to Flora and Fauna, it was considered that all four route options were considered neutral when compared against one another given the largely equivalent number of trees likely to be removed in each option.

All four route options were considered neutral when compared against one another under the Soils and Geology sub-criterion, given none presented any appreciable impacts.

All four route options were considered neutral when compared against one another under the Hydrology sub-criterion, given none presented any appreciable impacts.

With regard to Landscape and Visual, it was considered that all four route options were considered neutral when compared against one another given the largely equivalent level of road widening and impact on tree lines in each option.

With regard to Air Quality, it was considered that all four route options were considered neutral when compared against one another given that in each option there is already existing vehicular and bus traffic, and each would have an equivalent level of road widening.

With regard to Noise and Vibration, it was considered that all four route options were considered neutral when compared against one another given that in each option there is already existing vehicular and bus traffic, and each would have an equivalent level of road widening.

When the options were considered under the Land Use Character sub-criteria, Route Options 3 and 4 (via Northumberland Road) were considered to have some disadvantages when compared to Route Options 1 and 2 (via Pembroke Road), with Route Option 2 presenting further advantages over Option 1. In all four options a large number of trees and on-street parking provision was expected to be affected, however to a greater extent on Route Options 3 and 4 on Northumberland Road, with the lowest impact being under Route Option 2. Route Option 2 was therefore considered to have advantages given the lower impact on existing land use character.

Route Option 2 was identified as the preferred option for this section. With regard to the consideration of the Environment criterion, Route Option 2 was considered to have some advantages when compared to the other options due to the reduced impact on Land Use Character. Route Option 2 was therefore brought forward into the Emerging Preferred Route.

3.3.2.1.2 Sub-Section SAS2: Route Options Assessment

Following the 'Stage 1' sift for the SAS 2, the remaining four route sections were combined to form one cohesive route option (M1) as follows:

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

This route is presented in Image 3.10.

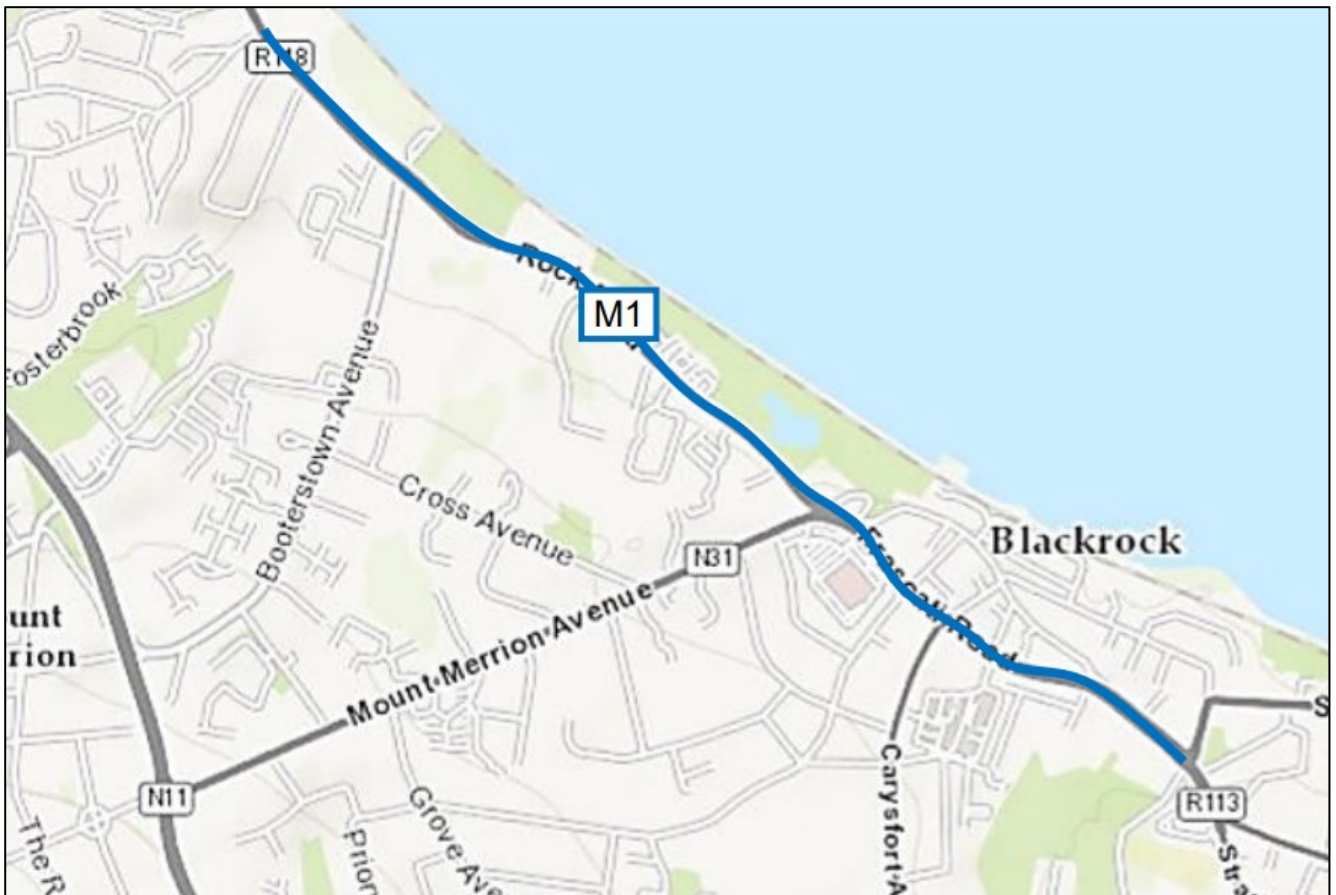


Image 3.10: Sub-section SAS2 Route Option extracted from 'Dún Laoghaire to City Centre Core Bus Corridor Options Study – Feasibility and Options Assessment'

Two scheme options were considered along this route which would provide traffic lanes, bus lanes and cycle tracks in each direction. The primary difference between these scheme options was the treatment at the junctions (Option 2 of each route required buses to share with left-turning traffic at junctions). The assessment sub-criteria which were differentiators between route options were Capital Cost and Land Use Character with Route M1 Option 2 being identified as having benefits over the other option under these two sub-criteria. Following a detailed MCA, Route M1 Option 2 was identified as the preferred option for this section and was brought forward into the Emerging Preferred Route.

As mentioned previously each route option was evaluated using a multi-criteria assessment with one of the primary criteria being 'Environment', under which there was a number of sub-criteria which each route option was considered against comparatively.

All four route options were considered neutral when compared against one another under each of the Environmental sub-criteria, given the equivalent impacts associated with each.

Route Option 2 was identified as the preferred option for this section, based on the Capital Cost sub-criterion, noting that the two options were considered neutral under the Environment criterion. Route Option 2 was therefore brought forward into the Emerging Preferred Route.

3.3.2.2 Ballsbridge to UCD Bus Corridor: Route Options Assessment

Following the Stage 1 sifting process for the Ballsbridge to UCD Bus Corridor, the remaining route sections were combined to form three cohesive route options. These three routes are presented in Image 3.11.



Image 3.11: Ballsbridge to UCD section extracted from ‘Ballsbridge to UCD Bus Corridor – Route Options Assessment’

Within these three routes, a number of potential scheme options were also assessed. These comprised:

- Scheme Option 1A: Provision of a single traffic lane, bus lane and cycle lane in each direction along the entire route;
- Scheme Option 1B: Provision a single traffic lane in each direction and shared outbound bus/cycle lane along the entire route. A shared inbound bus/cycle lane would be provided along Nutley Lane from the Stillorgan Road junction to just beyond the Nutley Avenue junction; beyond which point a separate bus and cycle lane would be provided up to the Merrion Road junction;
- Scheme Option 1C: Provision of a segregated bus and cycle lane in each direction along the entire length of Nutley Lane. This scheme option also proposed a one-way traffic system in the eastbound direction along Nutley Lane between Nutley Avenue and Nutley Road. Existing westbound traffic travelling between Merrion Road and Stillorgan Road via Nutley Lane would be rerouted via Ailesbury Road. Local access to Nutley Lane would be provided for by a loop around Nutley Avenue and Nutley Road, which would involve opening the existing cul-de-sac;
- Scheme Option 2A: Provision of a bus lane and cycle lane in each direction along the majority of the route within the Eastern Bypass and connecting to the existing environment. A footpath would be provided on one side of the route only - adjacent to the inbound cycle lane. The footpath and inbound

cycle lane would start of as a shared pedestrian / cyclist facility for the first 150m from the Rock Road to avoid demolition along this section;

- Scheme Option 2B: Provision of a bus lane, cycle lane and footpath in each direction along the majority of the route within the Eastern Bypass and connecting to the existing environment;
- Scheme Option 3A: The option would replace the existing traffic lanes with bus lanes along the entire route. Booterstown Avenue would be accessible to local traffic only; and
- Scheme Option 3B: The option would maintain a traffic lane in both directions but would also provide an inbound bus lane where it could be achieved without avoid land-take / demolition. No land-take would be required though footpath widths would need to be reduced to 1.8m in sections, as well as a small number of pinch points where the footpath would reduce to 1.5m. All of the on-street formal parking spaces would be removed to facilitate the proposed works.

A multi-criteria assessment of all scheme options was undertaken. The assessment sub-criteria which were differentiators between options included Capital Cost, Transport Reliability and Quality, Land Use Integration, Residential Population & Employment Catchment, Cycle Network Integration, Traffic Network Integration, Key Trip Attractors, Road Safety, Flora & Fauna, Landscape and Visual, Air Quality, Noise and Vibration, and Land Use Character.

In terms of Capital Cost, Route 1 scheme options were identified as having the lowest cost; Route 1 is shorter than Route 3 (i.e. less infrastructural works) and would require less land-take than Route 2. Route 1 scheme options were deemed to offer relatively faster and more reliable bus journey times due to the shorter length of Nutley Lane and the segregation of buses with Scheme Option 1A and 1C, in particular.

Furthermore, Route 1 scheme options scored highest under the Integration sub-criteria as they would better integrate the proposed bus lanes within the existing traffic network while also providing cycle facilities. In particular, Scheme Options 1A and 1C proposed segregated cycle lanes which were seen as safest for cyclists and in line with the GDA Cycle Network Plan, which identifies Nutley Lane as a secondary cycle route.

Route 1 and 3 scheme options were deemed to serve a greater residential and employment catchment than Route 2, with more key trip attractors along their length e.g. St. Vincent's University Hospital and RTÉ Studios along Route 1, and Willow Park and St. Andrew's College along Route 3. There were significantly fewer developments identified within the immediate vicinity of Route 2; as such this route was not seen as accessible to local residential estates/businesses. Hence, Route 1 and Route 3 scheme options score higher under Accessibility.

By removing buses, cyclists and pedestrians from the vicinity of traffic and junctions, Route 2 scheme options were anticipated to be safer for cyclists and pedestrians in particular. Therefore, Scheme Option 2A and 2B scored highest under Road Safety.

As mentioned previously each route option was evaluated using a multi-criteria assessment with one of the primary criteria being 'Environment', under which there was a number of sub-criteria which each route option was considered against comparatively.

In terms of potential Archaeological, Cultural Heritage and Architectural Heritage impacts, it was considered that all seven Scheme Options were considered neutral when compared against one another given that no appreciable impacts were identified in any of the options.

With regard to Flora and Fauna, it was considered that Route Options 1 and 2 scheme options had some disadvantages over Route Option 3 scheme options given the lack of on-street trees which would be affected in Route Options 3 scheme options – as there are no trees within the road boundary along Booterstown Avenue. Route Option 2 scheme options showed particular disadvantages due to the off-road nature of the works including the requirement to a construction a full new roadway through largely greenfield and undeveloped lands, which would have the most significant impact on flora and fauna of all scheme options considered.

All seven route options were considered neutral when compared against one another under the Soils and Geology and Hydrology sub-criteria given that no appreciable impacts were identified.

Route Option 2 scheme options were expected to have the most significant adverse impact on Landscape and Visual compared to Route Option 1 and 3 scheme options as the provision of the necessary new road would require significant land-take and impact much of the current treelines. Route 1 scheme options would require the removal the trees along the length of Nutley Lane which and consequently impact on the landscape and visual.

Route 3 scheme options did not propose additional traffic lanes (existing lanes would be used for buses/traffic) and would not require any land-take.

Scheme Option 1C scored negatively on Air Quality and Noise & Vibration due to the impacts on Nutley Avenue and Nutley Road in terms of number of properties exposed to additional traffic. Route 2 Scheme Options scored negatively on Air Quality and Noise & Vibration due to the impact of bringing traffic through the lands surrounding the proposed route. While Scheme Options 1A, 2A, 3A, and 3B therefore scored positively in comparison.

When the options were considered under the Land Use Character sub-criterion, Route Options 1 and 3 scheme options were considered to have some disadvantages when compared to Route Options 2 scheme options. Route Option 1 would require considerable change to land use including road widening, removal of parking and trees, while Route Option 3 would also require the removal of parking on Booterstown Avenue. Route Option 2 would result in less impact in terms of land use compared to the other two route options.

Scheme Option 1A overall scored better than the other scheme options when considering all sub-criteria – particularly the positives under Land Use Integration, Cycle Network Integration, and Traffic Network Integration (which Route 3 scheme options did not offer) and also in scoring higher than Route 2 scheme options under Air Quality and Noise & Vibration. While Route 3 scheme options did perform well under many sub-criteria including those under Environment, the impacts in relation to Transport Reliability and Quality, Cycle Network Integration, and Road Safety were considered to be so severe, that this option was not selected. Scheme Option 1A was therefore identified as the preferred option for this section and was brought forward into the Emerging Preferred Route.

3.3.3 Cycling Options

Consideration of alternative cycling route options was fundamental in the process of defining the Emerging Preferred Route. In general, the Emerging Preferred Route aligns with primary Cycle Route 13 and Cycle Route 13A on the Greater Dublin Area Cycle Network Plan. In addition, the Proposed Scheme intersects with two other primary cycle routes, namely SO1 and SO3 (the Grand Canal Greenway and the Dodder Greenway respectively).

During the Emerging Preferred Route stage, identification of alternative cycle routes separate to the core bus corridor emerging preferred route were not considered appropriate for this scheme as they were proposed as part of each of the route options identified. However, further cycle options were considered during the development of the Preferred Route Option as outlined later in this Chapter.

Where cycle facility options have been comparatively assessed in order to determine the preferred option for a cycle route, the assessment was based on a methodology that assesses options using the ‘Five Needs of a Cyclist’ outlined in the National Cycle Manual Guidelines together with Capital Cost and Environmental Impacts. The cycle route options were assessed using the criteria and rationale presented in Table 3.1.

Table 3.1: Alternative Cycle Route Assessment Criteria

| Appraisal Criteria | Rationale |
|--------------------|---|
| 1. Capital Cost | <ul style="list-style-type: none"> ▪ Capital cost estimates consist of both the indicative infrastructure cost estimate and land acquisition costs. ▪ The cycle route infrastructure cost examines the practicality and extent of works required to accommodate cycle route infrastructure along route options. ▪ This criterion evaluates the likely costs associated with land acquisition and associated boundary/accommodation works for each route option. The assessment takes consideration of: <ul style="list-style-type: none"> • The number of adjacent public/commercial/ residential/industrial properties, from which land acquisition would be required as well as the extent (area) of land acquisition likely to be necessary; and • The costs associated with boundary/accommodation works. |
| 2. Road Safety | <ul style="list-style-type: none"> ▪ For the purposes of comparing route options, the extent of segregation and the number of junctions along the route has been used as a proxy for road safety. The number of junctions is effectively a |

| Appraisal Criteria | Rationale |
|--------------------|---|
| | <p>measure of the number of potential conflicts on the route and therefore a measure of the potential for a collision.</p> <ul style="list-style-type: none"> ▪ The type of movement required by the cyclist at junctions on the route is also considered with routes where turning movements (either left or right) are required being assigned a lower ranking in terms of safety. ▪ The quality of cycle provision practically achievable on route options has been assessed. For comparison purposes, the highest level of practical cycle provision achievable on each route has been determined and compared between route options. |
| 3. Coherence | <ul style="list-style-type: none"> ▪ This criterion considers whether a route option forms part of the GDA Cycle Network Plan, with routes where CBC and designated Cycle Routes overlap given a higher designation in terms of benefits arising where cycle infrastructure can be provided as part of a proposed CBC scheme. In some instances, however it may be more appropriate to provide a parallel cycle track off the CBC route. Consideration is also given to cycle routes intersecting with the CBC route. The cycle route should also link the main origin and destination zones along the CBC route. |
| 4. Directness | <ul style="list-style-type: none"> ▪ For the purposes of comparing route options, the number of junctions, length of the route and the number of detours and gaps from the CBC has been used as a proxy for directness. |
| 5. Attractiveness | <ul style="list-style-type: none"> ▪ The cycling environment along the route should be pleasant and interesting. Monotony and lack of points of interest along the cycle route are unattractive to cyclists. Cycle routes should also be adequately lit so as not to deter evening and night-time use. |
| 6. Comfort | <ul style="list-style-type: none"> ▪ The quality of cycle provision practically achievable on route options has been assessed. For comparison purposes, the highest level of practical cycle provision achievable on each route has been determined and compared between route options. |
| 7. Environmental | <ul style="list-style-type: none"> ▪ The provision of segregated cycle tracks 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. The provision of segregated cycle tracks has the potential to impact on flora and fauna, the townscape/streetscape along the route and on the land use character through land-take, severance or reduction of viability which prevents or reduces it from being used for its intended use. |

3.3.4 Emerging Preferred Route

Informed by the appraisal of options as set out earlier, the Emerging Preferred Routes were identified. As previously mentioned, the Proposed Scheme previously comprised of two Core Bus Corridors, the UCD Ballsbridge to City Centre Core Bus Corridor and the Blackrock to Merrion Core Bus Corridor and were summarised as follows:

‘The UCD to City Centre Core Bus Corridor commences at the junction of Fitzwilliam Street Lower and Baggot Street Lower in the city centre. The corridor continues through Baggot Street Upper, Pembroke Road and Merrion Road. At St. Vincent’s Hospital, the corridor runs along Nutley Lane onto the R138 Stillorgan Road where it joins the Bray to City Centre City Core Bus Corridor that runs by, and connects to, the UCD Campus.’ and

‘The Blackrock to Merrion Core Bus Corridor commences on the R118 Merrion Road at its junction with Nutley Lane. Buses are proposed to be routed along Rock Road joining the N31 at the Mount Merrion Avenue junction. The proposed scheme terminates at the junction of Temple Hill/ Monkstown Road and Stradbroke Road. Priority for buses and cyclists is provided along the entire route, consisting primarily of dedicated bus lanes in each direction, and continuous segregated cycle tracks. The Blackrock to Merrion Core Bus Corridor connects to the route of the UCD to City Centre Core Bus Corridor at the junction of Merrion Road and Nutley Lane, providing a continuous route from Blackrock to the City Centre.’

A public consultation on this Emerging Preferred Route was undertaken from 14 November 2018 to 29 March 2019, providing feedback which was then meaningfully considered in the further development of the scheme proposal.

3.4 Design Alternatives

3.4.1 Development of the Draft Preferred Route Option

Following the completion of the public consultation process in relation to the Emerging Preferred Route, various amendments were made to the scheme proposals to address a number of the issues raised in submissions, including incorporating suggestions and recommendations from local residents, community groups and stakeholders, and/or arising from the availability of additional information. These amendments were incorporated into the designs and informed a draft Preferred Route Option.

This additional design development took account of:

- New and updated topographical survey information;
- Output from engagement and consultation activities on the Emerging Preferred Route and draft Preferred Route Option proposals;
- Further design development and options assessment; and
- Changes in the extent of the scheme.

An instance of design development related to the proposed road alignment on Nutley Lane. From a review of submissions received as part of the first round of non-statutory public consultation for this route, as well as a review of the topographical survey carried out subsequent to the route's publication, a number of issues were identified. The proposed removal of on-street trees and those in front gardens was a significant cause for concern amongst residents. These issues primarily relate to the section of Nutley Lane between the St. Vincent's University Hospital entrance / Nutley Avenue and the Elm Park Golf & Sports Club entrance due to the number of residential properties fronting onto the north-western side of the road, including a number which were proposed to be subject to land acquisition, and the number of on-street trees.

The Emerging Preferred Route (EPR) Option on Nutley Lane consisted of the two general traffic lanes, two bus lanes, two cycle tracks and two footpaths, from the R138 Stillorgan Road junction to the R118 Merrion Road junction. In order to achieve this, the EPR Option design indicated a loss of existing trees and parking along the length of Nutley Lane, as well as potential land take on both sides of the road (including a number of front gardens on the north-west side immediately adjacent to Nutley Avenue).

The proposed road alignment was revised to retain the existing kerb line on the residential side, and as such retaining the existing on-street trees along this footpath, and remove the requirement for land acquisition and tree removal in private residential properties. In order to minimise the incursion into the properties on the opposite side of the road as a result, additional design development was carried out. This included delaying the on-set of the proposed southbound bus lane to the south of the St. Vincent's University Hospital entrance. In addition, it was determined that no footpath is to be proposed on the south-eastern (Elm Park Golf & Sports Club) side of Nutley Lane over this section from just south of the St. Vincent's University Hospital entrance junction to just north of the Elm Park Golf & Sports Club entrance junction, with a dedicated pedestrian crossing provided at both ends. This is due primarily to the proposed removal of parking and presence of no private entrances along this section which would require footpath access.

The overall result of this design development being the subsequent reduction in potential land take, and the retention of the existing footpath and on-street trees on the residential side. It is considered therefore that this design development has benefits in terms of environmental considerations such as Flora & Fauna, Landscape & Visual, and Land Use Character.

Where substantial revisions had been made to the design since the publication of the Emerging Preferred Route, options were assessed using MCA to determine the Preferred Route Option. The MCA assessed any newly developed options against the previously identified Emerging Preferred Route. The methodology and MCA used were consistent with that carried out during the initial route optioneering work (including consideration of the relevant environmental aspects), which informed the identification of the Emerging Preferred Route.

3.4.1.1 Alternatives Considered at Draft Preferred Route Option Stage

For the portion of the Proposed Scheme which relates to UCD Ballsbridge to City Centre Core Bus Corridor, the main alternatives considered during the development of the draft Preferred Route Option consisted of the following:

3.4.1.1.1 Fitzwilliam Street Lower

Fitzwilliam Street was not previously assessed as part of the Emerging Preferred Route as the Proposed Scheme extents were extended at a later stage.

The Proposed Scheme was extended onto Fitzwilliam Street Lower for reasons including the following:

- To improve the integration with new and existing sustainable transport facilities on the street itself and on Merrion Square;
- To provide cycle facilities on the Secondary Route of the GDA Cycle Network Plan; and
- To increase the catchment of the Proposed Scheme in terms of Combined Activity Density - refer to Image 3.12. In particular, this relates to the significant new and existing commercial properties in this area.

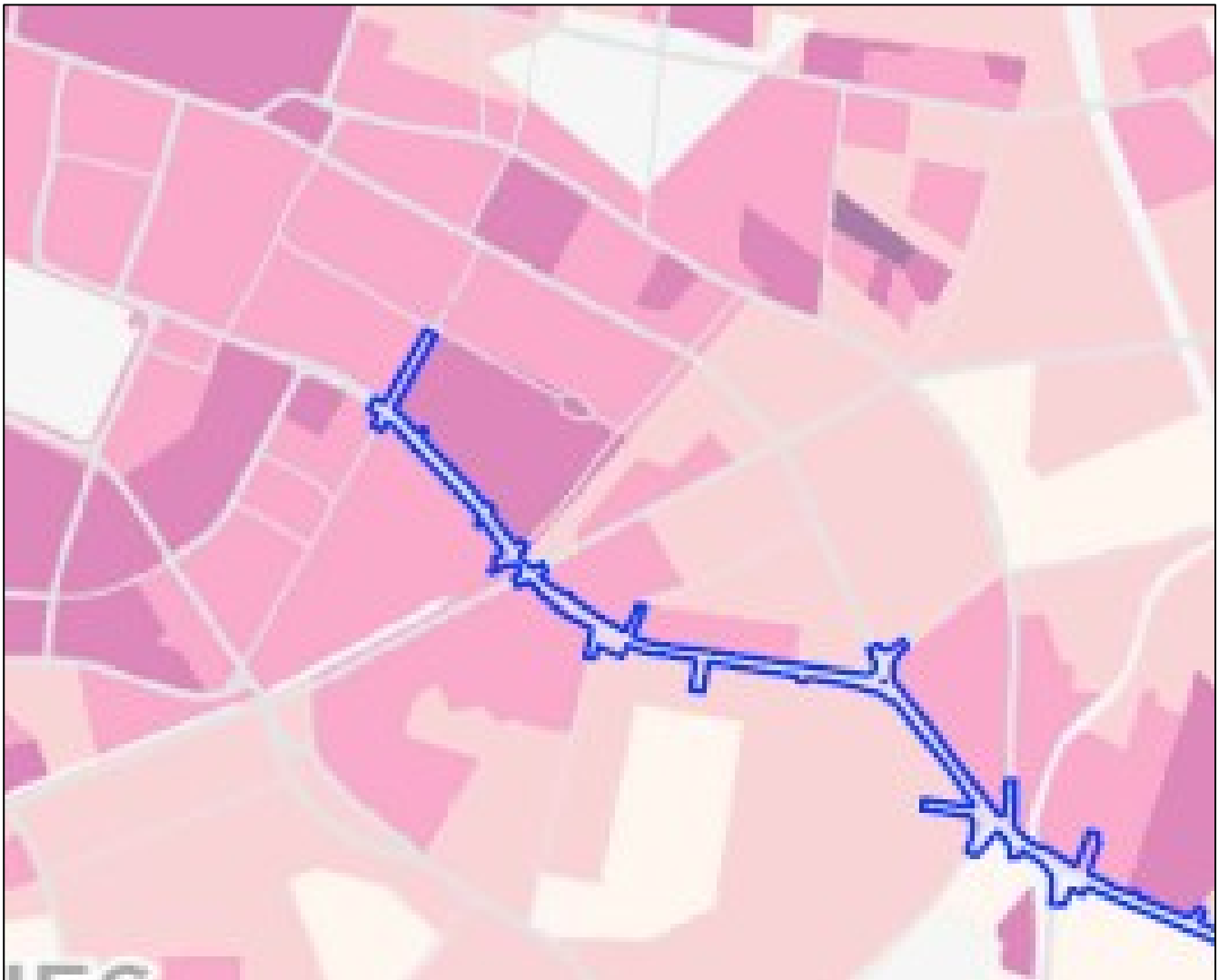


Image 3.12: Combined Activity Density Map (Dublin Area Bus Network Redesign Revised Proposal (NTA 2019). Proposed Scheme Highlighted in Blue for Information.

At the draft Preferred Route Option stage, four options were assessed, as follows:

- Option FS1: Full BusConnects Cross-Section with removal of existing on-street parking, as an extension of the EPR Option (4 lane cross-section + cycle tracks);
- Option FS2: Two-lane cross-section with a Bus Gate provided at the Mount Street Upper end with retention of parking on the northern side of the road (2-lane cross-section + cycle tracks + parking on one side);
- Option FS3: Four-lane cross-section with retention of parking on the northern side of the road and cyclists cycling in the bus lanes (4 lane cross-section + parking on one side); and
- Option FS4: Back-to-Back Bus Lanes along with signal-controlled bus priority to enable a three-lane cross-section of two general traffic lanes and single bus lane with retention of some parking on both sides of the street (3-lane cross-section + cycle tracks + parking).

Option FS1 – the provision of two bus lanes, traffic lanes, cycle lanes and footways, requiring the removal of parking and loading along Fitzwilliam Street Lower – was identified as the preferred option as it best aligned with the objectives for the Proposed Scheme and provided fully segregated bus and cycle facilities in both directions while maintaining access for general traffic. This option will provide segregated bus priority, provide connectivity with the GDA Cycle Network Plan and meets the desirable Proposed Scheme cross-section.

In terms of the sub-criteria under the Environment criterion, the preferred option performed marginally worse than one other option (Option FS2 - which removed general traffic from the street) in terms of Air Quality and Noise & Vibration due to the retention of through traffic along Fitzwilliam Street Lower. With respect to Land Use Character, other options performed marginally better than the preferred option as they retained some level of on-street parking.

The preferred option performed equally to all other options in the remaining sub-criteria under Environment.

Notwithstanding that the preferred option scored marginally lower under the environmental criteria compared to Option FS2 (and equal to the other options) it was taken forward as it best met the Proposed Scheme objectives when compared to the other options.

3.4.1.1.2 Pembroke Road

The EPR Option along Pembroke Road (between Baggot Street Upper to Northumberland Road) would impact on mature trees and antique railings. Consultation also identified safety concerns around narrowed footpaths as well as the importance of the local on-street parking for residents. Four options were assessed, as follows:

- Option PR1: EPR Option with the road realigned to remove impact on existing access steps to properties on the northern side and reappportion all land acquisition to the southern side of the road (4 lane cross-section + cycle tracks + parking);
- Option PR2: Removal of land acquisition on the northern side as per PR1, however, with removal of all parking along the section, including removal of space between parking bays for tree planting (4 lane cross-section + cycle tracks);
- Option PR3: Removal of land acquisition on the northern side as per PR1, however, with only a one-way outbound traffic lane and with Bus Lanes and cycle tracks in each direction (3-lane cross-section + cycle tracks + parking); and
- Option PR4: Introduction of a single Bus Gate between Waterloo Road and Eastmoreland Place with two general traffic lanes from there to the Northumberland Road junction, with retention of all trees and no impact to property boundaries (2-lane cross-section + cycle tracks + parking).

The preferred option was identified as Option PR4 – comprising the provision of two traffic lanes and a Bus Gate at the western end of Pembroke Road. Compared to the alternative options, this will not require permanent land take through road widening nor on-street tree removal and will retain and, in some areas, widen footpaths.

In terms of the sub-criteria under the Environment criterion, the preferred option performed significantly better than the other options in relation to Flora & Fauna as it does not require the removal of any trees, whereas the others required the removal of a significant number of trees. In terms of Air Quality and Noise & Vibration, the preferred option again performed the best as it removes significant volumes of traffic from the road and reduces the carriageway width.

In terms of Architectural Heritage, Landscape & Visual and Land Use Character, the preferred option does not require tree removal nor permanent land acquisition and was ranked the highest under these categories. This option also retains the highest amount of parking. Each of the other options require land acquisition from properties that are on the record of protected structures and tree removal along the street. In these options existing parking volumes are also significantly reduced.

The preferred option performed equally to all other options in the remaining sub-criteria under Environment.

As such it is noted that the preferred option scored significantly higher under the environmental criteria compared to the other options, and overall it best met the Proposed Scheme objectives when compared to the other options.

It is noted that other options were also considered in the area but were not carried forward to the MCA for the reasons briefly outlined below:

- Option of reversing the direction of the proposed one-way general traffic in Route Option PR3. This option was examined and sifted out as the outbound direction was considered to be the better option for a one-way road. This is primarily due to Pembroke Road's proximity to the city centre, which would have a higher probability of becoming congested more often if there are a higher quantity of inbound general traffic streets in comparison to outbound general traffic streets. This could, in turn, impact on bus operations within the city centre core;
- Option of removing cycle tracks on Pembroke Road and providing an off-line cycle route. This option was examined but not considered a viable solution due to a number of factors. Firstly, Pembroke Road is defined as a primary cycle corridor in the GDA Cycle Network Plan. In addition, alternative routes were examined in order to determine if suitable cycle routes could be facilitated on a number of adjacent streets and lanes, but each of these routes were found to not meet the criteria of a primary cycle track under criteria including directness, safety and attractiveness and comfort; and
- Option of providing one-way general traffic outbound (as in Route Option PR3) yet with the removal of all on-street parking (as in Route Option PR2). This option was examined and sifted out, as such an option was not expected to offer the same benefits arising from a Bus Gate arrangement, in terms of Environmental criteria (with the Bus Gate option PR4 scoring higher in all Environmental sub-criteria with the exception of Soils, Geology & Hydrogeology under which it was neutral), while sharing negatives arising from both the one-way arrangement being assessed (regarding Traffic Integration) and the removal of parking being assessed (regarding loss of parking under Land Use Character).

3.4.1.1.3 Merrion Road

The EPR Option along Merrion Road (between Sandymount Avenue and Nutley Lane) would require land take, tree removal and the narrowing of footpaths. It was also determined, following the review of the topographical survey information, that land take would likely be required from a significant number of properties which were not previously identified in the EPR Option (with the information available at the time of production) to progress the EPR Option as published. It was also determined, unlike other areas along Merrion Road, that the issues identified could not be fully addressed through minor design refinements without amendments to the proposed cross-section. Therefore, four options were assessed, as follows:

- Option MR1: EPR Option with road alignment adjustments to retain a number of trees and reduce land take where practicable (4 lane cross-section + cycle tracks);
- Option MR2: As per MR1 from Nutley Lane to Ailesbury Road and Shrewsbury Road to Sandymount Avenue, with the introduction of Back-to-Back Bus Lanes together with signal-controlled bus priority between Ailesbury Road and Shrewsbury Road to enable a three-lane cross-section consisting of two general traffic lanes and a single bus lane (3-lane cross-section + cycle tracks);
- Option MR3: Introduction of a Bus Gate at each end of the route option section with two general traffic lanes between them, with retention of all trees and no impact to property boundaries (2-lane cross-section + cycle tracks); and
- Option MR4: A three-lane cross-section of two bus lane and one-way outbound general traffic only (3-lane cross-section + cycle tracks).

The draft Preferred Route Option was identified as Option MR2 – comprising two bus lanes and two traffic lanes along the majority of this section. A single bus lane will be provided along a short section between Ailesbury Road and Wanderers Rugby Club inbound and between Shrewsbury Road and Wanderers Rugby Club outbound. This was considered the preferred option as it will provide physical bus priority for the majority of the route, provides continuous cycle facilities, maintains local access, and significantly reduces the amount of land take required compared to the EPR Option.

In terms of the sub-criteria under the Environmental criterion, the preferred option performed less well than Option MR3 (which involved a two-lane cross section throughout) in relation to Flora and Fauna as no trees would be lost in that option. The preferred option results in a lesser impact than Option MR1 (which involved a four-lane cross section throughout) due to the extent of trees to be removed in that option. Similarly, the preferred option ranked lower than Option MR3 regarding Landscape and Visual and Land Use Character due to the removal of all trees along this section, yet ranked higher than Option MR1 due to the removal of additional trees, including a number within private property, and the removal of existing boundaries in that option.

Under the Air Quality and Noise & Vibration sub-criteria, the preferred option retains the existing traffic volumes in this section, and therefore performed worse than Option MR2 and Option MR4 which reduced the expected traffic volumes.

The preferred option performed equally to all other options in the remaining sub-criteria under Environment.

While Option MR3 did perform well under many sub-criteria including those under Environment, the impacts in relation to traffic network integration were considered to be so severe, and in particular the likely associated impacts on adjacent residential streets due to rat-running (e.g. Nutley Road and Ailesbury Drive), that this option was not selected. As such the preferred option was taken forward as it best met the Proposed Scheme objectives when compared to the other options.

3.4.1.1.4 Nutley Lane – Cycle Facility Options

Consultation on the EPR Option for Nutley Lane highlighted concerns regarding the proposed impact to residential gardens, removal of on-street trees, and a number of safety concerns relating to conflict between vehicles accessing driveways and the users of the footpath, cycle track and bus lane. An initial options appraisal of just the cycle facilities was undertaken. Three options were assessed, as follows:

- Option CF1 (EPR Option) – Two single cycle tracks along the length of Nutley Lane;
- Option CF2 – Providing a two-way cycle facility connecting from the R138 on the eastern side of Nutley Lane as far as the St. Vincent's University Hospital entrance, then reverting to the EPR Option of two single cycle tracks on both sides to Merrion Road; and
- Option CF3 - Parallel cycle route via Woodbine Road and Trimleston Avenue to connect UCD to Merrion Road.

The preferred option for the Draft Preferred Route Option was Option CF2 – the provision of a two-way cycle facility from the junction with the R138 Stillorgan Road on the Elm Park Golf & Sports Club side, continuing as far as the St. Vincent's University Hospital entrance, then reverting to two single cycle tracks to Merrion Road. Compared to the other two options, this was considered to be the preferred option for cyclists, as it offered improved safety, comfort, and directness, and it reduced the potential impacts on properties and trees and was also the most cost-effective.

In terms of the sub-criteria under the Environment criterion, the preferred option performed the best under this criterion as it had the lowest impact on trees, properties, boundaries, and parking.

3.4.1.1.5 Nutley Lane – Principal Route Options

Following the cycle route appraisal, the Nutley Lane principal route options were assessed. Seven options were considered.

- Option NL1: EPR Option of a single traffic lane, bus lane and cycle lane in each direction along the entire section, and some general design refinements identified upon review of the topographical survey;

- Option NL2: This route option reflects the EPR Option in terms of traffic and bus lane arrangements, however, includes the two-way cycle track as identified during the initial assessment of alternative cycle route options for the route selection process. This option also removes the footpath between Elm Park Golf & Sports Club and St. Vincent's University Hospital entrances on the south-east side of the road as described in Section 3.4.1;
- Option NL3: As per NL2 from the R138 Stillorgan Road to Nutley Road and from St. Vincent's University Hospital entrance to the R118 Merrion Road, however, reduced to only two general traffic lanes between Nutley Road and St. Vincent's University Hospital entrance;
- This arrangement would be facilitated through the introduction of a Bus Gate on the northern side the Nutley Road junction;
- Option NL4: As per NL2 from the R138 Stillorgan Road to Elm Park Golf & Sports Club entrance and from St. Vincent's University Hospital entrance to the R118 Merrion Road, however, reduced to a single one-way northbound general traffic lane between Nutley Road and St. Vincent's University Hospital entrance – with potential for offline traffic management measures. A continuous bus lane is proposed in either direction;
- Option NL5: As per NL2 from the R138 Stillorgan Road to Nutley Road and from St. Vincent's University Hospital entrance to the R118 Merrion Road, however, reduced to a three-lane cross-section of two general traffic lanes and back-to-back bus lanes in between with the introduction of signal-controlled bus priority at the junctions of Nutley Road and St. Vincent's University Hospital;
- Option NL6: As per NL2 from the R138 Stillorgan Road to Nutley Road and from St. Vincent's University Hospital entrance to the R118 Merrion Road, however, reduced to only two general traffic lanes (to be shared with buses) between Nutley Road and St. Vincent's University Hospital entrance;
- This arrangement would be facilitated through the introduction of a bus priority signal at both the Nutley Road junction and the St. Vincent's University Hospital entrance. Queue relocation would be utilised to provide virtual bus priority through the two-lane shared section;
- Option NL7: As per NL2 from the R138 Stillorgan Road to Nutley Road and from St. Vincent's University Hospital entrance to the R118 Merrion Road, however, reduced to only a northbound bus lane along with two general traffic lanes (southbound to be shared with buses) between St. Vincent's University Hospital entrance and Nutley Road; and
- This arrangement would be facilitated through the introduction of a bus priority signal at the St. Vincent's University Hospital entrance. Queue relocation would be utilised to provide virtual bus priority through the southbound shared section.

The draft Preferred Route Option was identified as Option NL2, comprising two bus lanes and two traffic lanes along the majority of this section, along with the realignment of the roadway and footpath provision outlined in Section 3.4.1, and the two-way cycle track described above. While other options did perform well under many criteria, the expected impacts in relation to Transport Quality & Reliability and Traffic Network Integration were considerably more than in the preferred option. In particular is the likely associated reduction of bus journey time reliability and potential impacts on surrounding residential streets due to local and through traffic detouring onto other streets such as Ailesbury Road and Nutley Road, and beyond, in the options assessed which did not provide full physical bus priority. This option was considered the preferred option as it will provide continuous bus priority and cycle facilities, while also reducing the required tree removal when compared to the EPR Option, and significantly reducing the land acquisition when compared to the EPR Option, and maintain local access.

In terms of the sub-criteria under the Environmental criterion, due to the four-lane cross section within the preferred option it ranked less well than those options proposing three-lane and two-lane cross sections under Flora & Fauna, Landscape & Visual, and Land Use Character due to the required removal of the hedgerow on the eastern boundary. The preferred option did perform better than Option NL1 under these sub-criteria due to the retention of the existing on street trees along the residential side.

Due to the retention of two-way general traffic within the preferred option it ranked worse than those options proposing a reduction in general traffic under Air Quality and Noise & Vibration. The preferred option did perform better than Option NL1 under Noise & Vibration due to the proximity of road edge to residential properties in that option.

The preferred option performed equally to all other options in the remaining sub-criteria under Environment.

Notwithstanding that the preferred option scored lower under the environmental criteria compared to all other options with the exception of Option NL1, which it scored better than, it was taken forward as it best met the Proposed Scheme objectives when compared to the other options. While other options did perform well under many criteria, the expected impacts in relation to Transport Quality & Reliability and Traffic Network Integration are considerably more than Option NL2. In particular is the likely associated reduction of bus journey time reliability and potential impacts on surrounding residential streets due to local and through traffic detouring onto other streets such as Ailesbury Road and Nutley Road, and beyond.

It is noted that two other options were also considered in the area but were not carried forward in the MCA for the reasons outlined below:

- Option of reversing the direction of the proposed one-way general traffic in Route Option NL4. This option was examined and sifted out due to the presence of St. Vincent's University Hospital at the northern end of Nutley Lane. As a destination for a potentially large catchment, it was considered that a direct route to the hospital was more important than a direct route away from the hospital; and
- Option of a one-way route along the entire length of Nutley Lane. This option was not considered feasible due to the presence of St. Vincent's University Hospital at the northern end of Nutley Lane which would therefore not have two-way access to the entrance on Nutley Lane. As well as this, there is a large number of residents along Nutley Lane and in the vicinity of Nutley Lane that may be significantly negatively impacted by this proposal through limited local access, potential for rat-running on the residential streets, and need for additional traffic management interventions.

3.4.1.1.6 Blackrock to Merrion

For the portion of the Proposed Scheme relating to the Blackrock to Merrion Core Bus Corridor, no further alternatives were considered at the draft Preferred Route Option stage. The route proposed at the Emerging Preferred Route stage was considered to offer the most benefits and therefore the EPR Option was progressed as the Draft Preferred Route Option.

3.4.2 Consideration following Draft Preferred Route Option Consultation (March 2020)

The draft Preferred Route Option was published in March 2020 and a second round of public consultation occurred between 4 March 2020 to 17 April 2020. Due to COVID-19 restrictions in mid-March, the planned Public Information Events were impacted. There was a total of 65 submissions received during this second round of public consultation.

A number of changes to the design were made based on feedback received during the second round of public consultation and dialogue with stakeholders. However, the changes made to the draft Preferred Route Option were relatively small scale and no further option assessments using the MCA described in Section 3.3.2 were required.

Key changes for the Proposed Scheme implemented in the design of the draft Preferred Route Option include:

For the portion of the Proposed Scheme relating to the UCD Ballsbridge to City Centre Core Bus Corridor:

- A new signalised pedestrian crossing was introduced on Baggot Street Lower;
- At the Ballsbridge Junction, the Herbert Park arm was realigned to minimise the impact on adjacent properties and retain a number of existing trees east of the junction;
- At the Anglesea Road / Merrion Road junction the location of the proposed new access into the City of Dublin Education and Training Board (CDET) premises was amended to minimise the impact on historic railings;
- At Merrion View Avenue, the existing gate accessing a residential laneway has been retained in its existing location, which was proposed to be relocated in the draft Preferred Route Option published in March 2020;
- Bus stop locations have been modified in this revised proposal – some bus stops have been relocated or removed to achieve a better spacing between stops, while also ensuring that each stop is sited in the best location to serve surrounding neighbourhoods; and

- Following the review of submissions received, along with further assessment through the MCA, it was determined that the preferred option for Nutley Lane to be progressed to the updated draft Preferred Route Option was the two-way general traffic option.

For the portion of the Proposed Scheme relating to the Blackrock to Merrion Core Bus Corridor:

- At the junction of Elmpark Green Development on Merrion Road, the arrangement was revised to remove the proposed traffic island on the inbound arm, which removed the need for land take onto Landaff Terrace to the south;
- The gates, railings and piers forming the existing entrance to Blackrock Collage were proposed to be rotated on the westernmost pier to accommodate the realigning of the adjacent boundary, while preserving the symmetry of the protected entrance;
- The access and egress arrangements to the Frascati Centre were amended to reflect the existing, newly constructed, arrangement;
- A number of bus stops along the route have been redesigned as island bus stops where space allows; and
- Bus stop locations have been modified in this revised proposal – some bus stops have been relocated or removed to achieve a better spacing between stops, while also ensuring that each stop is sited in the best location to serve surrounding neighbourhoods. In a number of locations, separate bus stop laybys have been provided which are envisaged to accommodate private coaches.

3.4.3 Further consideration following Updated Draft Preferred Route Option Consultation (November 2020)

The third round of public consultation on the updated draft Preferred Route Option took place from the 04 November to 16 December 2020 and was held virtually due to the continuing effect of the COVID-19 pandemic and associated restrictions. There was a total of 493 submissions received during this round of public consultation.

Arising from the feedback received during this consultation process, a number of design amendments were identified and incorporated into the scheme proposals. The key changes included in the updated design of the draft Preferred Route Option include the following:

- The proposed pedestrian crossing south of James Street East was amended to a Toucan crossing to increase the connectivity for those cycling in the area, particularly those cycling to the adjacent school and commercial centres;
- An upgrade to the existing ramped access to the Grand Canal walkway from the McCartney Bridge to improve accessibility for pedestrian, particularly the mobility impaired, along this walkway which is currently not accessibility given the stepped nature of the path;
- A new access/egress arrangement is proposed for properties 1, 3, 5, 7, 9, and 11 Pembroke Road involving a new egress being introduced on Waterloo Road, and the closure of an existing egress onto Pembroke Road for vehicular traffic;
- Additional trees are to be retained between Northumberland Road and Ballsbridge by reducing the length of the right turn lane being proposed onto Lansdowne Road;
- At the Anglesea Road / Merrion Road junction, the proposed right turn lane, which previously reflected the approximate length of the existing provision, is proposed to be reduced in length with associated reallocation of space to the adjacent footpaths;
- A right turn lane from Nutley Lane into St. Vincent's University Hospital (SVUH) has been introduced into the design, with consideration for planning permission for the development of the National Maternity Hospital (NMH) at SVUH (granted by An Bord Pleanála) which included provision of right-turn lane;
- The two-way cycle track on Nutley Lane was amended so that it remains on the eastern side as far as the R138 Stillorgan Road rather than crossing to the RTÉ side;
- At the access junction to St. Vincent's University Hospital from Merrion Road, the dedicated right-turn lane into Merrion Avenue has been removed in order to improve cyclist safety and reduce the necessary land acquisition;

- The northern end of George's Avenue (south), which is currently an egress only onto the Frascati Road, is proposed to be converted into a cul-de-sac for local traffic, with a controllable bollard offering an egress opportunity for service and emergency vehicles; and
- The previously proposed layby bus stop on Temple Hill, encroaching past the existing wall at St. Vincent's Park, has been relocated to the north and the requirement for widening at St. Vincent's Park has been removed from the design. Along with the relocation of the bus stop, a new pedestrian crossing has been introduced on the northern arm of the Temple Hill / Monkstown Road Junction.

3.4.4 Specific Design Alternatives

No major scheme design alternatives were considered to the Proposed Scheme following the draft Preferred Route Option consultation. However, specific design alternatives which required a further level of consideration either in micro-location or in design form included the following:

- Proposed cross-section at Booterstown Marsh;
- Access arrangements to properties 1, 3, 5, 7, 9, and 11 Pembroke Road;
- Relocation of the Bloomfield Gateway on Merrion Road;
- Delaying the beginning of the bus lane on Merrion Road inbound from the Strand Road junction; and
- Restrictions on George's Avenue approaching Frascati Road.

3.4.4.1 Proposed Cross-Section at Booterstown Marsh

Consideration was given to the design of the Proposed Scheme along Rock Road in the vicinity of the Booterstown Marsh. Booterstown Marsh and the nearby Booterstown Stream are located within a pNHA (Booterstown Marsh) and a Special Protection Area (SPA) (the South Dublin Bay and River Tolka Estuary SPA). The EPR Option proposed a cross-section at this location which comprised fully segregated bus lanes in each direction, a single inbound cycle track, a two-way cycle track on the coastal side, together with footpaths and general traffic lanes in both directions, and an outbound right turn lane into St. Helen's Road. Within the EPR Option, the carriageway was proposed to be widened on Rock Road in the vicinity of the Booterstown Marsh, and as such included works to be carried out within the Booterstown Marsh pNHA. However, it did not indicate widening works within the South Dublin Bay and River Tolka Estuary SPA.

Subsequent to the development of the EPR Option, new topographical surveys were carried out, and a review of the proposed works was undertaken. It was identified, based on the topographical survey, that additional widening at this location would be required compared to that which was previously envisaged in order to provide the cross-section proposed within the EPR Option. Along with the proposed encroachment into the pNHA, encroachment into the South Dublin Bay and River Tolka Estuary SPA over approximately 15m in length (including setting back the existing boundary wall) was identified.

The following design options were assessed:

- EPR Option. This option is the option as described above; and
- Alternative Option. Retaining the above described cross-section with the removal of the existing dedicated right turn lane into St. Helen's Road, south of Trimleston Avenue (with the right turn movement still to be permitted from the general traffic lane), thus reducing the proposed overall cross-section width. As a result this removes the encroachment beyond hardstanding areas at the South Dublin Bay and River Tolka Estuary SPA.

The Alternative Option when compared to the EPR Option was found to have environmental benefits as it would avoid encroachment beyond hardstanding areas at the South Dublin Bay and River Tolka Estuary SPA, and in addition enabled an increase in the width of the proposed footpaths at this location improving the pedestrian environment, while not causing a material disbenefit with regard to traffic network integration and local access. Therefore the Alternative Option was taken forward into the final Preferred Route Option.

3.4.4.2 Pembroke Road Properties

The issue which required consideration was to resolve the safety and operation of the current egress at the Waterloo Road end of the properties 1, 3, 5, 7, 9, and 11 Pembroke Road, which currently conflicts with the existing stop line and pedestrian crossing on Pembroke Road.

The current access and egress arrangements provide a vehicular entrance on Pembroke Road towards the eastern end of the properties while the vehicular egress is located at the western end of the properties. The current egress onto Pembroke Road is in conflict with the stop line on the Pembroke Road approach to the Baggot Street / Waterloo Road signalised junction. The baseline environment at this location includes a number of mature trees within the properties, and the properties are a listed building located within a conservation area.

The Proposed Scheme includes amendments to the junction approach at this location which involves an additional cycle crossing, and traffic signal infrastructure for a proposed Bus Gate at this location. These interventions would likely further restricts the ability for cars to safely exit the property at this location due to the vehicle egress being located in front of the proposed stop line.

The following design alternative options were assessed:

- Alternative Option 1 which would involve reopening a historic gateway further east along Pembroke Road from the existing egress, with a new internal roadway through the existing grassed area (avoiding the mature trees). This would also involve formalising the parking bays within the property to ensure parking provision is retained. Note when exiting onto Pembroke Road, it would be right turn only during the hours the proposed Bus Gate is in operation. It is likely the existing exit point could remain open for pedestrian and cycling access; and
- Alternative Option 2 which would involve constructing a new egress gateway from the property onto Waterloo Road. This would likely require a controlled gate system to prevent potential rat-running vehicles through the property. This egress would be located to coincide with an existing pedestrian gate from the property onto Waterloo Road. It is likely the existing exit point could remain open for pedestrian and cycling access.

It was determined that Alternative Option 2 was the preferred design arrangement. While there is a disbenefit in terms of Architectural Heritage impact as it involves amendments to existing historic railings to introduce the new egress, there are also benefits in terms of biodiversity and landscape and visual impact due to the reduced impact to the existing green space within the property. The reduced impact on accessibility for the residents is also a benefit of this option. Therefore, Option 2 is considered as the preferred option for the egress at Pembroke Road properties when compared to Option 1 and is included in the final Preferred Route Option.

3.4.4.3 Bloomfield Gateway (Merrion Road)

An element of the Proposed Scheme design which required an assessment of alternatives was the treatment of an existing archway, referred to as the Bloomfield Gateway, on Merrion Road. Further details on the archway are provided in Chapter 16 (Architectural Heritage).

The Proposed Scheme requires road widening at the location of the Bloomfield Gateway and therefore there is the potential for direct impacts on historic arch. As part of the design development the cross-section at the location was reduced from the EPR Option to remove a previously proposed right turn lane for cars entering Bóthar Mhuirfean, and cars making this movement will turn from the general traffic lane. This resulted in an approximately 3m reduction of the road widening. However, this reduction in cross section was still sufficient to be able to retain Bloomfield Gateway at its existing location.

Bloomfield Gateway currently provides access to an Above Ground Installation (AGI) operated by Gas Networks Ireland (GNI), and as such consultation was required with GNI regarding the Proposed Scheme, along with consideration for the potential impacts on Architectural Heritage. Consultation with GNI identified the requirements to safely access and operate the adjacent AGI. Consultation was also required with representatives of St. Vincent's University Hospital due to ownership considerations relating to the proposed locations for the archway. During the design of the Proposed Scheme, St. Vincent's University Hospital informed the design team that a new temporary facility for COVID-19 has been installed within the hospital grounds to the east of the GNI AGI.

The following design alternative options were assessed:

- Alternative Option 1 which involved relocating the archway c. 50m to the west, placing it along the frontage of St. Vincent's University Hospital in place of a section of the current hedgerow and buffer between the Carew House parking;
- Alternative Option 2 which involved relocating the archway c. 200m to the west, placing it at the frontage of St. Vincent's University Hospital at an existing pedestrian access route from the plaza at the junction of Nutley Lane and Merrion Road into the hospital grounds. The archway would encompass the pedestrian walkway with gates remaining open for access; and
- Alternative Option 3 which involved relocating the archway c. 200m to the west, placing it at the frontage of St. Vincent's University Hospital at the plaza at the junction of Nutley Lane and Merrion Road within the zone of the current hedgerow and buffer to the east of the existing pedestrian access.

Whilst direct impacts on Bloomfield Gateway are unavoidable due to road widening, the design includes the relocation of the historic arch and preserves the gothic gateway within the grounds of St. Vincent's University Hospital and maintains the reference between the arch and historic mapping. In consultation with St. Vincent's University Hospital, Option 3 was considered to be the preferred option as it incorporates the arch within the long-term urban realm ambitions for St. Vincent's University Hospital, including development plans which could lead to further relocation of or impact to the arch. Option 3 is therefore included in the final Preferred Route Option.

3.4.4.4 Bus Lane at Merrion Gates Inbound

The issue which required consideration was the bus lane on the Merrion Road inbound, immediately after the Merrion Gates (Strand Road) junction. The Emerging Preferred Route proposed a full cross-section at this location, which would require land acquisition from 7 residential properties, the full demolition of another property and land acquisition from a commercial property over a section of 100m. Three of these properties possess very limited front gardens of approximately 2.5m depth, which the Emerging Preferred Route would effectively remove, resulting in these properties front doors being accessed directly from the new footpath. An alternative option was considered to investigate if the impacts of the Emerging Preferred Route could be lessened while achieving the core objectives of the Proposed Scheme.

The following design options were assessed:

- EPR Option. This option is the option as described above whereby fully segregated bus lanes and cycle tracks, together with footpaths and general traffic lanes are provided in both directions. This option ensures full priority for inbound buses; and
- Alternative Option. The option delays the re-introduction of the inbound bus lane on Merrion Road for approximately 100m after the Strand Road junction. Buses approaching the Strand Road junction inbound, will have a bus priority signal to stop inbound general traffic and permit inbound buses to join the general traffic lane. Traffic signal operation would be configured to keep the general traffic lane clear of stationary traffic to prevent delay to buses in the shared section. This option removed the need for land acquisition and demolition, permits fully segregated cycle facilities and permits some on-street parking to be retained.

While fully segregated bus lanes will be omitted over a 100m section of the Proposed Scheme, due to its location at a signalised junction on the route and the short length of shared lane, it will be possible to provide bus priority through this section without increased delay to buses. Given that the Alternative Option can still provide bus priority it is preferred when compared to the EPR Option which would result in land acquisition and property demolition. The Alternative Option has therefore been included in the final Preferred Route Option.

3.4.4.5 Restrictions at George's Avenue

George's Avenue runs from Anglesea Avenue to the south, in a north-easterly direction to Main Street Blackrock. However, George's Avenue is bisected by Frascati Road, which restricts traffic from travelling across it. Vehicular traffic is prohibited from entering George's Avenue from Frascati Road and this junction operates as a left turn exit only from George's Avenue to Frascati Road. Cyclists are permitted to enter George's Avenue from Frascati Road. During the development of the design of the Proposed Scheme, initial traffic modelling was undertaken in parallel to identify the potential implications arising from the proposals. This modelling was carried out utilising a Local Area Model (LAM) which predicted traffic volumes along the corridor and surrounding roads. These traffic volumes were then evaluated to identify the impacts of changes in traffic volumes on roads (particularly in relation to the potential for air quality and noise impacts).

This assessment identified that, as a result of the scheme, an additional volume of traffic would likely be attracted onto George's Avenue, between Anglesea Avenue and Frascati Road. Traffic which would traditionally travel down Carysfort Ave and onto the Frascati Road was seen within the model to instead divert onto Anglesea Ave and then to George's Avenue. The reduced traffic capacity in the Proposed Scheme at signalised junctions along the corridor (with bus and cycling facilities introduced), lead to the uncontrolled egress from George's Avenue becoming more attractive in the model. It was considered that this predicted diversion of traffic from Carysfort Avenue to George's Avenue would result in a potential negative noise impact classified as Moderate - Significant in the short term. In order to mitigate against this, alternative proposals were considered.

The following design options were assessed:

- EPR Option. This option is the option as described above whereby the egress remains largely as existing with uncontrolled egress from George's Avenue onto Frascati Road; and
- Alternative Option. The exit from George's Avenue onto Frascati Road would be closed, effectively creating a cul-de-sac at the northern end of George's Avenue (to the south of Frascati Road). This road would still be accessible to residents and visitors from Frascati Park, Sydney Avenue, Anglesea Avenue and Avoca Place as is currently the case, however, those exiting George's Avenue would also exit the street via one of these four streets. This would have the effect of removing all through traffic from the street and maintaining access to local traffic only, thus mitigating against potential environmental impacts.

The Alternative Option performed better with regard to the environmental impact when compared to the EPR option and has therefore been included in the final Preferred Route Option. This alternative option has also been discussed with the Roads Authority in Dún Laoghaire-Rathdown County Council (DLRCC).

3.5 Conclusion

The Proposed Scheme has been the subject of a systematic and comprehensive assessment of reasonable alternatives during the course of its development, informed by extensive engagement with residents, businesses, the local authority and other interested stakeholders, public representatives and the general public.

As described in this Chapter, a significant range of alternatives have been considered at three levels:

- Strategic alternatives, particularly with regard to the GDA Transport Strategy;
- Route alternatives; and
- Design alternatives, incorporating detailed local level design development.

The assessment of alternatives took account of environmental impacts, alongside other relevant factors including the economy, safety and accessibility, at appropriate stages.

It is considered that the examination of alternatives presented in this Chapter meets and exceeds the requirements of the EIA Directive and Section 50(2)(b)(iv) of the Roads Act (as amended), which states that an EIAR must contain '*a description of the reasonable alternatives studied by the road authority or the Authority, as the case may be, which are relevant to the proposed road development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed road development on the environment*'.

The Proposed Scheme is described in full in Chapter 4 (Proposed Scheme Description).

3.6 References

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