

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 [as 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 Tallaght / Clondalkin 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 Overview of the GDA Transport Strategy 2016 – 2035 and the new GDA Transport Strategy 2022 – 2042

The Transport Strategy for the Greater Dublin Area 2022-2042 (Transport Strategy) replaces the prior transport strategy for the period 2016 to 2035.

That prior transport strategy set out to contribute to the economic, social, and cultural progress of the Greater Dublin Area (GDA) by providing for the efficient, effective and sustainable movement of people and goods. In

other words, it was about making the Dublin region a better place for people who live and work there, and for those who visit.

It did that by providing a framework for the planning and delivery of transport infrastructure and services in the GDA. It has also provided a transport planning policy around which other agencies involved in land use planning, environmental protection, and delivery of other infrastructure such as housing, water and power, could align their own investment priorities.

It has been an essential component, along with investment programmes in other sectors, for the development of the GDA which covers the counties of Dublin, Meath, Kildare, and Wicklow.

Major projects provided for in the prior strategy included BusConnects Dublin which the Proposed Scheme is a key component of.

Under the Dublin Transport Authority Act 2008, the National Transport Authority (NTA) must review its transport strategy every 6 years. Arising from the review of the 2016 plan, an updated strategy has been developed which sets out the framework for investment in transport infrastructure and services over the next two decades to 2042.

Since the prior transport strategy was approved by government in 2016, the NTA, along with the Councils, other transport delivery agencies and transport operators, have worked to build and develop that strategy's projects and proposals.

With respect to BusConnects Dublin, work was commenced 2017. It is a multi-faceted programme comprising several elements of which the Core Bus Corridors (CBCs) which will provide approximately 230km of bus priority and approximately 200km of cycle routes.

It is the largest ever investment programme on the bus network to deliver high levels of bus priority on all the main corridors to not only support and significantly improve the operation of bus services now and into the future but is proofed for resilience to enable the operation for more frequent services as required. The Proposed Scheme is a fundamental element of this ongoing work.

The challenges outlined in the GDA Transport Strategy 2016 - 2035 and identified need for BusConnects Dublin as determined in the preparation of that prior strategy remain, and the evidence from the detailed corridor studies undertaken in the preparation of the prior strategy is still valid and robust. These studies are set out in Section 3.2.2.

3.2.2 GDA Transport Strategy 2016-2035

The prior GDA Transport Strategy 2016-2035 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 prior GDA Transport Strategy provided a comprehensive framework to guide the development of transport across the Greater Dublin Region over the period of that strategy. Careful consideration was undertaken of the transport requirements across the seven counties of the GDA, and the prior GDA Transport Strategy then formulated the appropriate transport responses to those requirements.

Various studies and reports were undertaken in the development of the prior 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 prior GDA Transport Strategy (NTA 2016). As set out in the Environmental Report, in respect of which the SEA of the prior 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 prior GDA Transport Strategy (including bus-based transport modes), were evaluated for potential significant effects, and measures integrated into the prior 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 prior 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 formed an important element of the prior 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 prior GDA Transport Strategy and is a key element of the new Transport Strategy 2022-2042. 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 most recent published figures for 2022 have shown that public transport passenger numbers are largely recovered to pre-pandemic levels. The figures presented that across the public transport network are 98% of pre-pandemic levels. Specifically, Dublin city area bus services carried 12.7m in November 2022, compared to 12.9m in November 2019, representing a 99% recovery.

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 in Image 3.1 (Figure 3.8 in the GDA Transport Strategy 2016-2035). These corridors were also divided into Outer Hinterland, Outer Metropolitan and Inner Metropolitan areas in terms of character.

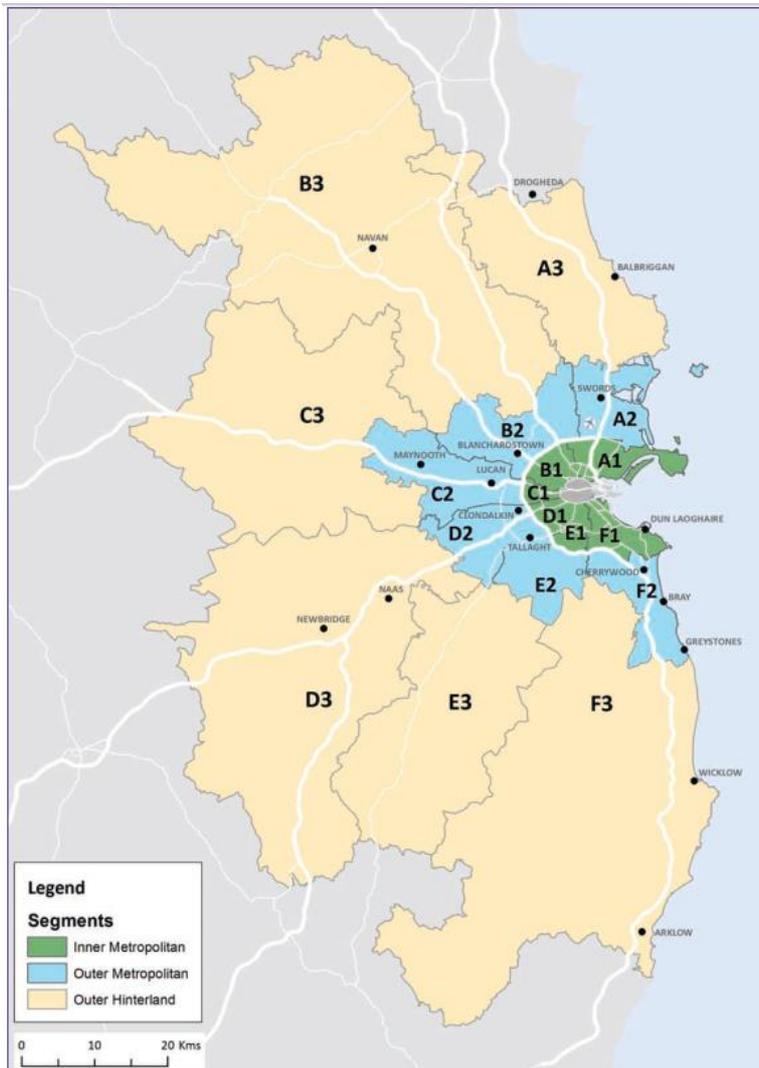


Image 3.2: GDA Segments (GDA Transport Strategy 2016 – 2035)

Through the work undertaken in the preparation of the prior GDA Transport Strategy, including its supporting studies, various alternatives to deal with the transport needs which are intended to be addressed by the Proposed Scheme were identified and considered. These are set out in the subsequent sections.

3.2.3 ‘Do Nothing’ Alternative

The prior GDA Transport Strategy was developed as the economy was emerging from the post 2008 economic downturn. In turn, the prior GDA Transport Strategy set out a number of key challenges and opportunities within the GDA:

- Suburbanisation and the spread of population, employment and other land uses has continued;
- Arising from the above trend, the mode share of car use continues to increase;
- Car ownership – a key determinant of car use – is likely to increase further, up to saturation levels;
- Cycling has increased significantly in numbers and in mode share;
- 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 economic downturn.

Congestion throughout the GDA was 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 route of the Tallaght / Clondalkin to City Centre Core Bus Corridor Scheme, bus lanes are currently provided on approximately 29% and 35% of the route outbound and inbound, 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 alternative relative to the outcomes which can be realised by the Tallaght / Clondalkin to City Centre Core Bus Corridor Scheme.

3.2.4 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 Malahide Road (Clongriffin) to Tallaght corridor which is pertinent to the Proposed Scheme.

Prior to the completion of these studies, the prior GDA Transport Strategy identified the development of a number of Core Bus Corridors (CBCs) as BRT schemes, including the Tallaght corridor. These BRT routes formed part of the overall CBC network set out in the prior GDA Transport Strategy. As design and planning work progressed on the CBCs, it became clear that the level of differentiation between the BRT corridors and the other CBCs 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 the CBCs, all of the CBCs 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 types of 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 CBC 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 CBCs and the advantages identified above of a unified integrated bus system.

Environmentally, the BRT option compared to the CBC 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 land take and potentially involve demolition of buildings at pinch-points. In the case of the CBC proposals, bus-priority can be achieved through short lengths at pinch-points by the use of signal-control priority.

3.2.5 Light Rail Alternative

The appropriate type of public transport provision in any particular case is predominately 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 prior 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 3.2.2 set out various studies undertaken for the prior GDA Transport Strategy. Arising from these studies and the specific assessment and transport modelling work undertaken for the prior 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 complimented by enhancing the capacity of the Luas Red Line through the provision of extra rolling stock. 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.

Environmentally, in comparison to the CBC proposal and similar to the BRT alternative, the light rail alternative 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 bus-based transport solution, bus-priority can be achieved through short lengths at pinch-points by the use of signal-control priority.

3.2.6 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 prior GDA Transport Strategy identified that a metro solution would not be economically justified within the area covered by this corridor (Corridor D).

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, in comparison to the CBC proposal, the metro alternative 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 bus-based transport solution, bus-priority can be achieved through short lengths at pinch-points by the use of signal-control priority.

3.2.7 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. In comparison to the CBC proposal, the heavy rail alternative 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 prior 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 prior 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 alternative (Section 3.2.6), 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 potential new heavy rail solution, the potential DART Kildare 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 Scheme 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 3.3 below shows the various projects in the DART Expansion Programme.

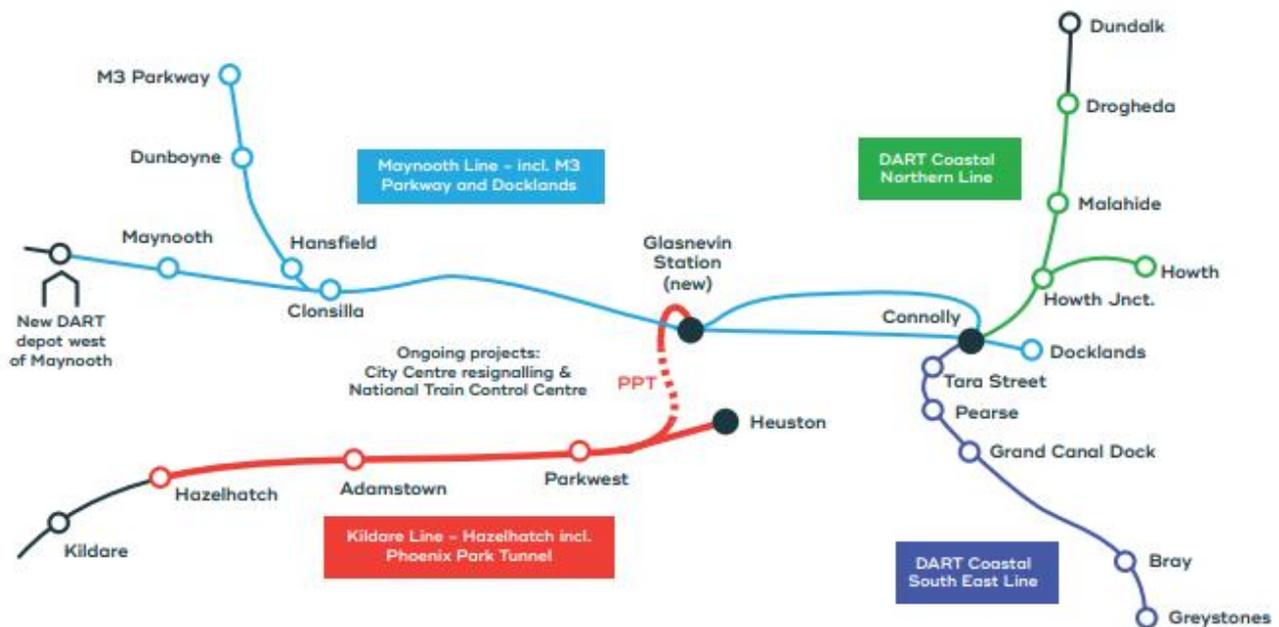


Image 3.3: DART Expansion Programme (Source: Irish Rail Website)

Arising from the various studies and analysis that had been carried out, and the specific assessment and transport modelling work undertaken for the GDA Transport Strategy, it was concluded that a high quality bus-based transport system supplemented by the expansion of the DART system on Kildare line to provide fast, high frequency services to Hazelhatch, as part of a phased delivery of DART Expansion (now DART + programme), would be part of the proposed public transport solution in the corridor of the Proposed Scheme.

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

3.2.8 Demand Management Alternative

One of the primary aims of the prior GDA Transport Strategy was 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 and 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 large 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 meant that additional bus fleet and driver resources had been utilised simply to maintain existing timetables, rather than adding overall additional capacity. The objective of the prior GDA Transport Strategy was to significantly increase the capacity, and subsequent use, of the public transport system, focusing 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 prior 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.

3.2.9 Technological Alternatives

Technological advances have opened-up new areas of potential in the delivery of transportation 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 emission impacts, 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 minimize 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. The Proposed Scheme (The Tallaght / Clondalkin to City Centre Core Bus Corridor) consists of two sections that amalgamate the former Greenhills to City Centre CBC and the Clondalkin to Drimnagh CBC preferred route Core Bus Corridors. Development of the Proposed Scheme has evolved in the following stages:

- 1) **Feasibility and Options Reports** which were associated with the Proposed Scheme (Greenhills to City Centre Core Bus Corridor Options Study – Volume 1: Feasibility and Options Assessment and Clondalkin to City Centre Core Bus Corridor – Feasibility Study and Options Assessment) were concluded in 2017 and 2018, setting out the initial route options and concluding with the identification of an Emerging Preferred Route (EPR);
- 2) A first round of non-statutory **Public Consultation** was undertaken on the EPR from 14 November 2018 to 31 May 2019;
- 3) Development of **Draft Preferred Route Option (PRO)** (May 2019 to March 2020). Informed by feedback from the first round of public consultation, stakeholder and community engagement and the availability of additional design information, the design of the EPR evolved with further alternatives considered;
- 4) A second round of non-statutory **Public Consultation** was undertaken on the Draft PRO 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 PRO** 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 PRO from 4 November 2020 to 16 December 2020; and
- 7) Finalisation of **PRO**. Informed by feedback from the overall public consultation process, continuing stakeholder engagement and the availability of additional design information, the PRO, 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 the location of offline cycle routes and the road layout in constrained locations. 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 physical 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 PRO 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 Record of Monuments and Places (RMP), Record of Protected Structures (RPS), Sites of Archaeological or Cultural Heritage and buildings listed on the National Inventory of Architectural Heritage (NIAH) along or adjacent to the corridor;
- **Flora and Fauna** – provision of CBC infrastructure could have negative impacts on flora and fauna, for example, through construction of new infrastructure through green field sites;
- **Soils and Geology** – construction of CBC infrastructure 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** – 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;
- **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 EPR, which then formed the basis of the first non-statutory public consultation. A summary of the process is described below.

The Feasibility and Options Reports used a two-stage assessment process to determine the EPR option, 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; 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 Greenhills to City Centre Core Bus Corridor comprised of four main sections:

- Section 1 examined the feasible route options from Tallaght to the Ballymount area north of the M50;
- Section 2 examined the feasible route options north of the M50 to the intersection of the R819 Walkinstown Road with the R110 Crumlin Road;
- Section 3 examined the feasible route options from the intersection of the R819 Walkinstown Road with the R110 Crumlin Road to the R110 Dolphins Barn Street where the Core Bus Corridor crosses the Grand Canal; and
- Section 4 examined the feasible route options from where the route crosses the Grand Canal at R110 Dolphins Barn Street to the R137 Nicholas Street at the intersection with R137 Christchurch Place.

The study area for the Clondalkin to Drimnagh Core Bus Corridor comprised of three main sections:

- Section 1 examined the feasible route options from the R136 Outer Ring Road to R113 Fonthill Road South. This section no longer forms part of the Core Bus Corridor route assessment as there is already high quality bus infrastructure within the area and modest potential for development leading to increased demand for public transport;
- Section 2 examined the feasible route options from R113 Fonthill Road South to R110 Long Mile Road / R134 New Nangor Road junction; and
- Section 3 examined the feasible route options from R110 Long Mile Road / R810 Naas Road / R134 New Nangor Road junction to Christchurch.

Further discussion on the route options assessment process for each Study Area Section is provided in Section 3.3.2. The potential for cumulative impacts as a result of the Proposed Scheme is assessed in Chapter 21 (Cumulative Impacts & Environmental Interactions).

At the start of the Stage 1 assessment, an initial 'spider's web' of potential route options that could accommodate a Core Bus Corridor was identified for each study area section, as shown in Image 3.4 and Image 3.5 (extracted from the Feasibility and Options Reports).

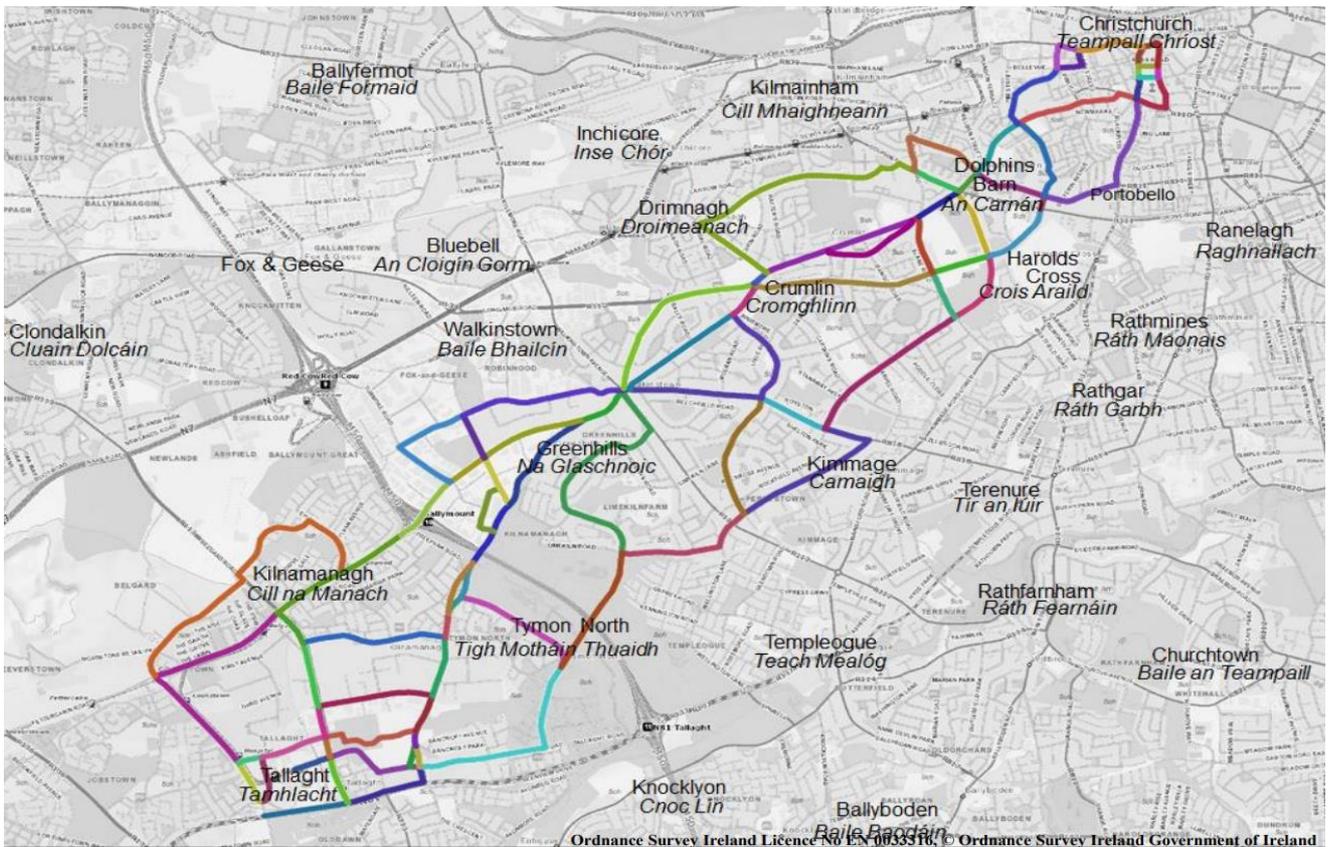


Image 3.4: Spiders Web of Route Options extracted from 'Greenhills to City Centre Core Bus Corridor Options Study – Volume 1: Feasibility and Options Assessment'

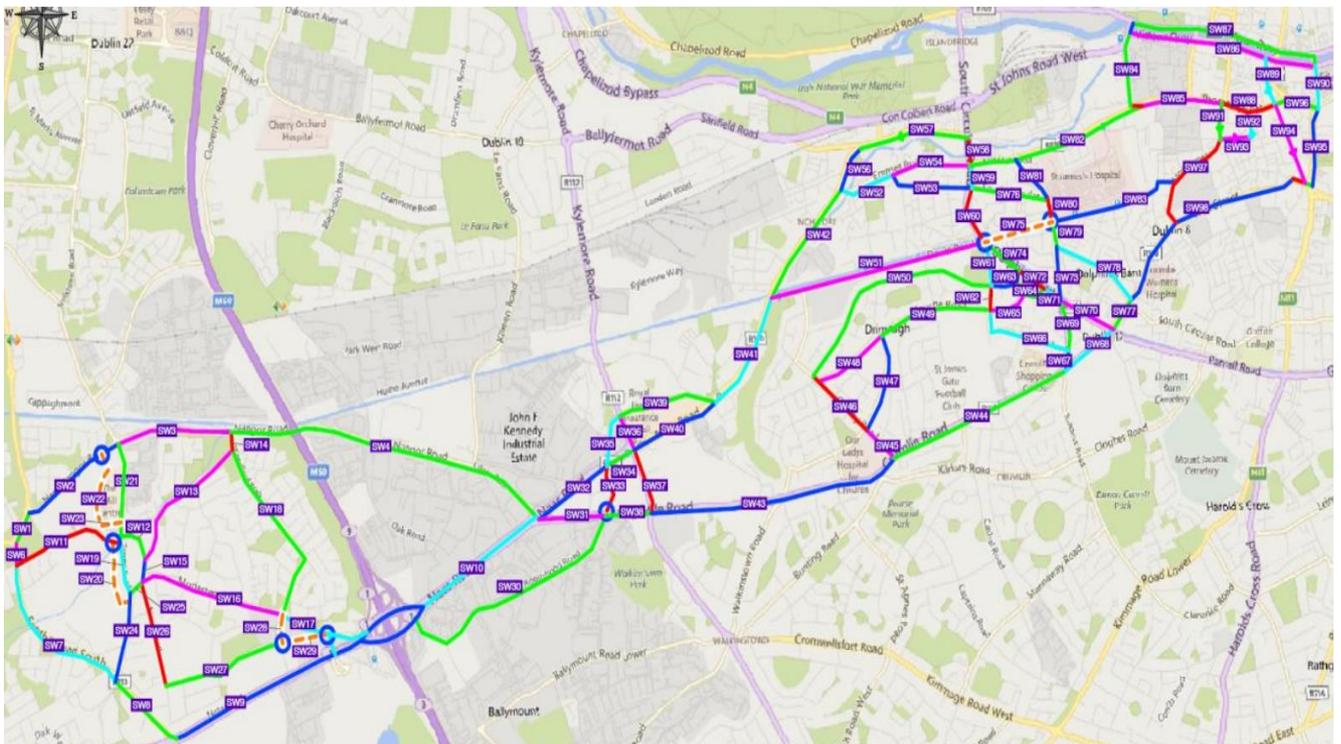


Image 3.5: Spiders Web of Route Options extracted from 'Clondalkin to City Centre Core Bus Corridor – Feasibility Study and Options Assessment – Volume 1'

The initial “spider’s web” was narrowed down having considered 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 issues, high-level environmental aspects 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, the need for significant land take from residential properties, in addition to other factors.

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 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. These options are presented in Image 3.6 to Image 3.10.

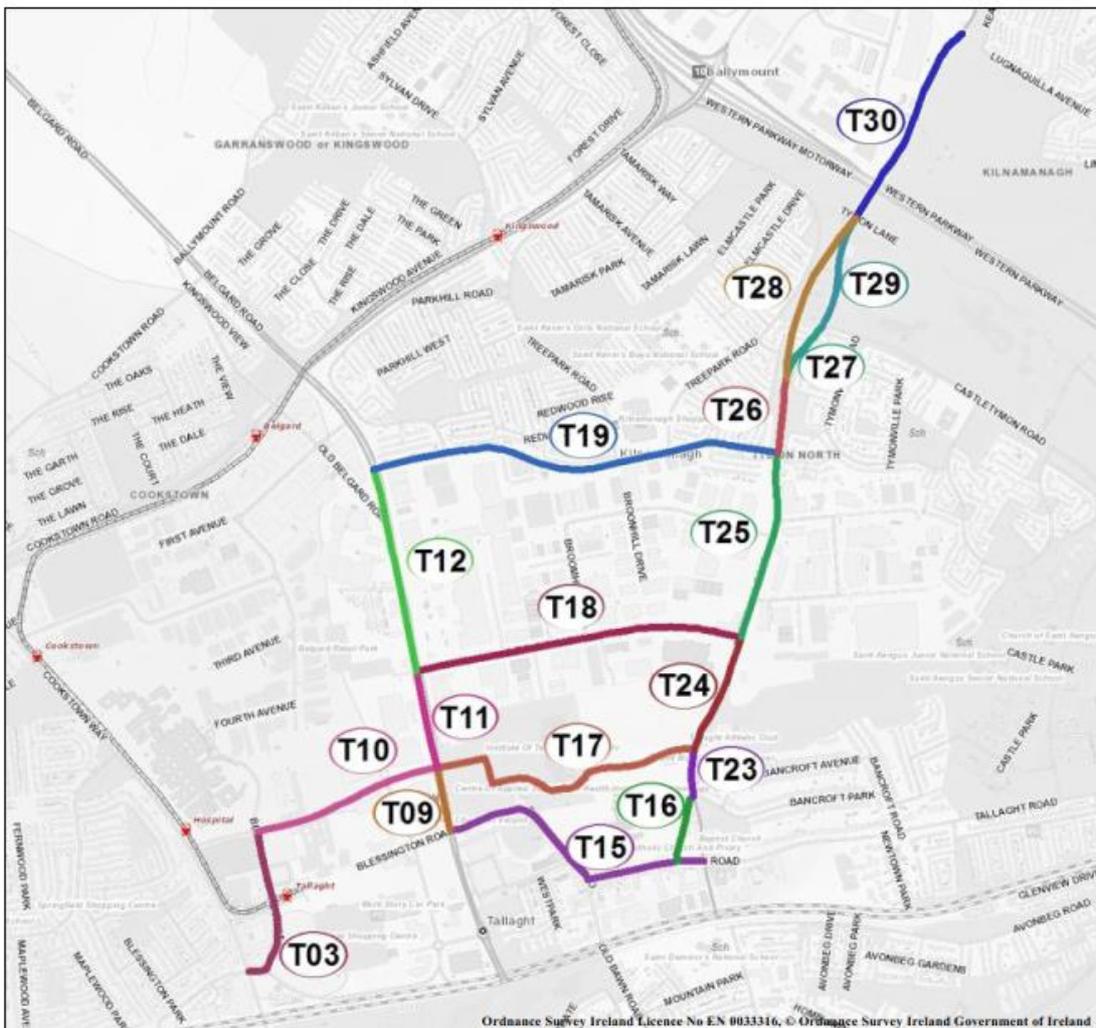


Image 3.6: Route Options from Initial Sift of the Greenhills to City Centre Core Bus Corridor – Section 1

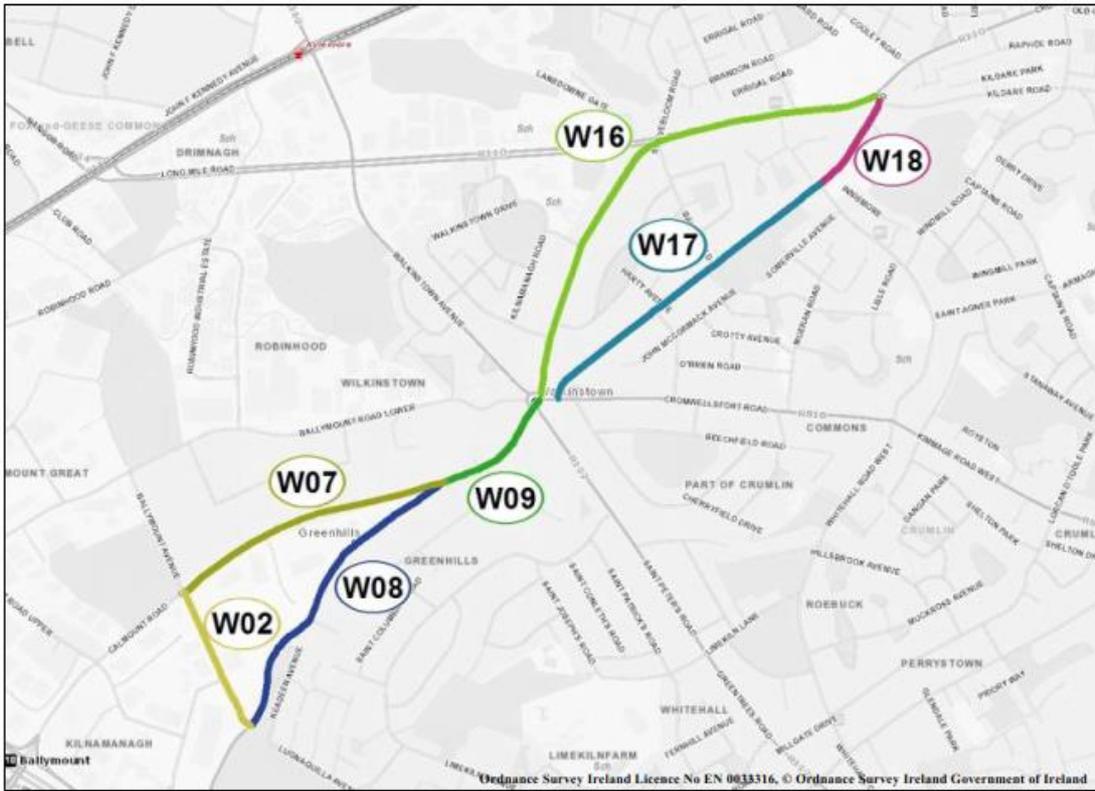


Image 3.7: Route Options from Initial Sift of the Greenhills to City Centre Core Bus Corridor – Section 2

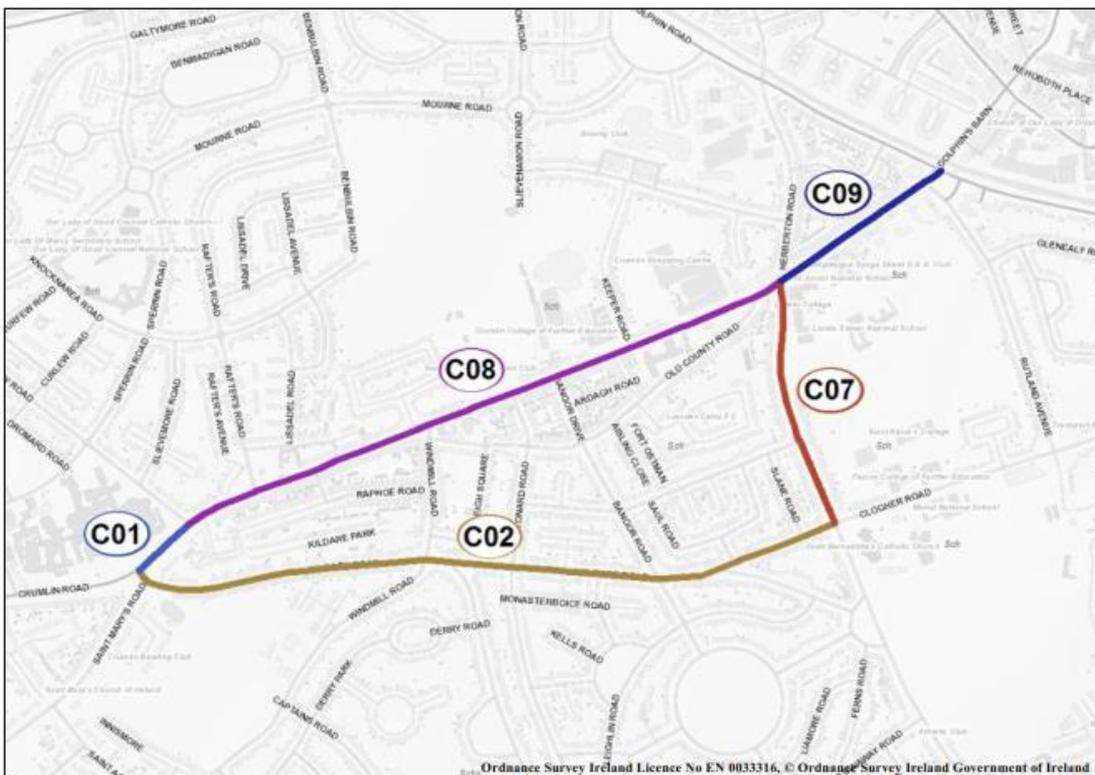


Image 3.8: Route Options from Initial Sift of the Greenhills to City Centre Core Bus Corridor – Section 3

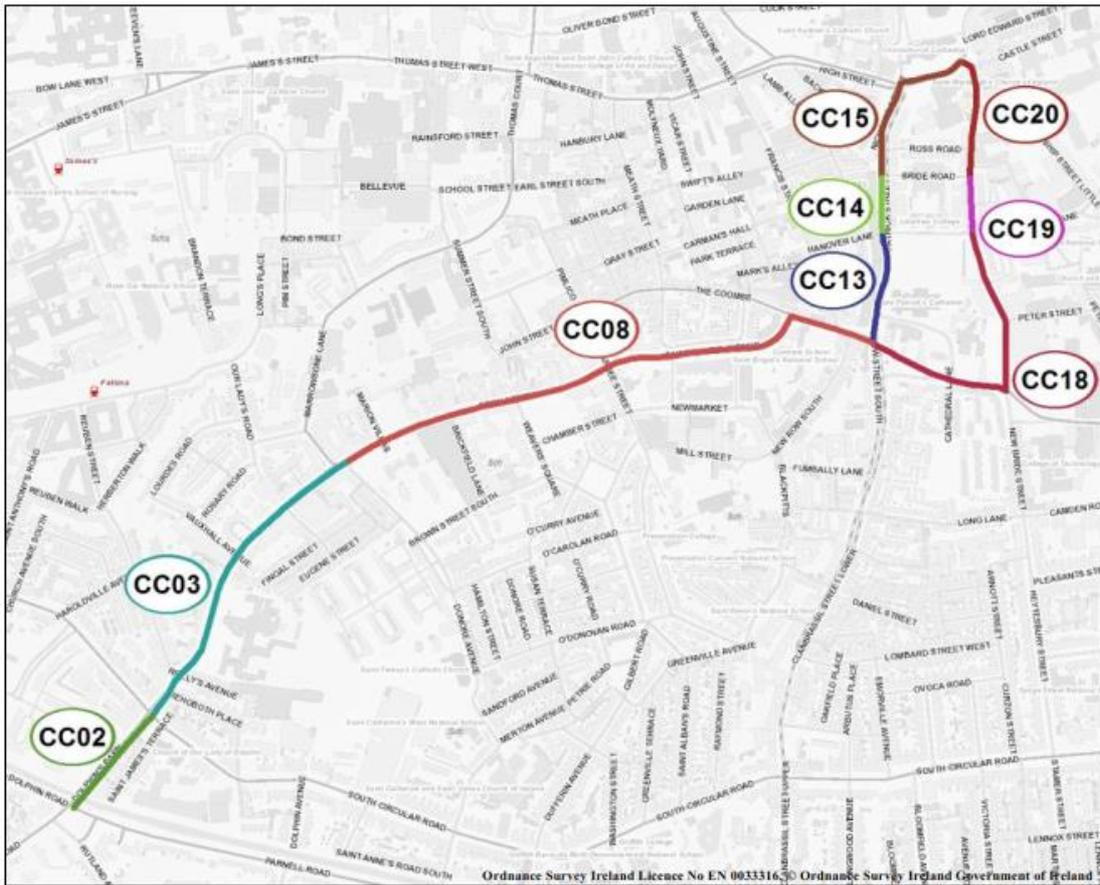


Image 3.9: Route Options from Initial Sift of the Greenhills to City Centre Core Bus Corridor – Section 4

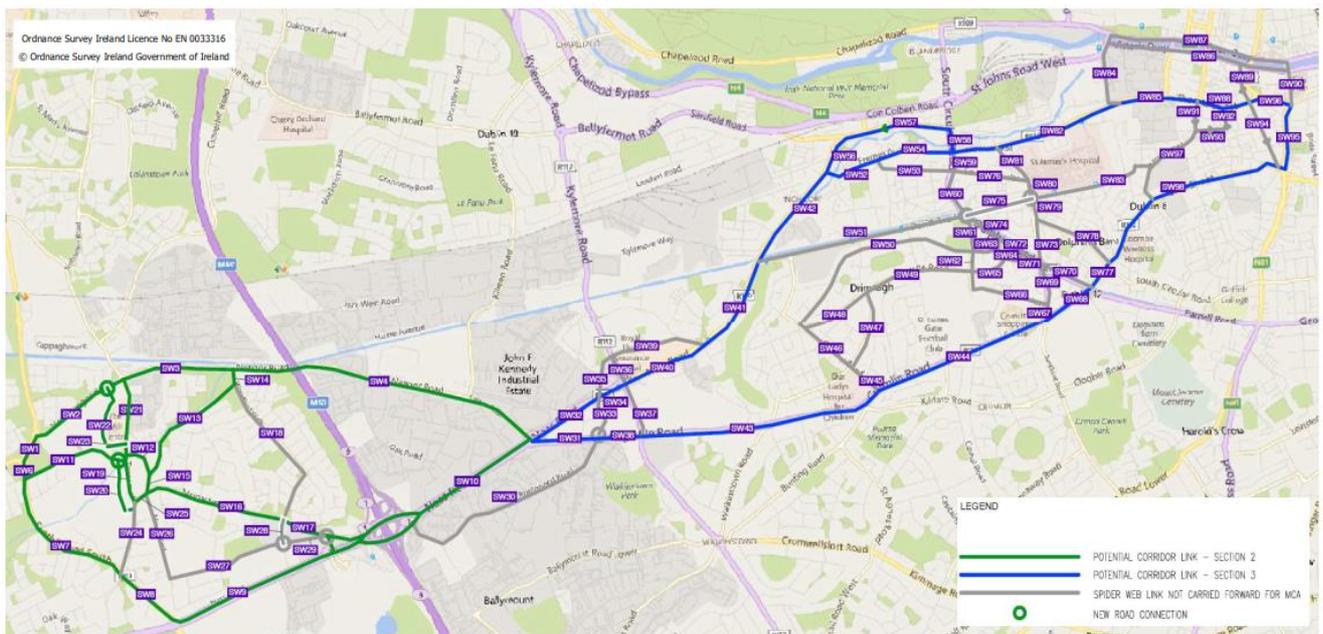


Image 3.10: Route Options from Initial Sift of the Clondalkin to Drimnagh Core Bus Corridor – Sections 2 and 3

3.3.2 Stage 2 – Route Options Assessment

Following completion of Stage 1 initial appraisal, the remaining reasonable alternatives 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 EPR:

- **Archaeological, Architectural and Cultural Heritage** – there is the potential for impacts on archaeological, architectural and cultural heritage when providing CBC infrastructure. The evaluation of options had regard to RMPs, Sites of Archaeological or Cultural Heritage and buildings listed on the NIAH along or adjacent to the corridor;
- **Flora and Fauna** – 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 option under this criterion;
- **Soils and Geology** – construction of infrastructure necessary for the provision of CBC infrastructure 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. These considerations were compared for each option under this criterion;
- **Hydrology** – 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 option 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 options were compared, and any negative effects considered under this criterion;
- **Air Quality** – provision of CBC infrastructure has the potential to impact the air quality along the route. These effects were compared for each 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 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** – 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. These effects were compared for each option under this criterion.

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.

Using the same Study Area Sections (SAS) as the Stage 1 Assessment, the Stage 2 Assessment involved combining shorter route sections which passed the Stage 1 assessment, to form longer end-to-end potential routes within each SAS.

3.3.2.1 Greenhills to City Centre Corridor: Route Options Assessment

Section 1 of the Greenhills to City Centre Core Bus Corridor was sub divided into three sub-sections for further assessment and refinement (see Image 3.11).

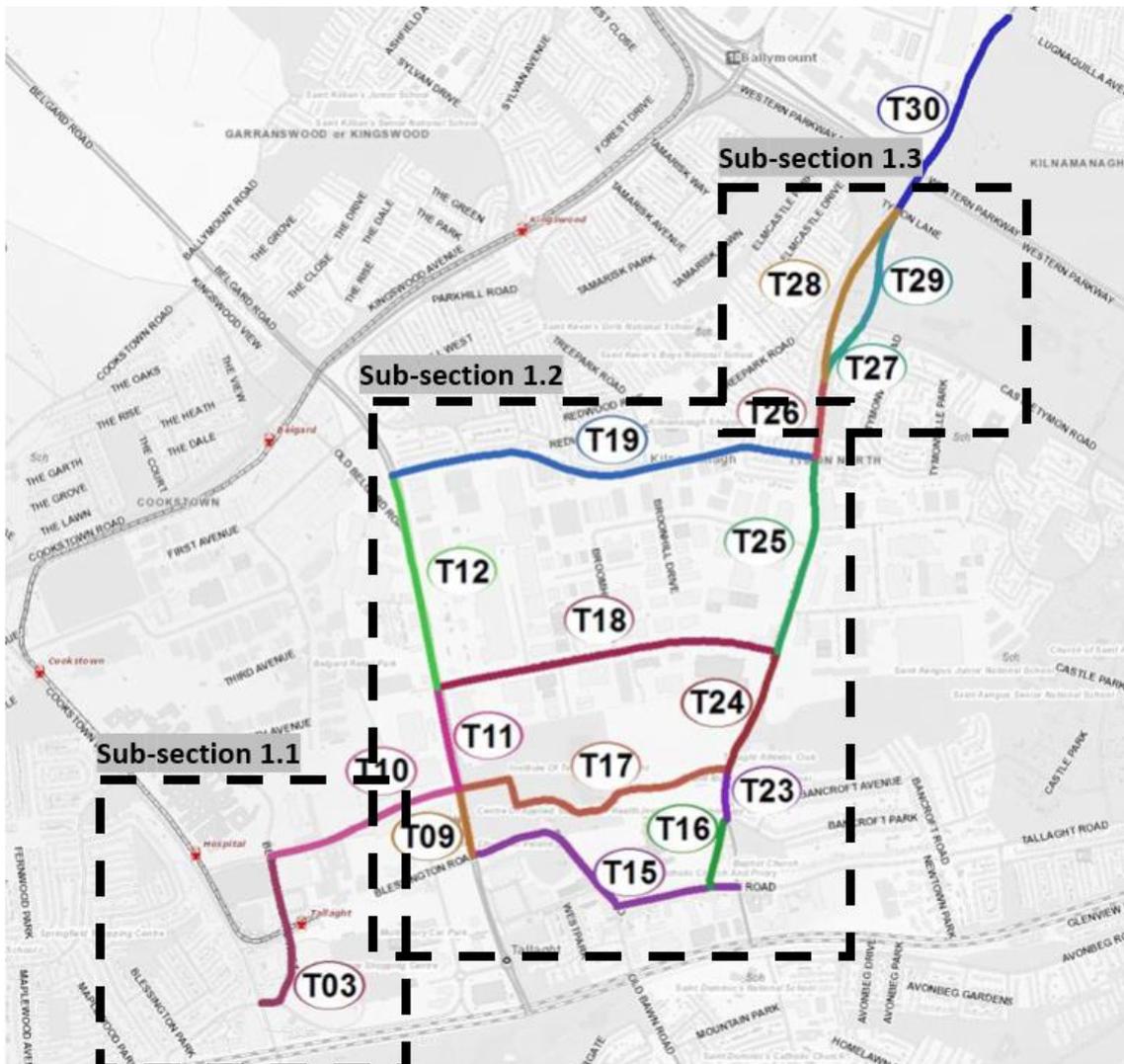


Image 3.11: Greenhills to City Centre Core Bus Corridor Stage 2 Route Options – Section 1 Sub-section Division

3.3.2.1.1 Sub-Section 1.1: Route Options Assessment

Following the Stage 1 sifting process, only one route option was identified between Cookstown Way and R113 Belgard Road which commences on Belgard Square South at its junction with Cookstown Way. From here, the route turns onto Belgard Square West which, under this option, would be restricted to buses only. Buses would continue along Belgard Square West before turning right onto Belgard Square North. This section of route ends at the junction of Belgard Square West and Belgard Road.

3.3.2.1.2 Sub-Section 1.2: Route Options Assessment

Following the Stage 1 sifting process, four viable route options for sub-section 1.2 were taken forward for assessment and further refinement as follows:

- Route Option 1 (BG1): Commences on R113 Belgard Road at the junction with Belgard Square North. From here, the route travels south before turning left onto Old Blessington Road and through the existing bus gate to Main Street. The route turns onto Old Greenhills Road, which is currently a cul-de-sac with local access. A new bus gate would be provided to restrict access between R819 Greenhills Road and Old Greenhills Road to buses only. The remainder of this route travels along R819 Greenhills Road;
- Route Option 2 (BG2): Commences on R113 Belgard Road at the junction with Belgard Square North. From here, the route travels through the TUD Tallaght internal campus roads as far as R819 Greenhills Road. The route then turns onto R819 Greenhills Road which forms the remainder of the route;
- Route Option 3 (BG3): Commences on R113 Belgard Road at the junction with Belgard Square North. From here, the route travels north along Belgard Road before turning right onto Airton Road. The route continues along Airton Road turning left onto R819 Greenhills Road which forms the remainder of the route; and
- Route Option 4 (BG4): Commences on R113 Belgard Road at the junction with Belgard Square North. From here, the route travels north along Belgard Road before turning right onto Mayberry Road. The route continues along Mayberry Road turning left onto R819 Greenhills Road.

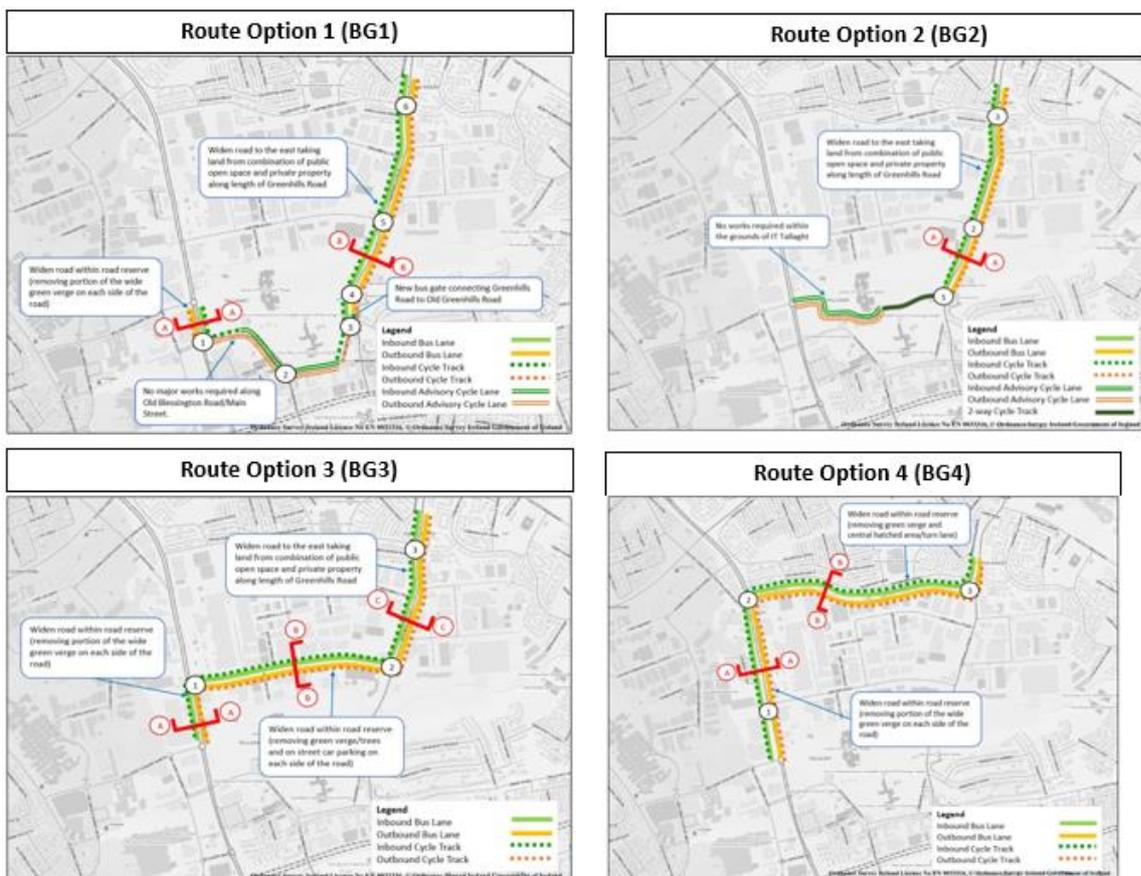


Image 3.12: Alternative Options between Belgard Road and Mayberry Road

Route Option 1 (BG1): Along R113 Belgard Road, it would be possible to provide bus lanes and raised adjacent cycle lanes in each direction by removing the wide verge on each side of the road or a combination of narrowing the central median and the verges. Along Old Blessington Road, there is very little opportunity to widen the road

to provide bus lanes or cycle lanes in either direction. As such this option assumes that no bus lanes are provided on this section. Given the constraints through the village centre, no bus lanes would be provided along Old Blessington Road / Main Street. Similarly, it is assumed that no cycle lanes would be provided beyond the 200m section already in place on the northern side of the carriageway between the junctions with R113 Belgard Road and the pedestrian entrance to TUD Tallaght. Between Main Street and R819 Greenhills Road, there is no opportunity to provide bus lanes or cycle lanes in either direction due to the proximity of adjacent buildings. However, to avoid delays at the R819 Greenhills Road / Main Street junction, and geometric constraints north of the junction, there would be merit in buses bypassing this junction by using Old Greenhills Road to connect from Main Street to R819 Greenhills Road. Old Greenhills Road is currently a cul-de-sac and, under this option, a bus gate would be proposed to restrict access to buses only. Along R819 Greenhills Road, there is no opportunity to provide bus lanes or cycle lanes in either direction within the existing road reserve. It would therefore be necessary to widen Greenhills Road by up to 10m to accommodate the bus lanes and raised adjacent cycle lanes in each direction. Along the length of Greenhills Road, within this route option, there is potential to widen to the west of the road utilising a combination of existing public space and private land. There are six signalised junctions (including one new bus gate) along this route option.

Route Option 2 (BG2): On entry to TUD Tallaght, two inbound lanes are currently provided. It would be proposed to convert one of these lanes to a contraflow bus lane outbound to allow outbound buses to travel along this route and exit onto R113 Belgard Road. Within the campus, there are currently no bus lanes provided. There is some scope to provide bus lanes in some areas of the internal campus through-road (e.g., the section between the main campus building and R819 Greenhills Road). However, the road through the campus is currently physically closed to through traffic between 08:00 and 10:00 and between 17:00 and 19:00 and outside of these hours, traffic volumes are observed to be low. This means that buses would not be delayed by traffic through this section of the route option and therefore bus lanes are not necessarily required. Buses would need to be provided with a transponder or similar to allow the barrier to be activated during the peak periods when the barrier is down. A two-way cycle track is currently provided on the northern side of the main campus road between the main building and R819 Greenhills Road. This proposal assumes that no further cycle facilities would be provided. Along R819 Greenhills Road, there is no opportunity to provide bus lanes in either direction within the existing road reserve. It would therefore be necessary to widen R819 Greenhills Road by up to 10m to accommodate the bus lanes and raised adjacent cycle lanes in each direction. Along the length of R819 Greenhills Road within this route option there is potential to widen to the west of the road utilising a combination of existing public space and private land. There are three signalised junctions along this route option.

Route Option 3 (BG3): Along R113 Belgard Road, it would be possible to provide bus lanes and raised adjacent cycle lanes in each direction by removing the wide verge on each side of the road or through narrowing a combination of the central median and the verges. Along Airton Road, it would be possible to provide bus lanes and raised adjacent cycle lanes in each direction by removing the verge and trees on each side of the road. It would also be necessary to remove on-street car parking. Along R819 Greenhills Road, there is no opportunity to provide bus lanes in either direction within the existing road reserve. It would therefore be necessary to widen R819 Greenhills Road to accommodate the bus lanes and raised adjacent cycle lanes in each direction. Along the length of R819 Greenhills Road within this route option there is potential to widen to the west of the road utilising a combination of existing public space and private land. There are three signalised junctions along this route option.

Route Option 4 (BG4): Along R113 Belgard Road, the verge is removed to accommodate the bus lanes and raised adjacent cycle lanes in each direction. Along Mayberry Road, it would be possible to provide bus lanes and raised adjacent cycle lanes in each direction by removing the verge and trees on each side of the road. In addition, the central hatched median which currently facilitates right turn lanes into adjacent side roads would require removal. For the short section of R819 Greenhills Road north of the Mayberry Road junction, it would be necessary to widen R819 Greenhills Road to accommodate the bus lanes and raised adjacent cycle lanes in each direction. This widening can be accommodated in the adjacent open space to the west of the carriageway. There are three signalised junctions along this route option.

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

In terms of 'Economy', a primary differentiator between route options is the land acquisition cost. Generally, the longer the section of route that runs along R819 Greenhills Road, the more expensive the option due to the requirement for land-take along the length of Greenhills Road. The cost estimate for route options BG1 and BG2 are higher compared to other options considered, largely due to the quantity of private land-take required, while route options BG3 and BG4 result in lower capital costs. The cost estimate for route option BG4 is the lowest as no private land-take is required to facilitate this option.

In terms of transport reliability and quality of service, route option BG1 is less attractive than other options through a combination of overall length and the extent to which priority can practically be delivered on the route, particularly through Tallaght Village.

Route options BG1 and BG2 rank more favourably in terms of catchments, primarily as they serve more residential and employment populations than route options BG3 and BG4.

In terms of transport network integration, route option BG1, which is the current route for buses, ranks highest of all options considered.

Route option BG1 ranks poorest in terms of cycling integration, as cycle facilities cannot be provided along the entire length of the route.

In terms of 'Accessibility and Social Inclusion', route options BG1 and BG4 serve slightly more key trip attractors along the route than route options BG2 and BG3. While route option BG3 does not serve as many attractors, it does directly serve a major attractor of bus users in TUD Tallaght, and as such, route options BG1, BG2 and BG4 rank higher under these criteria.

Under 'Safety' there is relatively little to differentiate with a similar number of turn movements required for each route option.

In terms of 'Environment', route option BG4 ranks poorest and has the potential for a comparative disadvantage in terms of Flora and Fauna, Landscape and Visual and Air and Noise criteria. Route options BG1, BG2 and BG3 are considered to have a comparative advantage on the environment with BG3 negatively affecting an existing tree row but preserving mature trees elsewhere in comparison with BG1 and BG2.

Based on the assessment undertaken, route option BG2 appears to offer an advantage over other options. Route option BG2 was therefore brought forward into the Emerging Preferred Route for the Tallaght area for the following reasons:

- It has a comparatively low capital cost, coupled with the opportunity for journey time reliability and bus service efficiency;
- It serves large residential catchments as well as directly serving TUD Tallaght;
- It is the most direct route offering faster and reliable journey times (four to five minutes); and
- It has a comparative advantage for the environment across most sub criteria (with the exception of Flora and Fauna).

3.3.2.1.3 Sub-Section 1.3: Route Options Assessment

Following the Stage 1 sifting process, two viable route options for sub-section 1.3 were taken forward for assessment and further refinement as follows:

- Route Option 1 (PV1): This route option follows the existing R819 Greenhills Road alignment from a point just south of Parkview to Tymon Lane; and
- Route Option 2 (PV2): This route option would run along a realigned section of R819 Greenhills Road from a point just south of Parkview to Tymon Lane in the green area between Treepark Road and Parkview.

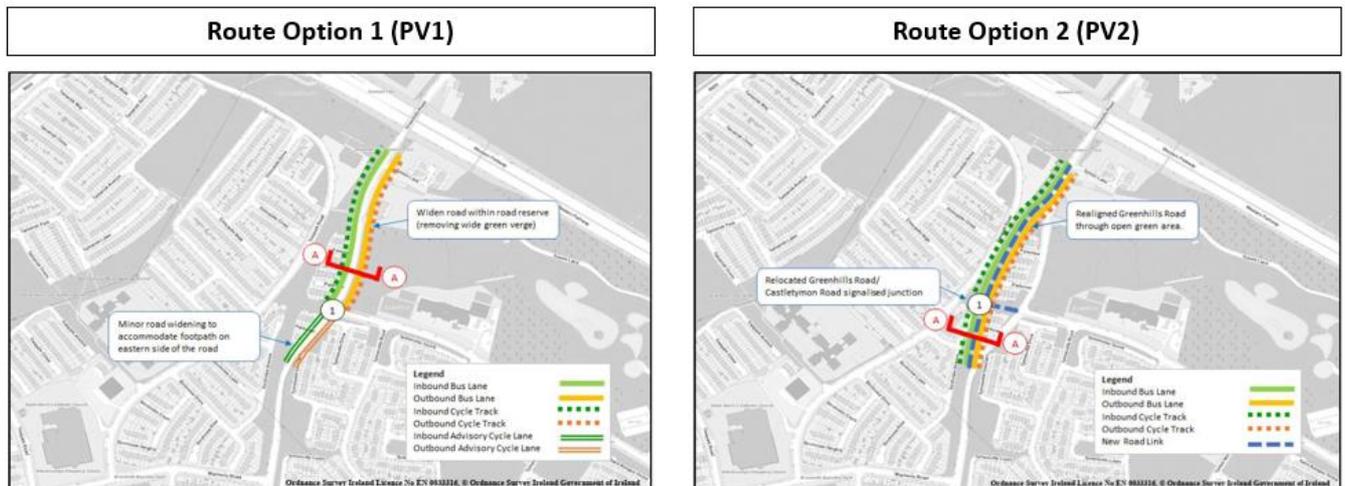


Image 3.13: Alternative Options between Parkview and Tymon Lane

Route Option 1 (PV1): At the southern portion of this route option there is a pinch point between Tymonville Crescent and the houses opposite in Parkview. At this location, the available width is limited to approximately 11m, with no scope to widen without acquiring and demolishing a residential property or reducing the width of the adjacent road (Tymonville Crescent) to 3-4m in front of the houses at the end of this road. While there is currently no footpath on the eastern side of the road, any upgrade works would need to provide this facility. As such, the available road width would be limited to 7m, leaving no scope for bus lanes or cycle lanes to be provided through this section. It may be possible to provide a short section of bus lane on approach to the junction past this pinch point to allow buses to skip queuing traffic (observed to extend 50m from the stop line), but this would be of little benefit to buses as they would likely make it through the junction in one cycle from the point where bus lanes are dropped. North of Castletymon Road, the road reserve is currently wide enough to accommodate a traffic lane, bus lane and raised adjacent cycle lanes in each direction. Towards the northern portion of the route it may be necessary to locally narrow traffic lanes or cycle lanes to fit within the road reserve. There is a level difference between the road and the adjacent properties in Parkview and a retaining wall may be required to overcome this difference. There is one signalised junction along this route option.

Route Option 2 (PV2): This route option proposes realigning R819 Greenhills Road through the green area between the Parkview and Birchview Avenue residential developments. This road alignment is identified in the draft South Dublin County Council Development Plan 2016 – 2022 as a road objective. All required works could be accommodated within public land. The new road would facilitate bus lanes and raised adjacent cycle lanes in each direction. The current junction of Castletymon Road and R819 Greenhills Road would need to be relocated to the new Greenhills Road alignment. The existing R819 Greenhills Road alignment would be closed to through traffic and maintained for access only to the Parkview residential estates. It would also be necessary to downgrade the existing R819 Greenhills Road / Castletymon Road junction to a priority controlled junction to facilitate access to Parkview. There is one signalised junction along this route option.

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 'Economy', route option PV1 is the most cost efficient option as it requires less construction works. However, route option PV1 provides less bus lane priority compared to route option PV2, which provides bus lanes in each direction along its length.

In terms of Integration, route option PV2 delivers a new road link which is included as a development plan objective and as such receives a higher ranking under land use integration. Furthermore, route option PV2 provides higher quality continuous raised adjacent cycle lanes and as such ranks higher under these criteria.

In terms of Accessibility and Social Inclusion and safety, there is nothing to distinguish between route options.

In terms of Environment, route option PV1 generally ranks higher than route option PV2. This is largely due to the fact that route option PV2 proposes a new road through an existing open green space. This has the potential for negative impacts in terms of land use character, air and noise, and landscape and visual.

Based on the assessment undertaken, route option PV2 appears to offer more benefits over other options. Route option PV2 is therefore brought forward into the Emerging Preferred Route for the Parkview area for the following reasons:

- It strikes the right balance between cost and delivering reliable journey times through the provision of continuous bus lanes and cycle facilities;
- It delivers high quality cycle facilities;
- It delivers road links which are included as objectives in the South Dublin County Council Development Plan 2016 – 2022; and
- Notwithstanding that option PV2 was considered to have a greater potential for negative environmental impacts than option PV1 the MCA identified option PV1 as having more advantages in terms of meeting the Proposed Scheme objectives by providing high quality bus and cycle facilities and delivering reliable bus journey times.

3.3.2.1.4 Fixed Route Section: Greenhills Road between Parkview and Ballymount Road Upper Route Options Assessment

Following the Stage 1 sifting process, only one route option was identified between Parkview and Ballymount Road Upper. It is not considered practical to provide dedicated bus and cycle lanes across the existing R819 Greenhills Road M50 overpass, given the width of the existing bridge. Bus priority would therefore be dropped in advance of the bridge. A queue relocation facility is proposed for outbound buses due to the proximity of a pedestrian crossing south of the bridge and potential of this crossing to cause delay to buses on the M50 overpass. However, there is no potential source of delay to inbound buses at this location and as such inbound buses would merge into the traffic lane in advance of the bridge. It is proposed to provide a 3m shared pedestrian / cycle facility on each side of M50 overpass bridges transitioning to / from dedicated facilities in advance of the bridge on each approach. North of the M50 overpass, it is proposed to widen R819 Greenhills Road to the east and west to facilitate bus and raised adjacent cycle lanes in each direction.

Section 2 of the Greenhills to City Centre Core Bus Corridor was sub divided into three sub-sections for further assessment and refinement (see Image 3.14).

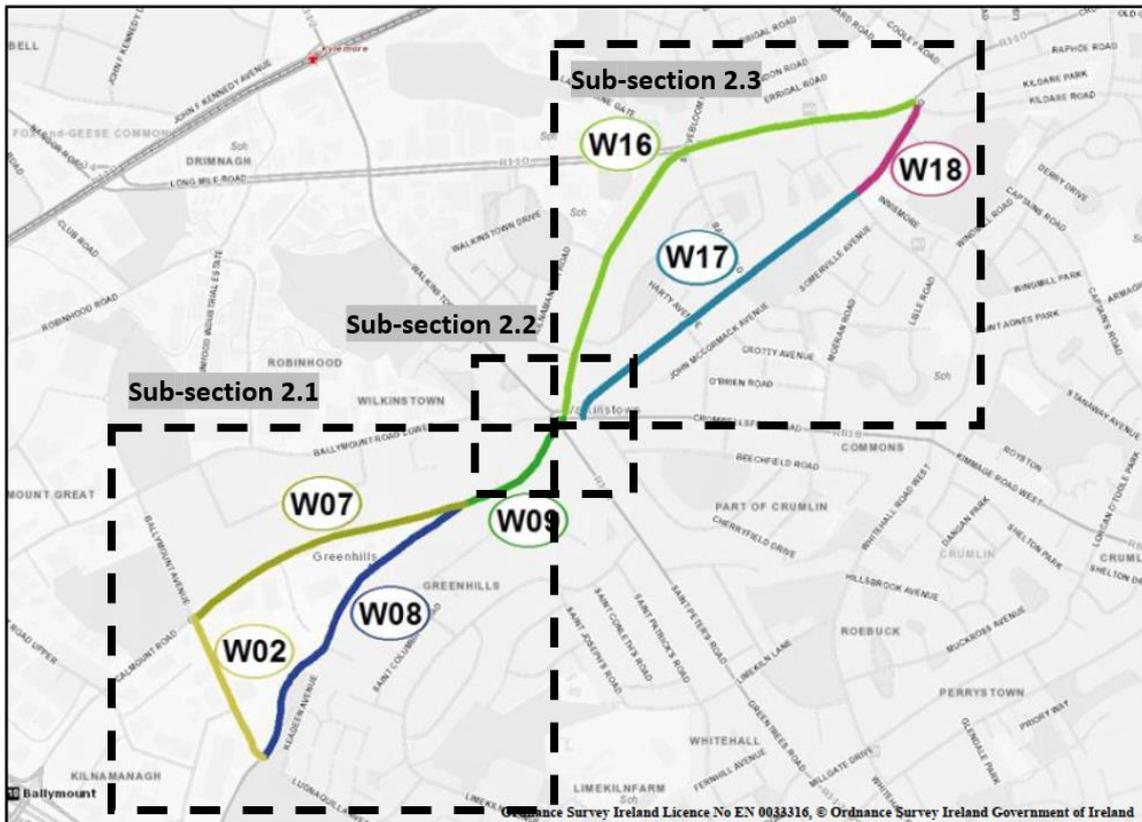


Image 3.14: Greenhills to City Centre Core Bus Corridor Stage 2 Route Options – Section 2 Sub-section Division

3.3.2.1.5 Sub-Section 2.1: Route Options Assessment

Following the stage 1 sifting process, three viable route options for sub-section 2.1 were taken forward for assessment and further refinement as follows:

- Route Option 1 (BW1): This route option would run along R819 Greenhills Road as far as Walkinstown Roundabout;
- Route Option 2 (BW2): This route option would turn from R819 Greenhills Road onto a new link road to Ballymount Industrial Estate connecting into Ballymount Avenue. At the Ballymount Avenue / Calmount Road junction, the route would turn onto Calmount Road. A new link would be provided to connect Calmount Road to R819 Greenhills Road allowing the route to continue as far as Walkinstown Roundabout. The existing R819 Greenhills Road would be closed to through traffic; and
- Route Option 3 (BW3): This route option would run along R819 Greenhills Road which would be restricted to bus and local access only. General traffic would turn from R819 Greenhills Road onto a new link road to Ballymount Industrial Estate connecting into Ballymount Avenue. At the Ballymount Avenue / Calmount Road junction, the route would turn onto Calmount Road. A new link would be provided to connect Calmount Road to R819 Greenhills Road allowing the general traffic to continue as far as Walkinstown Roundabout.

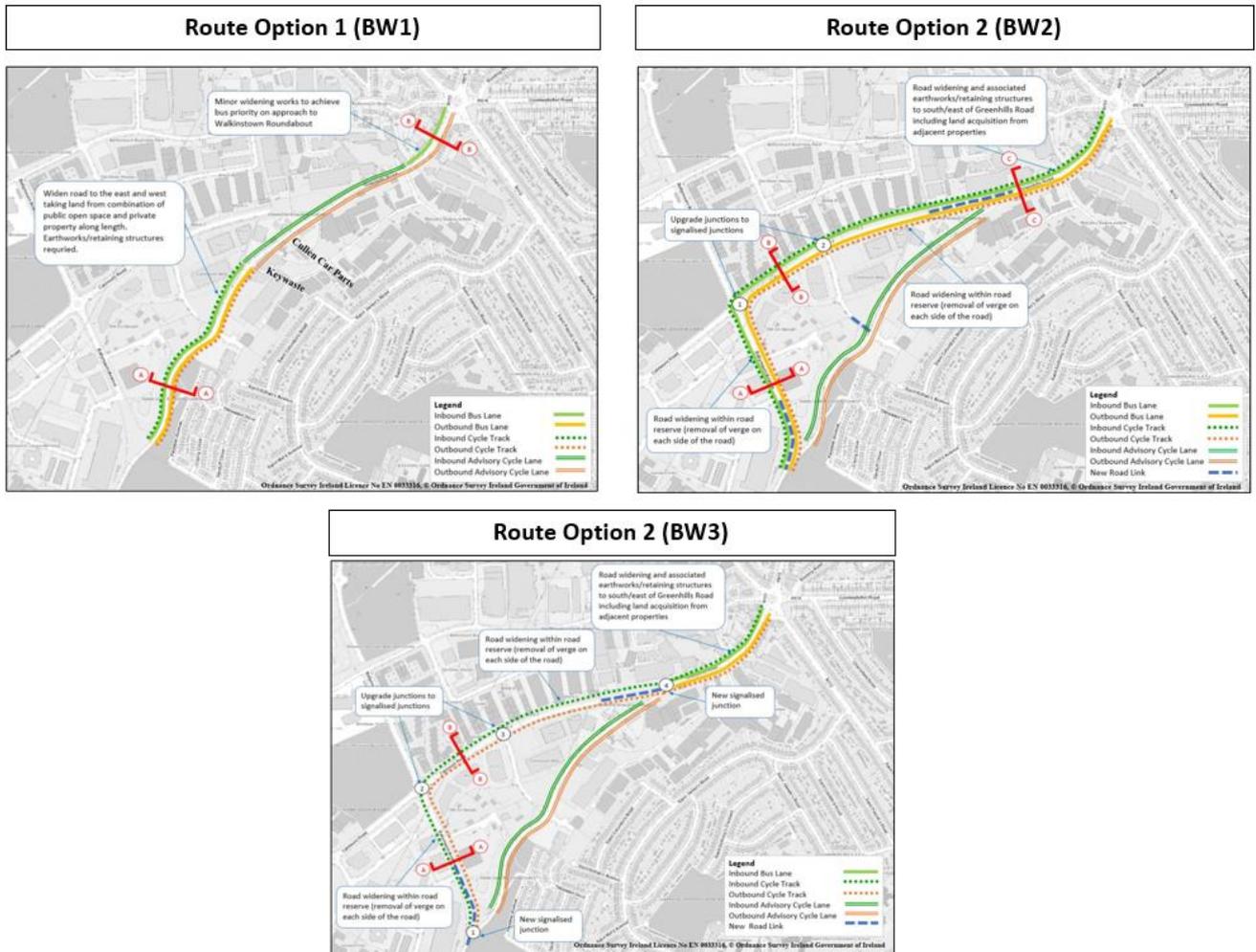


Image 3.15: Alternative Options between Ballymount Avenue and Walkinstown Roundabout

Route Option 1 (BW1): This route option would stay along the existing R819 Greenhills Road alignment. In this area, secondary cycle route 8A follows R819 Greenhills Road between Calmount Road and Walkinstown Roundabout. Beyond this, it follows Calmount Road, Ballymount Avenue and the associated planned links to / from R819 Greenhills Road (included as a development objective in the South Dublin County Council Development Plan 2016 - 2022). Cycle facilities would be required along the length of this route to accommodate the re-routed secondary cycle route 8A. Bus lanes and raised adjacent cycle lanes are provided in each direction between the southern portion of the route and the Keywaste facility by widening the road on each side. This would require land-take from adjacent properties. As R819 Greenhills Road effectively runs along a ridge, earthworks / retaining structures would be required to facilitate the road widening. North of the Keywaste facility, there are a number of buildings which are very close to the existing road. As a result, bus lanes or dedicated cycle lanes are not possible for a 150m section between the Keywaste facility and Cullen Car Parts. North of Cullen Car Parts, the road could be widened to provide bus and raised adjacent cycle lanes in each direction as far as Walkinstown Roundabout (similar to option BW2). This would require road widening resulting in land-take, retaining structures and an associated high cost. A similar extent of works would be required to deliver the cycle facilities alone. However, given the inability to provide bus or cycle lanes between Keywaste and Cullen Car Parts, this level of investment is not considered to be justifiable in the context of the overall route which could not provide continuous priority or cycle lanes. On balance, it was therefore considered that for this section of this option, an inbound bus lane would be provided for approximately 200m in advance of the roundabout (within the existing road reserve).

Route Option 2 (BW2): This route option proposes rerouting all R819 Greenhills Road traffic, including buses, through Ballymount Industrial Estate. To facilitate this, a new section of road between R819 Greenhills Road and Ballymount Avenue is required. A new section of road is also required to connect Calmount Road to R819

Greenhills Road. This route option provides a bus lane and raised adjacent cycle lane in each direction by widening within the existing road reserve. On approach to Walkinstown Roundabout, the road would be widened to the south / east of R819 Greenhills Road to facilitate bus lanes and raised adjacent cycle lanes in each direction. This would likely require a combination of retaining structures, embankments or road lowering to facilitate this. Under this option it is proposed to close R819 Greenhills Road to through traffic at either end with access provided via a new junction off Calmount Road. There are two signalised junctions along this route option.

Route Option 3 (BW3): This route option proposes that buses would run along R819 Greenhills Road. Along R819 Greenhills Road, as through traffic would be removed from the road, it is not proposed to provide any bus lanes along this section. The current cross-section consisting of a traffic lane and advisory cycle lane in each direction is therefore proposed to be maintained. A bus-gate would be provided at the R819 Greenhills Road / Calmount Road junction to allow buses to enter / exit R819 Greenhills Road. It is also proposed to reroute through traffic from R819 Greenhills Road through Ballymount Industrial Estate (i.e., no buses). To facilitate this, a new section of road between R819 Greenhills Road and Ballymount Avenue would be required. A new section of road would also be required to connect Calmount Road to R819 Greenhills Road. A raised adjacent cycle lane would be provided in each direction by widening within the existing road reserve slightly. On approach to Walkinstown Roundabout, the road would be widened to the south/east of R819 Greenhills Road to facilitate bus lanes and raised adjacent cycle lanes in each direction. This would likely require a combination of retaining structures, embankments or road lowering to facilitate this. There are two signalised junctions along this route option.

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 economy, route option BW1 represents the most cost efficient solution. However, this route option provides the least bus lane priority of all options and therefore would result in poorer journey time reliability than the more expensive route options of BW2 and BW3.

In terms of 'Integration', route options BW2 and BW3 deliver a new road link which is included as a development plan objective and as such receives a higher ranking under land-use integration. Furthermore, route options BW2 and BW3 would provide high quality cycle facilities along a route that coincides with secondary cycle route 8A with facilities provided along the entire length of the route while BW1 would provide partial dedicated cycle facilities. As such, route options BW2 and BW3 rank higher in terms of cycling integration.

Under 'Accessibility and Social Inclusion', there is little to differentiate between route options with each route serving a similar number of key trip attractors.

In terms of 'Safety', route option BW1 requires no turning movements and as such it ranks higher than options BW2 and BW3. Similarly, cyclist safety is better along route options BW2 and BW3, which offer safer environment and facilities for cyclists.

In terms of 'Environment', generally, route option BW1, which would require a large amount of road widening along R819 Greenhills Road, resulting in greater potential impact in the environment in terms of air and noise. While significant works would be required to facilitate route options BW2 and BW3, comparatively, these options have less impact on the environment and sensitive receptors.

Based on the assessment undertaken, route options BW2 and BW3 appear to offer similar benefits to route option BW1. However, route option BW2 is preferred for the Ballymount area for the following reasons:

- It strikes the right balance between cost and delivering reliable journey times compared to BW1 which is cheaper to construct but provides less bus lane priority;
- It delivers high quality cycle facilities along the entire length of the route, forming part of secondary cycle route 8A, which are not achievable along R819 Greenhills Road. Cycle access to R819 Greenhills Road, which is identified as a feeder route, could also be maintained in this option;
- Compared to route option BW3, this option removes the need for additional signalised junctions associated with bus access to and from the current R819 Greenhills Road alignment. Furthermore,

it directly serves Ballymount Industrial Estate which is a major trip attractor with a large employment catchment;

- It delivers road links which are included as objectives in the South Dublin County Council Development Plan 2016 – 2022. It also allows R819 Greenhills Road to be downgraded to a local road which is more suitable for its current alignment and geometry; and
- It has less impact on the environment compared to other options due to BW2 taking all through traffic away from residential receptors, BW3 taking general traffic away from residential receptors and BW1 bringing traffic closer to residential receptors.

3.3.2.1.6 Sub-Section 2.2: Walkinstown Roundabout Route Options Assessment

Following the stage 1 sifting process, six viable route options for sub-section 2.2 were taken forward for assessment and further refinement as follows:

- Option 1 (WRB1): Modified roundabout dual lane (preferred option from previous study);
- Option 2 (WRB 2): Modified Roundabout Dual Lane, Ballymount Road local access only;
- Option 3 (WRB 3): Modified roundabout single lane (except R819 Greenhills Road and Walkinstown Road), dual lane gyratory;
- Option 4 (WRB 4): Four-arm signalized junction, Ballymount local access only, Cromwellsfort Road LIL0;
- Option 5 (WRB 5): Double signalised junction north / south with Ballymount Road local access only; and
- Option 6 (WRB 6): Double signalized junction east / west.

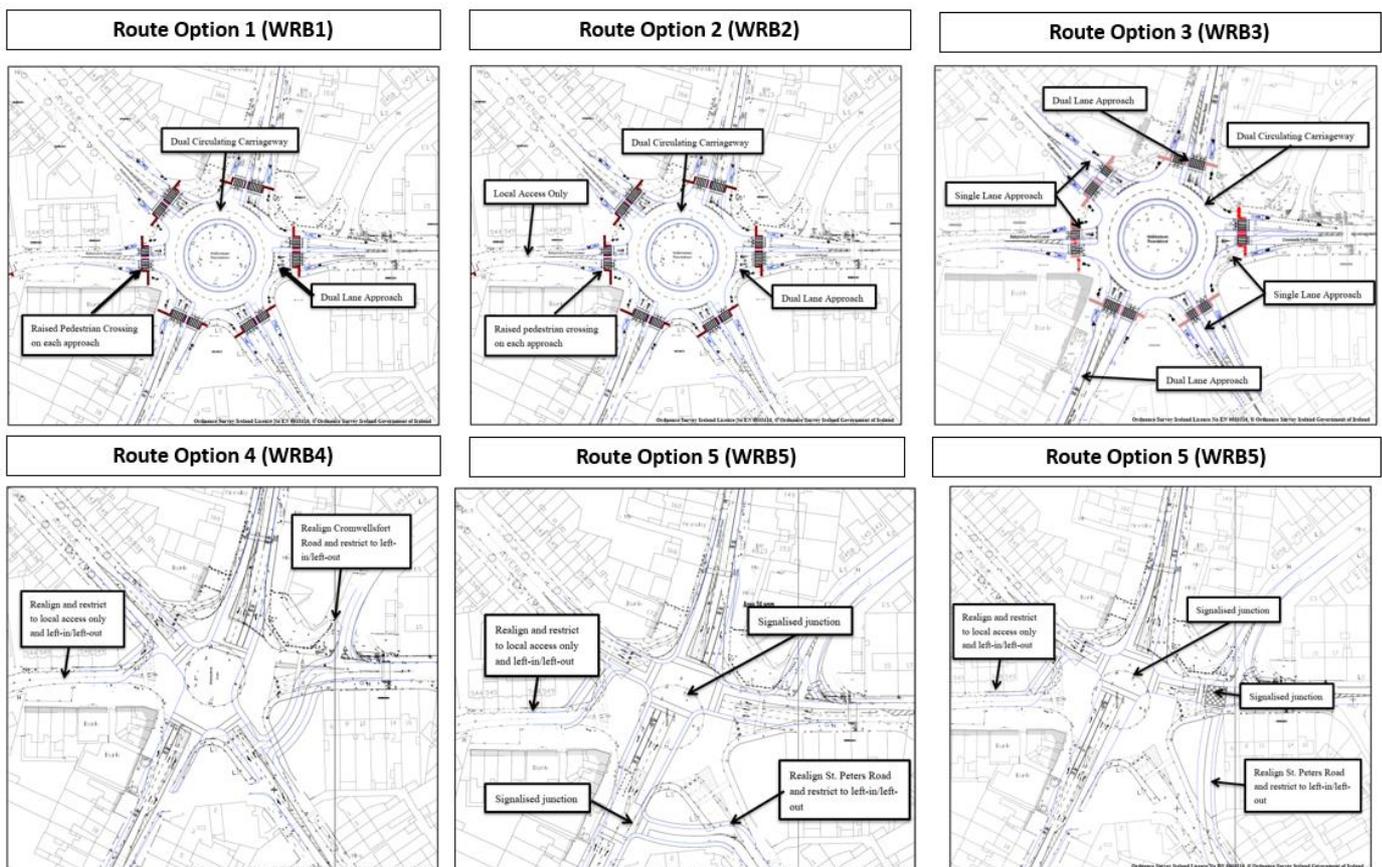


Image 3.16: Alternative Options at Walkinstown Roundabout

Option 1 (WRB1): This option would maintain the roundabout control at the junction with a reduction of the internal circulating carriageway from three lanes to two lanes.

Option 2 (WRB2): This option would require each of the same changes noted to facilitate Option 1 (WRB1). In addition, Option 2 (WRB2) would see the closure of Ballymount Road Lower to through traffic and the creation of a turning head at the end of the new cul-de-sac.

Option 3 (WRB3): This option would maintain the roundabout control at the junction with the following modifications:

- The reduction of the internal circulating carriageway from three lanes to two lanes;
- The reduction the number of lanes from three to one lane on each approach to the roundabout except R819 Greenhills Road and R819 Walkinstown Road which would maintain a two-lane entry;
- The provision of separating islands on all arms of the roundabout;
- The provision of raised pedestrian crossings on all arms of the roundabout as a traffic calming measure to ensure traffic speeds entering and exiting the roundabout are low;
- Creation of shared spaces at the corner of the junction on each approach to facilitate the safe movement of cyclists through the roundabout;
- The introduction of tighter radii at the entry to the roundabout; and
- Provision of bus lanes on approach to the roundabout on R819 Walkinstown Road and R819 Greenhills Road to approximately 35m in advance of the stop line.

Option 4 (WRB4): This option would see the creation of a 4-arm signalised junction and require the following modifications:

- The provision of signalised pedestrian crossings. The existing signalised pedestrian crossings would be removed as part of the installation of the traffic signal controlled junction;
- The application of a five stage plan (four traffic stages servicing each arm of the junction and an exclusive pedestrian stage);
- The provision of cycle lanes through the junction;
- Provision of bus lanes to the stop line on R819 Walkinstown Road and R819 Greenhills Road;
- The realignment of Ballymount Road Lower to join Walkinstown Avenue;
- The restriction of Ballymount Road Lower to left-in / left-out;
- The closure of Ballymount Road Lower to through traffic and the creation of a turning head at the end of the new cul-de-sac road;
- The realignment of Cromwellsfort Road to join St. Peter's Road; and
- The restriction of Cromwellsfort Road to left-in / left-out.

Option 5 (WRB5): This Option would propose the creation of two signalised junctions in close proximity which would operate as two linked traffic signal controlled junctions. The following modifications would be required:

- The provision of signalised pedestrian crossings. The existing signalised pedestrian crossings would be removed as part of the installation of the traffic signal controlled junction;
- The application of a five stage plan (four traffic stages servicing each arm of the junction and an exclusive pedestrian stage);
- The provision of cycle lanes through the junction;
- Provision of bus lanes to the stop line on R819 Greenhills Road;
- The realignment of Ballymount Road Lower to join R112 Walkinstown Avenue;
- The restriction of Ballymount Road Lower to left-in / left-out;
- The closure of Ballymount Road lower to through traffic and the creation of a turning head at the end of the new cul-de-sac road; and
- The realignment of St. Peter's Road to join R819 Greenhills Road.

Option 6 (WRB6): This would propose the creation of two signalised junctions in close proximity which would operate as two linked traffic signal controlled junctions. The following modifications would be required:

- The provision of signalised pedestrian crossings. The existing signalised pedestrian crossings would be removed as part of the installation of the traffic signal controlled junction;
- The application of a five stage plan (four traffic stages servicing each arm of the junction and an exclusive pedestrian stage);
- The provision of cycle lanes through the junction;
- Provision of bus lanes to the stop line on R819 Walkinstown Road and R819 Greenhills Road;
- The realignment of Ballymount Road Lower to join R112 Walkinstown Avenue;
- The restriction of Ballymount Road Lower to left-in / left-out;
- The closure of Ballymount Road lower to through traffic and the creation of a turning head at the end of the new cul-de-sac road; and
- The realignment of St. Peter's Road to join Cromwellsfort Road.

Each 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 Economy, route options 1 (WRB1), 2 (WRB 2) and 3 (WRB3) are significantly cheaper than route options 4 (WRB 4), 5 (WRB 5) and 6 (WRB 6), largely because they do not require any land-take. However, route options 4 (WRB 4), 5 (WRB 5) and 6 (WRB 6) offer the potential for better journey time reliability and as such rank higher.

In terms of Integration, route option 1 (WRB 1) maintains all existing traffic movements at the junction and therefore ranks highest. All other options propose traffic management measures which would require traffic to reroute, and as such have a greater impact. Route option 6 (WRB 6) combines traffic management measures with a junction arrangement that would restrict capacity at the junction more than other signalised options, and as such ranks the worst of all options explored. A similar level of cycle provision can be provided for each option through the junction.

Similarly, in terms of safety, each option provides improved safety for all road users with no option clearly safer than another and as such all options receive a neutral ranking.

In terms of Environment there is nothing to distinguish options under Landscape and Visual impacts. However, route options 1 (WRB 1), 2 (WRB 2) and 3 (WRB 3) have less impact on existing land use compared to the signalised junction arrangements, which require land take to facilitate the required layouts.

On the basis of this assessment, route option 1 (WRB 1, Dual Lane Roundabout) is considered to be the preferred roundabout option for Walkinstown Roundabout for the following reasons:

- It allows good bus lane provision on both the northern and southern approaches to the junction, stopping only 35m in advance of the yield line to accommodate left turners;
- It negates the need for buses to switch lanes to pass through the roundabout (currently identified as a major issue for buses progressing through the three lane roundabout);
- It is considerably cheaper than options to signalise the junction;
- It provides improved facilities for cyclists and pedestrians;
- It requires no land take and would actually create some additional public space; and
- Although it reduces capacity for general traffic, all existing traffic movements are catered for.

3.3.2.1.7 Sub-Section 2.3: Route Options Assessment

Following the stage 1 sifting process, three viable route options for sub-section 2.3 were taken forward for assessment and further refinement as follows:

- **Option 1 (WC1):** Would run along R819 Walkinstown Road between Walkinstown Roundabout and R110 Drimnagh Road. The route would then turn onto R110 Drimnagh Road. This route option ends at the R110 Drimnagh Road / Kildare Road junction, this option was further sub-divided into four sub-options (WC1a-d);
- **Option 2 (WC2):** From Walkinstown Roundabout this route option would run onto Cromwell's Fort Road for a short section before turning onto Bunting Road. This route option ends at the R110 Drimnagh Road / Kildare Road junction, this option was further sub-divided into three sub-options (WC2a-c); and
- **Option 3 (WC3):** This option is a combination of route options 1 (WC1) and 2 (WC2) above, with route option 1 (WC1) catering for inbound buses and 2 (WC2) catering for outbound route options, this option was further sub-divided into three sub-options (WC3a-c).

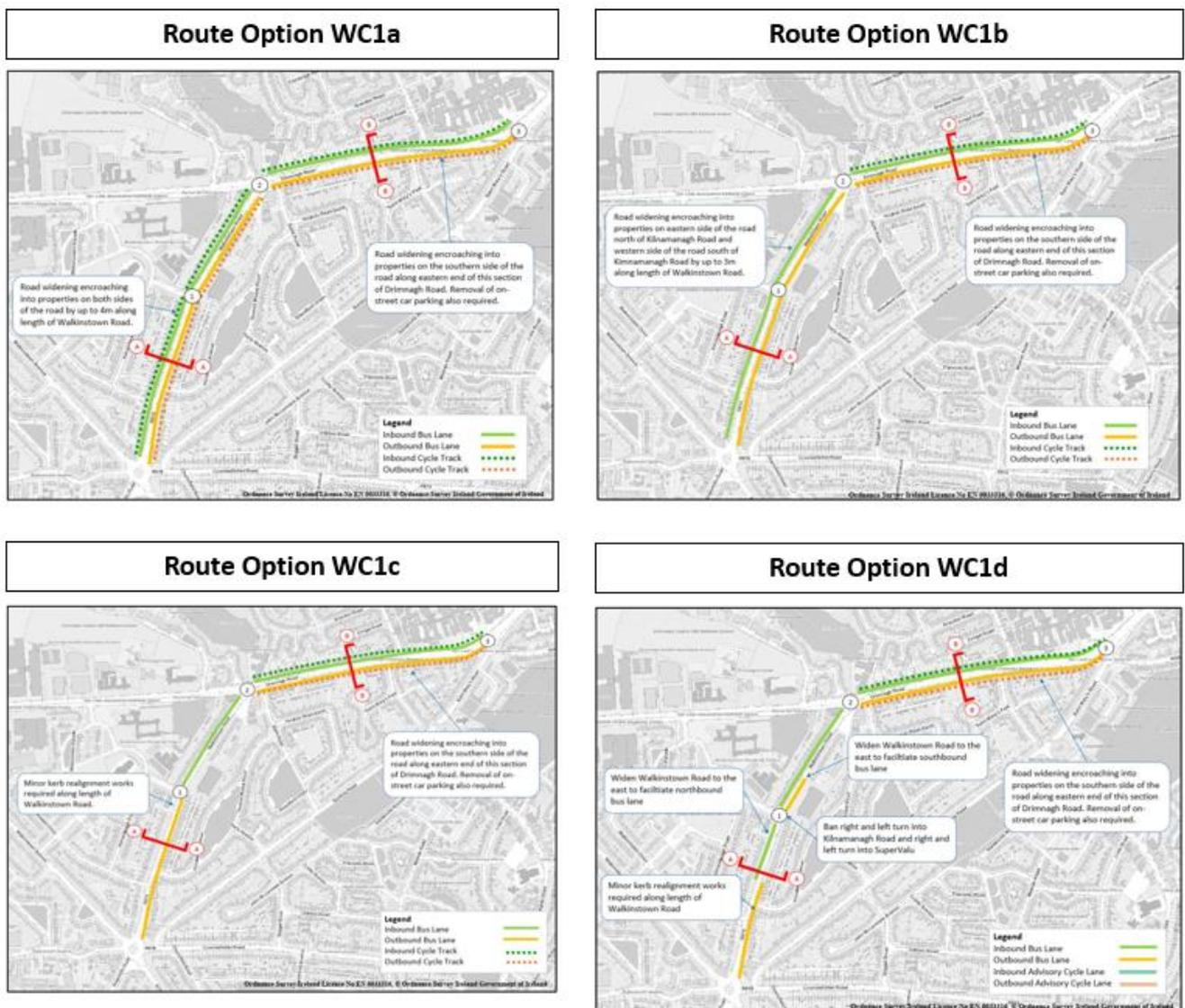


Image 3.17: Alternative Options WC1a-d

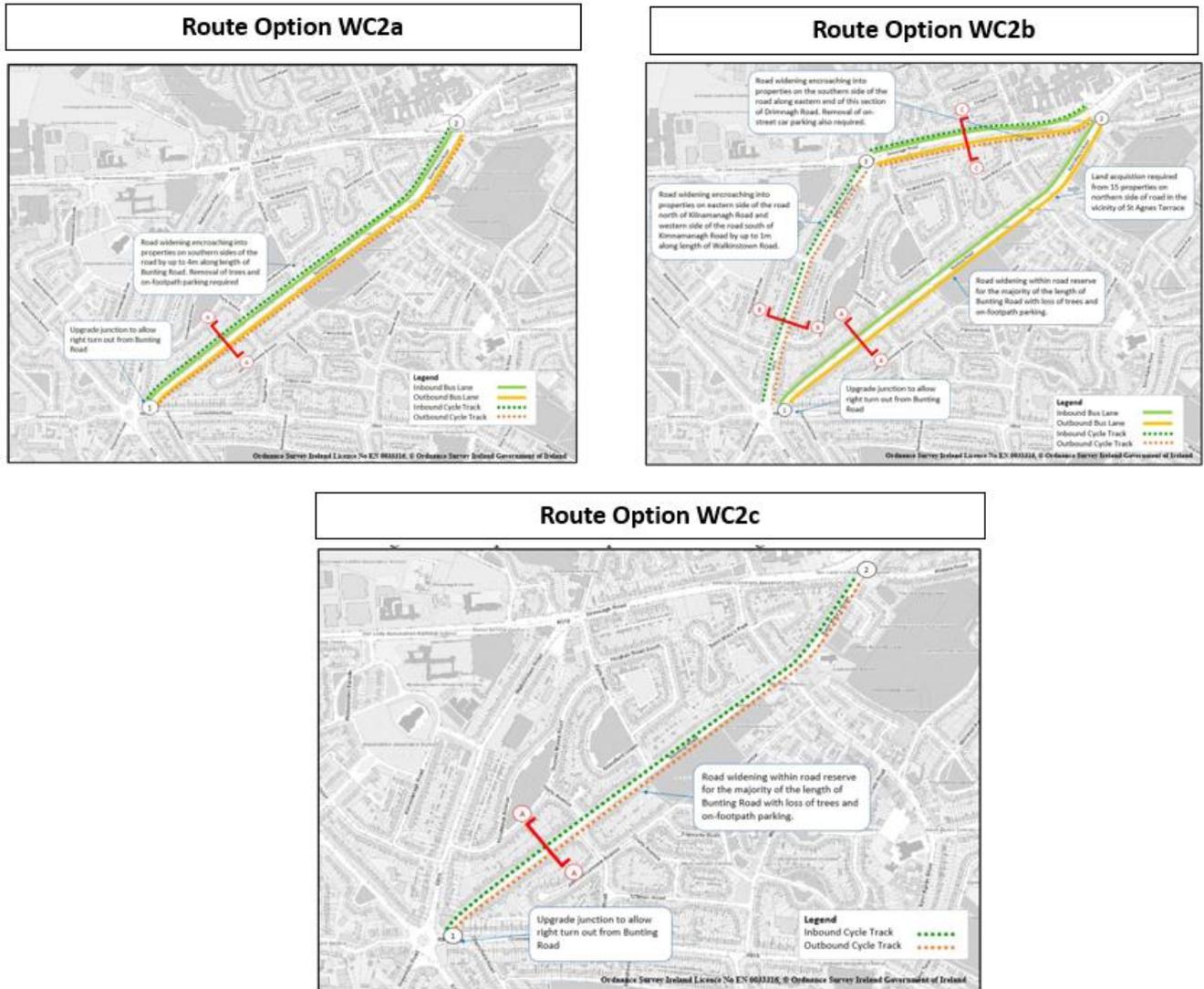


Image 3.18: Alternative Options WC2a-c

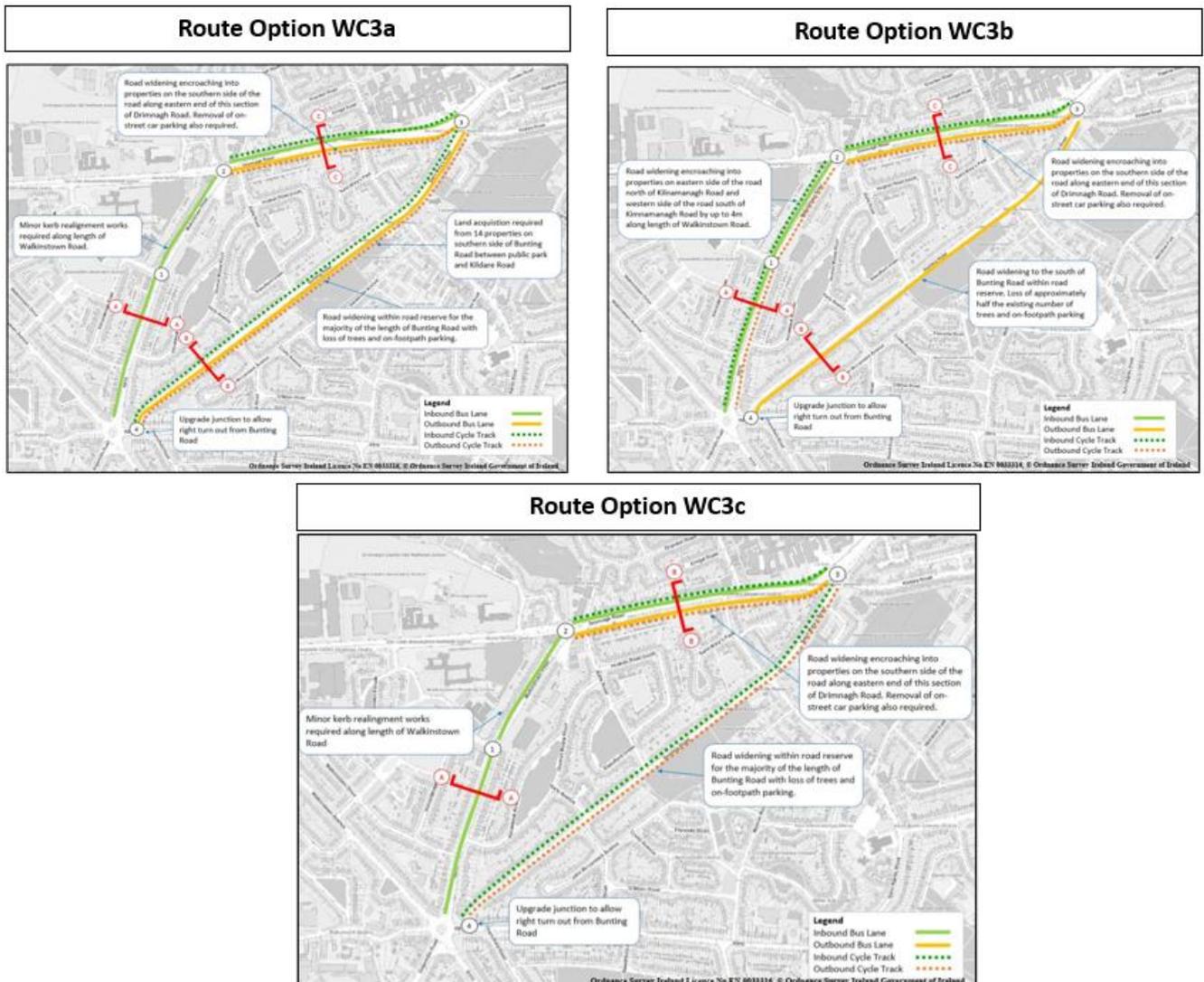


Image 3.19: Alternative Options WC3a-c

Option 1a (WC1a): Bus lanes and raised adjacent cycle lanes in each direction, would see widening along the length of R819 Walkinstown Road with land-take from adjacent properties, to provide bus lanes and raised adjacent cycle lanes in each direction in addition to traffic lanes and footpaths. While the extent of land-take varies along the route, it is generally required to widen the road by up to 7m along the length (typically 3-4m on each side). While the widening would reduce the size of gardens in front of impacted properties, sufficient length would be maintained to allow a car to be parked in the driveway. However, it is worth noting that approximately 20 car parking spaces associated with Supervalu would be removed to facilitate this option. Along R110 Drimnagh Road, there are currently bus lanes in each direction, and these would be maintained under this proposal. To provide dedicated cycle lanes along R110 Drimnagh Road, it would be necessary to widen the road and acquire land from some adjacent properties. This proposal would also require the loss of approximately 16 on-street car parking spaces and 14 trees.

Option 1b (WC1b): Bus lanes in each direction, proposes widening R819 Walkinstown Road, with land-take from adjacent properties, to provide bus lanes in each direction in addition to traffic lanes and footpaths. While the extent of land-take varies along the route, it is generally required to widen the road by up to 3m along the length. To minimise the number of properties impacted, widening would be limited to one side of the road. While the widening would reduce the size of gardens in front of impacted properties, sufficient length would be maintained that would allow a car to be parked in the driveway. It is worth noting that approximately 20 car parking spaces associated with Supervalu would be removed to facilitate this option. Along R110 Drimnagh Road, there are

currently bus lanes in each direction, and these would be maintained under this proposal. To provide dedicated raised adjacent cycle lanes along R110 Drimnagh Road (which is identified as Secondary Route 8C), it would be necessary to widen the road and acquire land from some adjacent properties. This proposal would also require the loss of approximately 16 on-street car parking spaces and 14 trees. For this option, cyclists along R819 Walkinstown Road (which is not identified as a cycle route in the GDA Cycle Network Plan (GDACNP)) would share the bus lane with other traffic.

Option 1c (WC1c): Partial bus lanes in each direction, It is possible to provide one additional lane along this section of R819 Walkinstown Road without the need for land acquisition by narrowing all lanes to 3m in width and carrying out some minor local road widening works. The third lane could be allocated to buses in one of the following ways:

- Bus lane one-way inbound along length;
- Bus lane one-way outbound along length; and
- Bus lanes inbound for part of route, partial bus lane outbound for part of route.

The first two options above would mean that buses in one direction would be afforded no physical priority for a section approximately 800m in length. This could lead to large variability in journey times and therefore impact on the reliability of bus routes in the direction for which no bus lanes are provided. The third option makes the best use of the available road space by allocating bus lanes in each direction for approximately half the route section, both of which would be on approach to junction which form the main source of delay to buses. This option would be strengthened by traffic management and the use of traffic signal controlled 'queue relocation'.

This would manage the sections of the route where no bus lanes are provided, with buses afforded virtual priority by relocating queuing traffic to sections of the route upstream where bus lanes are present (i.e., limited queuing traffic would be present on sections that buses share with general traffic). Traffic volumes on this road are seen to reach 500 vehicles inbound and 700 vehicles outbound in the AM and PM peak hours respectively. For this scheme option, the Kilnarnagh Road / Walkinstown Road signalised junction would be used to manage queues and facilitate the switch from the provision of an inbound bus lane to the outbound bus lane.

Under this route option cyclists would be directed to use Bunting Road which is designated as secondary cycle route 8A. Along R110 Drimnagh Road, there are currently bus lanes in each direction, and these would be maintained under this proposal. To provide dedicated raised adjacent cycle lanes along R110 Drimnagh Road (which is designated as Secondary Route 8C), it would be necessary to widen the road and acquire land from some adjacent properties. This proposal would also require the loss of approximately 16 on-street car parking spaces and 14 trees. There are three signalised junctions along this route option.

Option 1d (WC1d): Alternative partial bus lanes in each direction, this option offers a slight variation to route option 1c (WC1c) splitting the use of the third lane between inbound and outbound bus lanes twice. This arrangement would facilitate bus lanes on approach to the Walkinstown Roundabout, the Walkinstown Road / Kilnarnagh Road junction and the Walkinstown Road / Drimnagh Road junction. This option would therefore mitigate against queues which form at the Walkinstown Road / Kilnarnagh Road junction and improve journey time reliability through this junction. To facilitate bus lanes through the Kilnarnagh Road junction it would be necessary to take some land from a number of properties along the eastern side of R819 Walkinstown Road as well as approximately 20 car parking spaces associated with SuperValu. In addition, to improve the priority of buses at the junction the left turn movements into Kilnarnagh Road and SuperValu would be banned, thereby facilitating bus lanes to the stop line. Traffic currently turning left into Kilnarnagh Road would be rerouted to Walkinstown Drive while traffic turning left into SuperValu at the signalised junction would turn left into the other

SuperValu entrance further north on R819 Walkinstown Road. Under this route option cyclists would be directed to use Bunting Road which is designated as secondary cycle route 8A. A similar cross section to option WC1c would be provided along the length of R819 Walkinstown Road.

Along R110 Drimnagh Road, there are currently bus lanes in each direction, and these would be maintained under this proposal. To provide dedicated raised adjacent cycle lanes along R110 Drimnagh Road (which is identified as Secondary Route 8C), it would be necessary to widen the road and acquire land from some adjacent properties.

This proposal would also require the loss of approximately 16 on-street car parking spaces and 14 trees. There are three signalised junctions along this route option.

Option 2a (WC2a): Bus lanes and raised adjacent cycle lanes in each direction, this option would propose widening Bunting Road, with land-take from adjacent properties as well as from the park which runs alongside Bunting Road, to provide bus lanes and raised adjacent cycle lanes in each direction in addition to traffic lanes and footpaths. This option would require the removal of all trees along Bunting Road (approximately 90) and approximately 180 informal on-footpath parking spaces.

Option 2b (WC2b): Bus lanes in each direction, raised adjacent cycle lanes on R819 Walkinstown Road and R110 Drimnagh Road. This option proposes widening Bunting Road to provide bus lanes in each direction in addition to traffic lanes and footpaths. This option would require the removal of all trees along Bunting Road (approximately 90) and approximately 180 informal on-footpath parking spaces. Also rerouting Secondary Cycle Route 8A from Bunting Road onto R819 Walkinstown Road and R110 Drimnagh Road. To facilitate the raised adjacent cycle lanes, it would be necessary to widen R819 Walkinstown Road, including land take from adjacent properties. While the extent of land-take varies along the route, it would generally be required to widen the road by up to 1m along the length. To minimise the number of properties impacted, widening would be limited to one side of the road where possible.

Along R110 Drimnagh Road, there are currently bus lanes in each direction, and these would be maintained under this proposal. To provide dedicated raised adjacent cycle lanes along R110 Drimnagh Road (which is identified as Secondary Route 8C), it would be necessary to widen the road and acquire land from some adjacent properties. This proposal would also require the loss of approximately 16 on-street car parking spaces and 14 trees.

Option 2c (WC2c): No bus lanes, raised adjacent cycle lanes on Bunting Road and R110 Drimnagh Road. Considering the low volume of traffic on the road, for this option it is assumed that no bus lanes would be provided along this route option. Cycle lanes would be provided along Bunting Road for this route option and would consist of raised adjacent cycle lanes in each direction. To facilitate this it would be necessary to widen the road by up to 1.5m.

Option 3a (WC3a): Bus lanes and raised adjacent cycle lanes in each direction. It is possible to provide a third lane along R819 Walkinstown Road with only minor road widening. For this route option, as R819 Walkinstown Road would be catering for inbound bus routes only, it is proposed to allocate this third lane as an inbound bus lane. Along R110 Drimnagh Road, there are currently bus lanes in each direction, and these would be maintained under this proposal. To provide dedicated raised adjacent cycle lanes along R110 Drimnagh Road, it would be necessary to widen the road and acquire land from adjacent properties. This proposal would also require the loss of approximately 16 on-street car parking spaces and 14 trees.

For outbound buses, Bunting Road would be widened, with land-take from adjacent properties as well as from the park which runs alongside Bunting Road, to provide an outbound bus lane and raised adjacent cycle lanes in each direction in addition to traffic lanes and footpaths. This option would require the removal of all trees along Bunting Road (approximately 90) and approximately 60 spaces of informal on-footpath parking.

Option 3b (WC3b): Bus lanes and raised adjacent cycle lanes in each direction. This option proposes widening R819 Walkinstown Road by up to 4m to provide a bus lane inbound and raised adjacent cycle lanes in each direction. To minimise the number of properties impacted, widening would be limited to the one side of the road.

Along R110 Drimnagh Road, there are currently bus lanes in each direction, and these would be maintained under this proposal. To provide dedicated raised adjacent cycle lanes along R110 Drimnagh Road (which is designated as Secondary Route 8C), it would be necessary to widen the road and acquire land from adjacent properties. This proposal would also require the loss of approximately 16 on-street car parking spaces and 14 trees. For outbound buses, Bunting Road would be widened within the existing road reserve, to provide an outbound bus lane in addition to traffic lanes and footpaths. This option would require the removal of all trees on the southern side of Bunting Road (approximately 40). Space for informal on-footpath parking could be maintained for this option within the existing road reserve.

Option 3c (WC3c): Bus lane inbound, no bus lane outbound. It is possible to provide a third lane along R819 Walkinstown Road with only minor road widening. For this route option, as R819 Walkinstown Road would be catering for inbound bus routes only, it is proposed to allocate this third lane as an inbound bus lane.

Along R110 Drimnagh Road, there are currently bus lanes in each direction, and these would be maintained under this proposal. To provide dedicated raised adjacent cycle lanes along R110 Drimnagh Road (which is identified as Secondary Route 8C), it would be necessary to widen the road and acquire land from adjacent properties. This proposal would also require the loss of approximately 16 on-street car parking spaces and 14 trees.

Given the current low volumes of traffic on Bunting Road, especially in the outbound direction (approximately 70 vehicles per hour close at the junction with Cromwell's Fort Road), this is not considered to be a major issue for buses travelling outbound on Bunting Road. Cycle lanes would be provided along this route option which would consist of raised adjacent cycle lanes in each direction. To facilitate this, it would be necessary to widen the road by up to 1.5m.

Other options were also considered in the area but were not carried forward for the reasons briefly outlined below:

- Option to convert R819 Walkinstown Road to one-way northbound with southbound traffic using Bunting Road. The reverse was also considered. These options were not considered feasible as it would direct large traffic volumes down Bunting Road, which is a residential, traffic calmed street. The impact of such a change on local residents was considered to be too significant and as such these options were not considered further; and
- Option to close access to and egress from the R819 Walkinstown Road approach to the junction for general traffic while maintaining it for buses. This option would require through traffic to continue along R112 Walkinstown Avenue or Bunting Road, R112 Walkinstown Avenue is already a busy road and would struggle to accommodate the additional volumes of rerouted traffic. As noted above, being a residential road, Bunting Road is not suitable for through traffic.

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 economy, route sub-sections WC1c, WC1d (from Option 1) and WC2c (from Option 2), represents the most cost efficient options largely as they require no land-take. The more expensive options require greater land acquisition but generally provide better bus priority and therefore better meet the scheme objectives.

In terms of catchments, Option 1 (WC1) and Option 2 (WC2) rank marginally better than Option 3 (WC3) as the inbound and outbound routing is along the same route. Option 3 (WC3) rank poorest as there is a comparatively small population that is served by bus services in both directions.

In terms of transport network integration, Option 1 (WC1) and Option 3 (WC3) coincide with more Dublin Bus routes, and as such schemes along these routes rank higher than those along Option 2 (WC2). In terms, of cycling Integration, those route options which propose dedicated raised adjacent facilities along roads which are included in the GDACNP (Option 2 (WC2a, WC2c), Option 3 (WC3a and WC3c)) rank highest, while options which propose cycle facilities on adjacent roads or do not propose any facilities receive a poorer ranking.

Under Accessibility and Social Inclusion, route sub-option WC1 ranks marginally higher as it serves more key trip attractors, particularly schools.

In terms of Safety options along route sub-option WC1 requires no turning movements and as such it ranks higher than options along route sub-options WC2 and WC3.

In terms of Environment, generally options which propose greater road widening result in greater impact to the environment such as route sub-options WC1a, WC2a, WC2b and WC3a. There is a potential for route sub-options WC2a and WC2b to impact on the St. Mary's Road / St. Agnes Road Conservation Area, and as such these options have some disadvantages in terms of the potential for Archaeology and Architectural Heritage.

Based on the assessment undertaken, Option 1 (WC1b, WC1c and WC1d) appears to offer more advantages over other options. However, the primary differentiator between these options is that route sub-option WC1b offers slightly better journey times and better physical bus priority, thus providing better journey time reliability. Route sub-option WC1b therefore better meets the scheme objectives and is the preferred option for the Walkinstown area for the following reasons:

- It delivers end-to-end bus lanes through the route section providing improved journey time reliability;
- It integrates better with existing bus routes;
- It delivers high quality cycle facilities along Drimnagh Road;
- It offers a safer route compared to other options due to less turn movements being required; and
- While road widening associated with this option impacts on several properties, there may be an increase in noise or in pollutant concentrations with respect to Air Quality WC1b offers a significant advantage over WC1a due no lesser number of affected properties and proximity to affected properties. Both WC1c and WC1d offer advantages over WC1b due to the number of affected properties but provide only partial bus lanes in each direction.

3.3.2.1.8 Section 3: Route Options Assessment

Following the stage 1 sifting process, for the Crumlin to Grand Canal study area, the remaining route option sections were combined into two core route options and taken forward for further assessment. In addition to these, a route option which utilised both core route options (one for inbound and one for outbound) was considered. The three route options therefore assessed at Stage 2 are:

- Option 1 (CG1) – A route option via Crumlin Road;
- Option 2 (CG2) – A route option via Kildare Road and Sundrive Road; and
- Option 3 (CG3) – Inbound routing via Crumlin Road and outbound via Kildare Road and Sundrive Road.

A fourth option which utilised Kildare Road and Sundrive Road inbound and Crumlin Road outbound was also considered. This option would generally require the same works and would result in the same level of impact as the alternative loop option and as such the CG3 option is considered to represent both variations.

Given the significant constraints along these route options, it was considered appropriate to explore a number of potential scheme options along each route to inform the route selection process. These range from do-maximum solutions which provide the full desired cross-section for segregated bus and cycle priority to reduced cross-sections which balance to some degree the scheme objectives with what can practically be achieved. Generally, the options explored are as summarised below:

- Options which provide the desired cross-section for all road users to achieve the Proposed Scheme objectives – i.e., a bus lane, traffic lane, raised adjacent cycle lane and footpath in each direction;
- Options which focus on the provision of bus lanes in each direction along a particular route option but reduces the provision for cyclists (i.e., share with bus lane, reroutes cycle facilities to nearby roads) and may reduce footpath widths to the minimum provision; and
- Options which focus on a solution which balances the primary scheme objective (i.e., continuous bus lanes) with the practicality of delivering such a scheme (i.e., extensive land-take, impact on environment, extent of engineering works required).

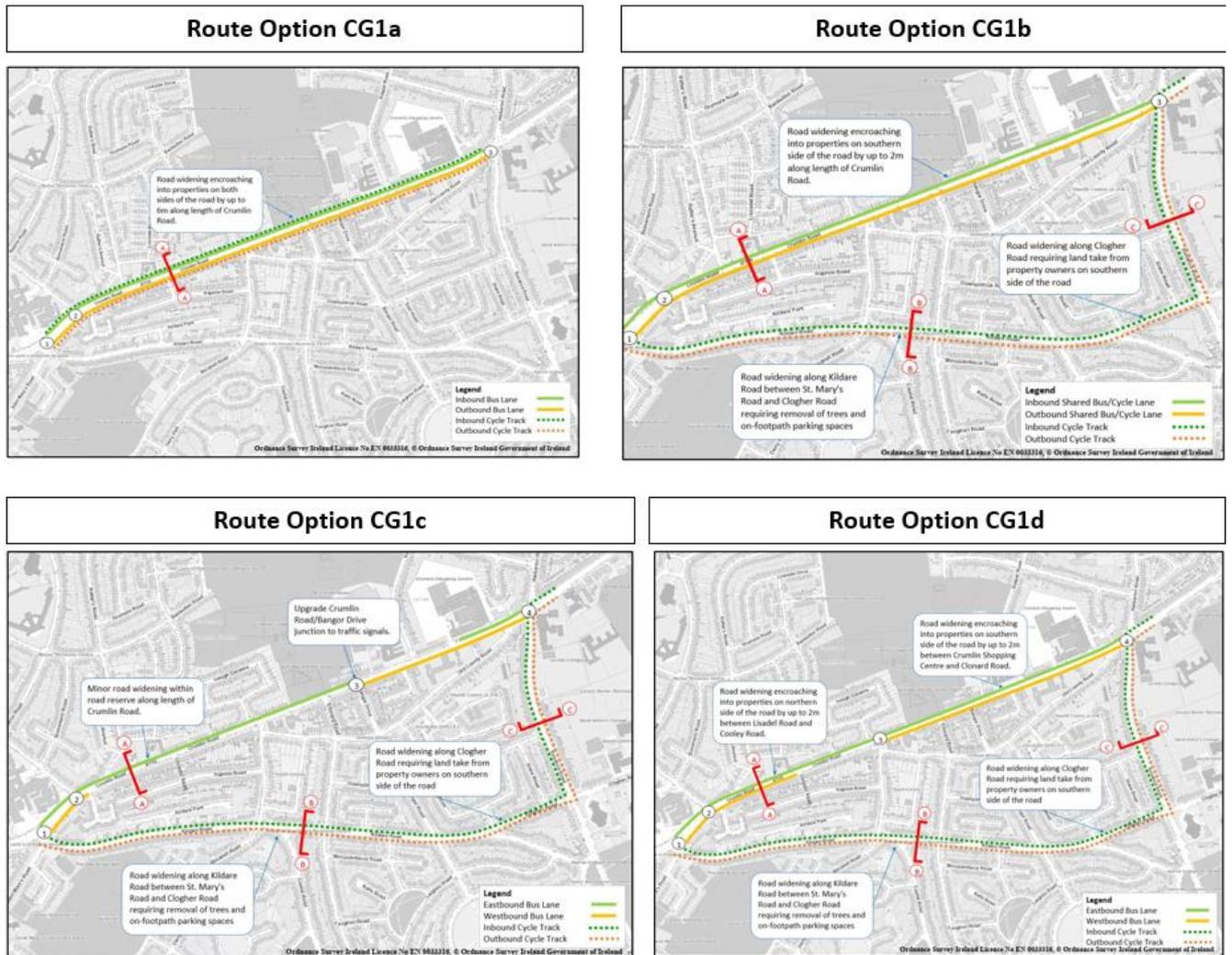


Image 3.20: Alternative Options CG1a-d

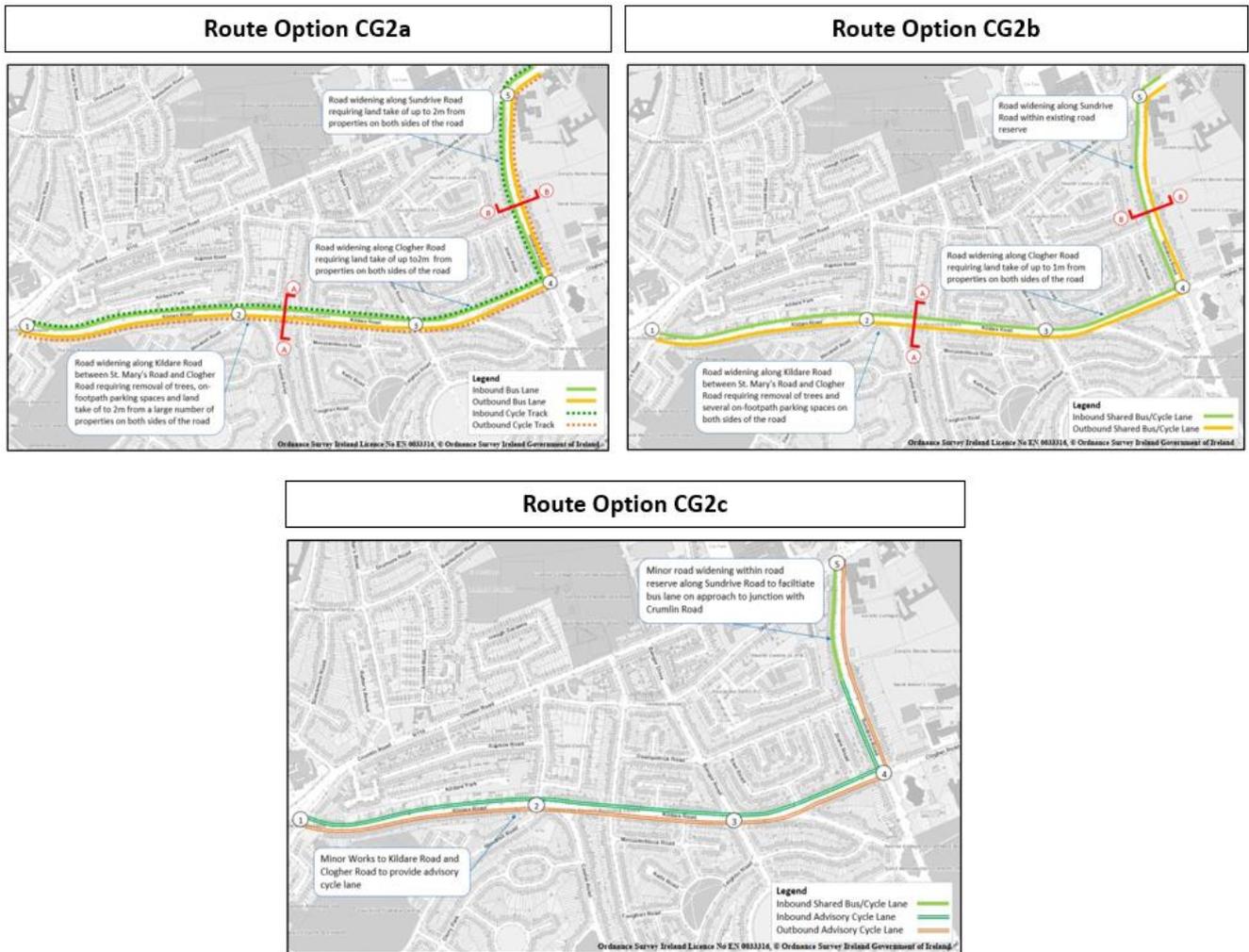


Image 3.21: Alternative Options CG2a-c

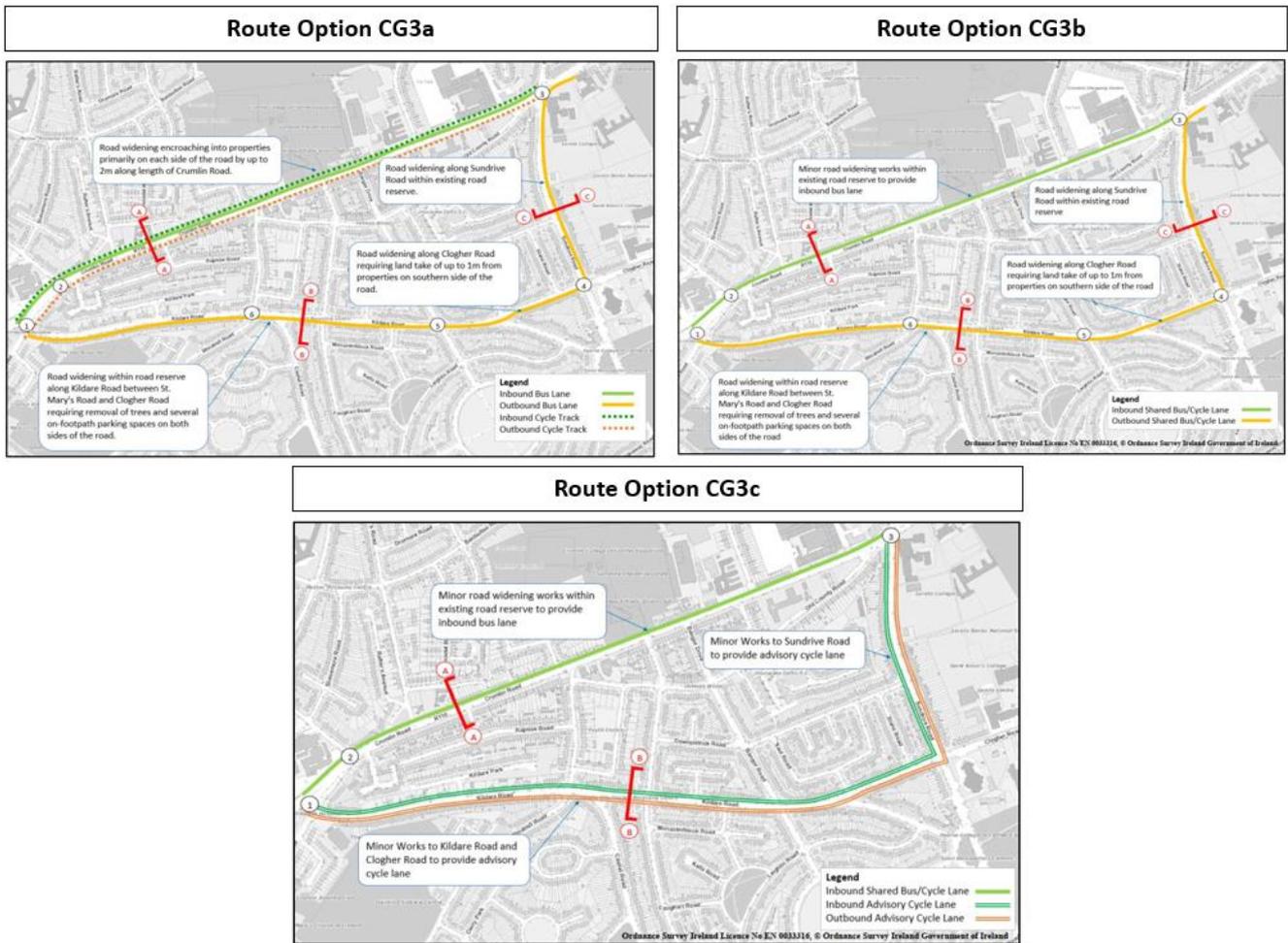


Image 3.22: Alternative Options CG3a-c

Option CG1a: Bus lanes and raised adjacent cycle lanes in each direction, requires road widening along R110 Crumlin Road, with land-take from adjacent properties, to provide bus lanes and raised adjacent cycle lane in each direction in addition to traffic lanes and footpaths. While the extent of land-take varies along the route, it is generally required to widen the beyond the existing road reserve by up to 6m along the length of the option. This widening would reduce the size of gardens and driveways in front of impacted properties such that residents would not have sufficient space to park a car in front of their property. There are three signalized junctions along this route option.

Option CG1b: Bus lanes in each direction, raised adjacent cycle lanes along Kildare Road / Clogher Road / Sundrive Road, would also require widening along R110 Crumlin Road, with land-take from adjacent properties to provide bus lanes in each direction in addition to traffic lanes and footpaths. While the extent of land-take varies along the route, it is generally required to widen beyond the existing road reserve by up to 2m along the length. To minimise the number of properties impacted, widening would be limited to one side of the road where possible. While the widening would reduce the size of gardens in front of impacted properties, sufficient length would be maintained that would allow a car to be parked in each driveway. R110 Crumlin Road is currently designated as secondary cycle route 8A between Kildare Road and Windmill Road, and as Primary Route 8 between Windmill Road and Sundrive Road. As this option assumes no dedicated cycle facilities are to be provided through R110 Crumlin Road, it would be necessary to reroute Secondary Route 8A and Primary Route 8 along Kildare Road, which coincides with Secondary Route 8C. The design of this route option would therefore include offline raised adjacent cycle lanes along Kildare Road and Sundrive Road. To provide raised adjacent cycle lanes along Kildare Road and Sundrive Road, it would be necessary to widen the road and remove some of the on-street and on-footpath parking. In addition, it would be necessary to acquire land from a number of properties on Clogher Road. There are three signalized junctions along this route option.

Option CG1c: Partial bus lanes in each direction, raised adjacent cycle lanes along Kildare Road / Clogher Road/Sundrive Road. It is possible to provide one additional lane along this section of R110 Crumlin Road without the need for land acquisition by removing the existing on-road cycle lanes and narrowing all lanes to 3m in width. The third lane could be allocated to buses in one of the following ways:

- Bus lane one-way inbound along entire length;
- Bus lane one-way outbound along entire length; and
- Bus lane inbound for part of route, bus lane outbound for part of route.

The first two options above would mean that buses in one direction would be afforded no physical priority for a section approximately 1.2km in length. This could lead to large variability in the journey time and therefore impact on the reliability of bus routes in the direction for which no bus lanes are provided. The third option makes the best use of the available road space by allocating bus lanes in each direction for approximately half of the route section. This option would be strengthened by traffic management and the use of traffic signal controlled 'queue relocation'. This would manage traffic on the sections of the route where no bus lanes are provided, with buses afforded virtual priority by relocating queuing traffic to sections of the route upstream where bus lanes are present (i.e. limited queuing traffic that would be present on sections where buses share with general traffic). Traffic volumes on this road are seen to reach 1,000 vehicles inbound and 700 vehicles outbound during the AM peak hour and the opposite in the PM peak hour.

Queue relocation would be complemented with additional traffic management measures to restrict the amount of traffic entering from side roads, which would have potential to contribute to queuing in the area managed by queue relocation signals on R110 Crumlin Road. This would encompass the following measures:

- Conversion of Clonard Road to one-way southbound;
- Closure of Old County Road at the junction with Windmill Road; and
- Closure of Windmill Road at the junction with Old County Road (the Windmill Road / Crumlin Road junction would remain open to facilitate traffic exiting from the adjacent service station).

Alternative routes are available for all traffic currently making the manoeuvres listed above. For this option, it would also be necessary to signalise the Crumlin Road / Bangor Drive junction to facilitate management of queuing. Similar to route option CG1b, for this option cycle facilities would be provided along Kildare Road. There are four signalized junctions along this route option.

Option CG1d: Partial bus lanes in each direction (alternative), raised adjacent cycle lanes along Kildare Road / Clogher Road / Sundrive Road. This option represents a combination of a do-minimum approach (CG1c) and a do-something approach (CG1b) to arrive at an option which provides good bus lane priority along with an element of land-take. This option provides full inbound priority along the length of the route and an outbound bus lane covering almost 85% of the route with a small degree of land-take from properties along R110 Crumlin Road between Crumlin Shopping Centre and a point just west of Clonard Road. The majority of this land-take is required from the southern side of R110 Crumlin Road. Similar to route option CG1c, this option would make use of queue relocation signals to manage queuing on the outbound section of R110 Crumlin Road where no bus lane is considered to be feasible. To facilitate this, the Crumlin Road/Windmill Road junction would be upgraded to traffic signals. Queue relocation would be complemented with additional traffic management measures to restrict the potential for traffic entering from side roads which has potential to contribute to queuing in the area being managed by queue relocation signals on R110 Crumlin Road. This includes the following measures:

- Closure of Old County Road at the junction with Windmill Road;
- Closure of Windmill Road at the junction with Old County Road (the Windmill Road / Crumlin Road junction would remain open to facilitate traffic exiting from the adjacent service station); and
- Banning of right turn from Rafters Road.

Alternative routes are available for all traffic currently making the manoeuvres listed above. For this option, queue relocation would be managed from the point outside AIB at which the outbound bus lane would terminate. Similar to route option CG1b, for this option cycle facilities would be provided along Kildare Road. There are four signalized junctions along this route option.

Option CG2a: Bus lanes and raised adjacent cycle lanes in each direction, proposes widening along Kildare Road, with land-take from adjacent properties to provide bus lanes and raised adjacent cycle lanes in each

direction in addition to traffic lanes and footpaths. While the extent of land-take varies along the route, it is generally required to widen the beyond the existing road reserve by up to 4m along the length. To minimise the number of properties impacted, widening would be limited to one side of the road where possible but 2m would be required from both sides for the majority of the length of the route option. The widening along Clogher Road would reduce the size of gardens and driveways in front of impacted properties such that residents would not have sufficient space to park a car in front of their property. Furthermore, the existing wide footpath along Kildare Road is observed to be used for car parking by local residents, most of whom do not have driveways.

This option therefore results in the loss of approximately 200 on-street / on-footpath car parking spaces. There are four signalized junctions along this route option.

Option CG2b: Bus lanes in each direction, would also see widening to Kildare Road, with land-take from adjacent properties, to provide bus lanes in each direction in addition to traffic lanes and footpaths. Land-take would only be required along Clogher Road to facilitate this option, but the extent of land-take would remove the potential for residents to park a car in their driveway. To minimise the number of properties impacted, widening would be limited to one side of the road where possible. Furthermore, the existing wide footpath along Kildare Road is observed to be used for car parking by local residents, most of whom do not have driveways. This option therefore results in the loss of approximately 200 car parking spaces. There are three signalized junctions along this route option.

Option CG2c: Partial bus lane inbound, no bus lane outbound. This option does not propose any widening works along Kildare Road to minimise land take and the associated impact on local residents. Between Windmill Road and Clogher Road (approximately 500m) a bus lane could be provided in one direction with some minor widening works and without impacting on local residents parking. Given this stretch of Kildare Road is mid-block with no immediate source of delay at either end, there is little benefit to providing an isolated section of bus lane of this nature and as such, this option assumes that this section is not provided. Clogher Road is a narrow single carriageway road, with parking behaviour similar to Kildare Road observed. There is no scope to widen Clogher Road, and therefore no bus lanes can be provided along this section of the route. Traffic flows along Kildare Road are observed to be approximately 300 vehicles in each direction in each peak hour. Sundrive Road is observed to be busier, with approximately 550 vehicles inbound and 400 vehicles outbound in the morning peak hour and reverse in the PM peak hour. Sundrive Road typically consists of a 9m carriageway. The road is fronted by residential properties, many of which do not have driveways. Similar to nearby roads, residents are observed to park on the footpath / kerb in front of their properties and it would be difficult to remove resident's ability to do this. One additional lane could be provided on the section of Sundrive Road which is fronted on the eastern side of the road by Loreto College, without impacting on this parking activity. This would require some kerb works along the eastern side of the road to widen the carriageway. To provide priority on approach to the Sundrive Road/Crumlin Road junction, this bus lane would be allocated to inbound buses. There are three signalized junctions along this route option.

Option CG3a: Bus lanes and raised adjacent cycle lanes in each direction. This option requires widening along R110 Crumlin Road, with land-take from adjacent properties, to provide an inbound bus lane and raised adjacent cycle lanes in each direction in addition to traffic lanes and footpaths. While the extent of land-take varies along the route, it is generally required to widen the road by up to 4m along the length. To minimise the number of properties impacted, widening would be limited to one side of the road where possible. While the widening would reduce the size of gardens in front of impacted properties, sufficient length would be maintained that would allow a car to be parked in the driveway. To facilitate an outbound bus lane, it would be required to widen Kildare Road. Land-take would only be required along Clogher Road to facilitate this option. To minimise the number of properties impacted, widening would be limited to one side of the road where possible. This option would require the removal of 50 informal on-footpath car parking spaces. There are three signalized junctions along this route option.

Option CG3b: Bus lanes in each direction. This option proposes minor widening on Crumlin Road to provide an inbound bus lane in addition to traffic lanes and footpaths. This option would not require any land-take. Cyclists would be accommodated in the bus lane. To facilitate an outbound bus lane, it would be required to widen Kildare

Road. Land-take would only be required along Clogher Road to facilitate this option. To minimise the number of properties impacted, widening would be limited to one side of the road where possible. This option would require the removal of approximately 50 informal on-footpath car parking spaces. There are three signalized junctions along this route option.

Option CG3c: Bus lane inbound, no bus lane outbound. This option would still require minor widening on R110 Crumlin Road to provide an inbound bus lane in addition to traffic lanes and footpaths. This option would not however require any land-take. Cyclists would be accommodated in the bus lane. To minimise the impact on residents along Kildare Road, this option proposes no bus lane along this section in either direction. A bus lane could be provided on the section of Sundrive Road which is fronted on the eastern side of the road by Loreto College without the need for land take. However, there is little benefit to providing an isolated section of bus lane on the exit side of a junction and as such this option does not include this section of bus lane. There are three signalized junctions along this route option

Some other options were also considered in the area but were not carried forward to the multi criteria assessment for the reasons outlined below:

- Remove traffic from R110 Crumlin Road and reallocate road space to bus lanes. Options to divert traffic from R110 Crumlin Road were also considered including making R110 Crumlin Road one-way in either direction for general traffic with bus lanes in each direction. Options to close R110 Crumlin Road to through traffic were also considered. However, there is no suitable alternative on which to re-route traffic. A combination of Sundrive Road and Kildare Road appears to be the most suitable alternative, but Kildare Road is a traffic calmed road on which though traffic is already discouraged through the use of speed ramps. Any proposal to reroute the large volumes of through traffic on R110 Crumlin Road along residential roads would detract from the residential environment along Kildare Road. As such, all proposals to reroute traffic from R110 Crumlin Road were discounted; and
- Options to use Old County Road for diverted outbound traffic were also considered which would allow R110 Crumlin Road outbound to be maintained for buses only. However, Old County Road is also a narrow traffic calmed road with on-street and on-kerb parking observed along its length. This road is not considered suitable to accommodate large volumes of diverted traffic.

Each 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 economy, route option CG2c represents the most cost efficient solution. The most expensive route options (CG1a and CG2a) require more land acquisition. While these options generally provide better journey time reliability, there are less expensive options which would also offer good reliability (e.g., CG1b).

In terms of catchments, scheme options along route options CG1 and CG2 rank marginally better as both the inbound and outbound routing is along the same route. Scheme options along route option CG3 ranks poorest as there is only a small population that is served by bus services in both directions.

In terms of transport network integration, route option CG1 coincides with more Dublin Bus routes and as such schemes along these routes rank higher than those along route options CG2 and CG3. In terms, of cycling integration, those route options which propose dedicated raised adjacent facilities along the route of planned routes in the GDACNP rank higher (CG1a, CG2a and CG3a rank highest).

Under Accessibility and Social Inclusion, route options CG1 and CG3 directly serve more key trip attractors.

In terms of Safety options along route option CG1 require no turning movements and as such it ranks higher than options along route CG2 and CG3. Safety for cyclists is somewhat reduced in route options CG1b, CG1c and CG1d which necessitate the removal of existing cycle lanes on Crumlin Road. It should be noted, however, that route options CG1b, CG1c and CG1d reroutes cyclists from Crumlin Road to a high quality facility on Kildare Road.

In terms of Environment, generally options which propose more road widening result in greater impact on the environment (land-take resulting in loss of amenity space, traffic lane proximity to premises, loss of part of gardens, tree loss etc.) such as route options CG1a, CG2a, CG2b and CG3a. CG1c, CG2c and CG3c would remain within the existing road corridor resulting in an advantage over other options for these criteria.

Based on the assessment undertaken, route options CG1b, CG1c and CG1d offer more benefits over other options combining Integration, Accessibility & Social Inclusion and Safety, in terms of environment CG1b has some disadvantages compared to CG1c, CG2c and CG3c (Architectural Heritage, Air Quality, Noise & Vibration and Land Use Character) but has some advantages over CG1a, CG2a and CG3a (Architectural Heritage, Landscape & Visual and Land Use Character). However, the primary differentiator between these options is that route options CG1b offers better physical bus priority and better journey time reliability. Option CG1b therefore better meets the Proposed Scheme objectives and is the preferred option for the Crumlin area for the following reasons:

- It delivers end-to-end bus lanes through the route section providing improved journey time reliability;
- It integrates better with existing bus routes;
- It delivers high quality cycle facilities along a parallel route;
- It offers a safer route compared to other options; and
- While road widening associated with this option impacts on the grounds of 2 buildings recorded on the National Inventory of Architectural Heritage, the scheme would not directly impact on the buildings.

3.3.2.1.9 Fixed Route Section: Crumlin Road between Sundrive Road and Dolphin Road

Following the Stage 1 sift only one route option was identified between Sundrive Road and R110 Dolphin Road as described below. This route is identified as route C09 in Image 3.8. This section of route would run along R110 Crumlin Road between Sundrive Road and R110 Dolphin Road.

This road also forms part of Primary Route 8 in the GDACNP. However, in order to provide dedicated cycle facilities in addition to bus lanes in each direction it would be necessary to take 3-4m of land from either side of the road. The northern side of R110 Crumlin Road in this area consists of residential properties with short gardens of approximately 4m in length. The required amount of widening would therefore remove gardens in front of these houses. The southern side of R110 Crumlin Road also consists of residential properties but with longer garden / driveways. However, widening by the required amount would remove the ability of residents to park a car in their driveway. A combination of land-take from properties on each side of the road was also explored but it was considered that any widening into properties on the northern side of the road would significantly reduce the amenity value of these gardens. On balance, it is not therefore considered practical to provide cycle lanes in either direction through this section. As such this section of the route would remain largely as per the existing arrangement.

3.3.2.1.10 Section 4: Route Options Assessment

Following the stage 1 sifting process, there was only one viable route option between the canal and R137 Patrick Street and there were two route options available for the remainder of this route which were taken forward for assessment and further refinement as follows:

- Option 1 (GC1) – A route option via R137 Patrick Street / Nicholas Street; and
- Option 2 (CG2) – A route option inbound via R137 Patrick Street / Nicholas Street and outbound via Werburgh Street, Bride Street and Kevin Street Upper.

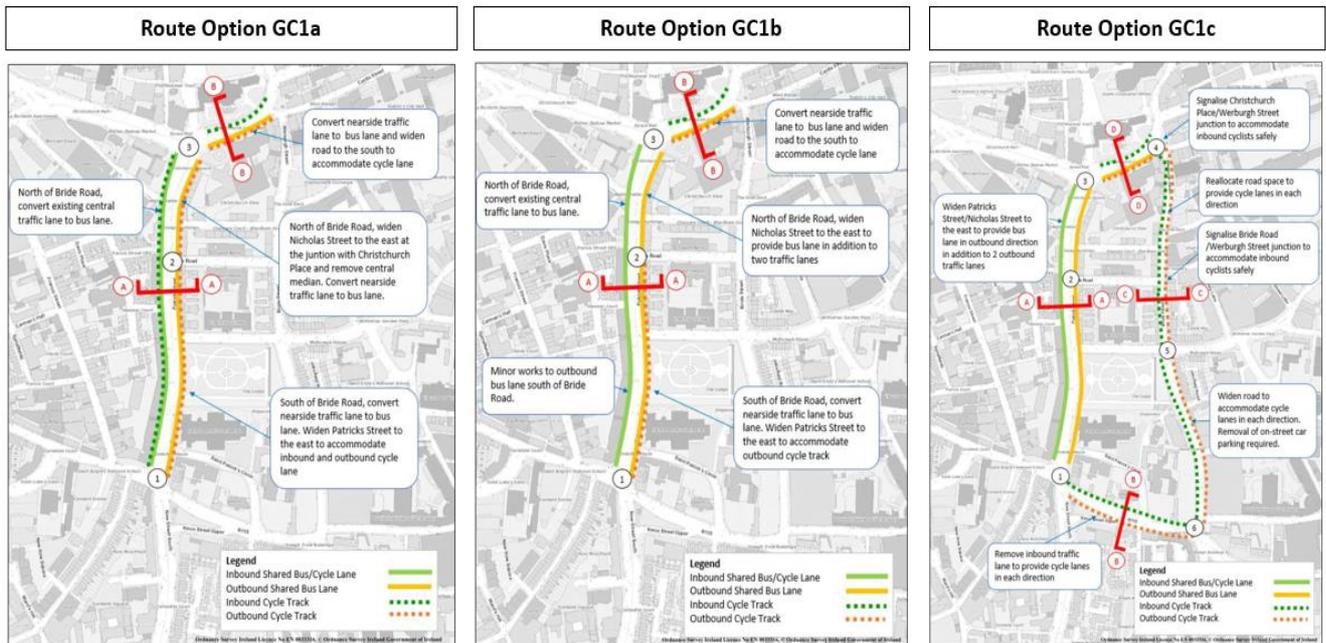


Image 3.23: Alternative Options GC1a-c

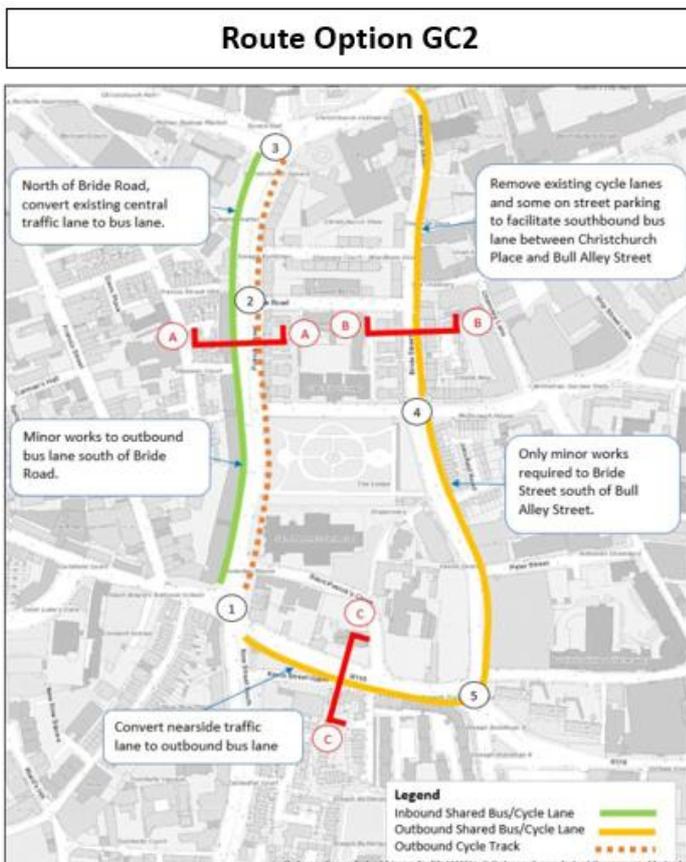


Image 3.24: Option GC2

Option 1a (GC1a): Remove central median on R137 Patrick Street / Nicholas Street. This option would provide bus lanes and raised adjacent cycle lanes along each side of R137 Patrick Street / Nicholas Street by widening the road to the east by up to 3m and removing the central median and associated trees.

Inbound, R137 Patrick Street currently caters for a bus lane and traffic lane between Kevin Street Upper and Bride Road. North of Bride Road, there is no bus lane inbound. However, it would be possible to convert the nearside traffic lane to a bus lane. As the majority of buses at this point will be turning right towards Dame Street, it would be necessary for buses to enter the central lane to turn right. This option assumes this proposal.

Outbound, a bus lane would be provided by converting one of the outbound traffic lanes to a bus lane. While this option provides much improved bus priority, it would likely have an impact on traffic particularly in the evening peak hour when there is approximately 1,000 outbound vehicles currently using the remaining traffic lane based on current traffic volumes. However, it is worth noting that the level of traffic on R137 Patrick Street is likely reduce to in future when changes are made to the Dame Street/College Green area as part of the City Centre Transport Plan. For this section, a dedicated raised adjacent cycle lane could be provided by widening to the east by up to 2m.

Along R137 Christchurch Place, a bus lane could be provided in one direction by reallocating one of the existing traffic lanes to a bus lane. For the purposes of this assessment, it is assumed that this bus lane would be provided in the outbound direction, thereby improving bus journey times on approach to the junction with R137 Nicholas Street. Dedicated inbound and outbound raised adjacent cycle lanes would also be possible by widening R137 Christchurch Place to the south by up to 1m.

Option 1b (GC1b): Maintain central median on R137 Patrick Street / Nicholas Street. R137 Patrick Street currently caters for a bus lane and traffic lane in the inbound direction between Kevin Street Upper and Bride Road. North of Bride Road, there is no bus lane inbound. However, it would be possible to convert the nearside traffic lane to a bus lane allowing left turning traffic to cross the bus lane closer to the junction. This proposal is assumed for this option.

Inbound, there is currently a substandard cycle lane adjacent to the existing bus lane ranging from 1.0m - 1.5m in width along R137 Patrick Street and R137 Nicholas Street. It is not possible to provide the desired 2m wide cycle lane and maintain the central median as widening to the west would introduce pinch points in the footpath of less than 1.0m. As such, for this option inbound cyclists would share with the bus lane in this option along R137 Patrick Street and R137 Nicholas Street.

Outbound, between R137 Christchurch Place and Bride Road, it would be possible to widen the carriageway by up to 2m to provide a bus lane in addition to two southbound traffic lanes. For this section, outbound cyclists would share with the bus lane.

South of Bride Road, as for option GC1a, an outbound bus lane could be provided by converting the nearside traffic lane to a bus lane.

Along R137 Christchurch Place, a bus lane could be provided in one direction by reallocating one of the existing traffic lanes to a bus lane. As with option CG1a, it is assumed that this bus lane would be provided in the outbound direction and improve bus journey times on approach to the junction with R137 Nicholas Street. Dedicated inbound and outbound raised adjacent cycle lanes would also be provided by widening R137 Christchurch Place to the south by up to 1m.

Option 1c (GC1c): Two-way buses on R137 Patrick Street / Nicholas Street, cyclists on Werburgh Street. R137 Patrick Street currently caters for a bus lane and traffic lane in the inbound direction between Kevin Street Upper and Bride Road. North of Bride Road there is no bus lane inbound. However, the nearside traffic lane could be converted to a bus lane allowing left turning traffic to cross the bus lane closer to the junction. This proposal is assumed for this option.

Inbound, there is currently a substandard cycle lane adjacent to the existing bus lane ranging from 1.0m - 1.5m in width along R137 Patrick Street and R137 Nicholas Street. It is not possible to provide the desired 2m wide cycle lane and maintain the central median as widening to the west would introduce pinch points in the footpath of less than 1.0m. As such, for this option, inbound cyclists would share with the bus lane in this option along R137 Patrick Street and R137 Nicholas Street.

Outbound, the carriageway could be widened by up to 2m to provide a bus lane in addition to two southbound traffic lanes. For this section, outbound cyclists would share with the bus lane.

Along R137 Christchurch Place, a bus lane could be provided in one direction by reallocating one of the existing traffic lanes to a bus lane. For the purposes of this assessment, it is assumed that this bus lane would be provided in the outbound direction to improve bus journey times on approach to the junction with R137 Nicholas Street. Dedicated inbound and outbound raised adjacent cycle lanes would also be provided by widening R137 Christchurch Place to the south by up to 1m.

R137 Patrick Street / Nicholas Street is identified as a secondary cycle route in the GDACNP, and as such would normally require the provision of dedicated raised adjacent cycle lanes. However, this route option would provide cycle lanes along Werburgh Street, Bride Street, and Kevin Street Upper, which is identified as the primary cycle route in the GDACNP. To accommodate the raised adjacent cycle lane on Werburgh and Bride Street, it would be necessary to remove car parking spaces. On Kevin Street Upper it would be necessary to remove a traffic lane to facilitate the raised adjacent cycle lane. To maintain traffic capacity exiting the city, this proposal assumes that an inbound traffic lane would be removed.

Option 2 (GC2): Patrick Street and Nicholas Street (inbound route) and Werburgh Street, Bride Street and Kevin Street Upper (outbound route). R137 Patrick Street currently caters for a bus lane and traffic lane in the inbound direction between Kevin Street Upper and Bride Road. North of Bride Road there is no bus lane inbound. However, it would be possible to convert the nearside traffic lane to a bus lane allowing left turning traffic to cross the bus lane closer to the junction. This proposal is assumed for the purposes of this assessment.

Inbound, there is currently a substandard cycle lane adjacent to the existing bus lane ranging from 1.0m - 1.5m in width along R137 Patrick Street and R137 Nicholas Street. It is not possible to provide the desired 2m wide cycle lane and maintain the central median as widening to the west would introduce pinch points in the footpath of less than 1.0m. As such, for this option, inbound cyclists would share with the bus lane along R137 Patrick Street and R137 Nicholas Street.

Outbound on Patrick Street, it is proposed to widen the road to provide a dedicated raised adjacent cycle lane.

Outbound there are currently no bus lanes provided along Werburgh Street or Bride Street between Ship Street Little and Bull Alley Street. This option would provide a bus lane along Werburgh Street as far as Ship Street Little an outbound bus lane on approach to the Bull Alley Street junction by removing the on street cycle lanes. It should be noted that these cycle lanes are currently only peak hour cycle lanes (07:00 – 10:00 and 12:00 – 19:00, Monday – Saturday) and the cycle lanes are seen to be used for car parking out of hours. Any bus lane in this area may also need to be restricted to peak hours to accommodate out of hours parking.

South of Bull Alley Street, a bus lane is provided as far as the Kevin Street Upper junction, but it should be noted that use is restricted to the same hours as the cycle lane on Bride Street and used as car parking outside of these hours.

Along Kevin Street Upper, an outbound bus lane would be provided by converting a traffic lane to a bus lane. An inbound raised adjacent cycle lane would also be provided by widening the road by approximately 1m.

The following options were also considered in the area but were not carried forward to a multi criteria assessment for the reasons briefly outlined below:

- **Two-way bus and cycle facilities along Patrick Street / Nicholas Street, maintain two outbound traffic lanes and remove median:** This option is not physically possible due to a pinch point at the junction of Patrick Street and Bull Alley Street which would not accommodate this cross-section. In addition, this option would require the removal of loading bays outside commercial properties, require encroachment into St. Patrick Park and reduce the footpath in front of St. Patrick Cathedral from approximately 10m to 5m. Given these impacts, this option was not considered to be practically deliverable; and
- **Two way buses and cycling on Werburgh Street, Bride Street and Kevin Street Upper:** To facilitate this it would be necessary to remove the northbound traffic lane from Bride Street between

Bull Alley Street and Bride Road to accommodate a northbound contraflow bus lane. This would effectively remove the movement of traffic from Golden Lane / New Bride Street to R137 Patrick Street (i.e., traffic moving from the south City Centre to north / west of the city). Removing this movement would force this turning traffic (750 vehicles in the PM peak hour) to the turn at Kevin Street Upper / New Street Junction. This is a low capacity turn which would not be capable of accommodating the additional traffic volumes. Furthermore, this option would require the signalisation of the Werburgh Street/Christchurch Place junction to facilitate exiting traffic in addition to cyclist movements, which would prove difficult given the proximity of the Fishamble Street / Dame Street junction and the Nicholas Street/High Street junction. Given the above, this option was not considered to be practically deliverable.

Each 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.

Given that both route options in the City Centre run in close proximity to each other, the multi-criteria assessment shows that there is little to differentiate between the route options. There are, however, a few differing sub-criteria.

In terms of economy, although the overall cost is not significant, route option GC1c is almost double the cost of GC1a and GC1b with GC2 slightly more expensive than these options. In terms of transport reliability, the level of bus priority achievable is comparable for each option. However, route option GC2 results in longer journey times, and as such receives a lower ranking.

In terms of Integration, there is little to differentiate between each option. While route options GC1a and GC1b would result in the removal of a traffic lane along R137 Patrick Street / Nicholas Street, the volume of traffic on this road may reduce slightly with the introduction of traffic management changes in the City Centre. Additionally, route option GC2 results in the loss of a traffic lane on Kevin Street Upper, which experiences greater congestion than Patrick Street in peak hours. As such, all options are considered to have a similar impact. Option GC1a ranks highest in terms of cycling integration as it provides dedicated cycle facilities along the route of the CBC.

Scheme options along route option GC1 rank marginally better than route option GC2 in terms of catchments primarily as both the inbound and outbound routing runs along the same route for these options.

Similarly, under Safety there is nothing to differentiate between each route option. However, it is worth noting that the removal of cycle lanes along a section of Bride Street to accommodate the southbound bus lane in route option GC2 makes this section slightly less safe for cyclists.

In terms of Environment, relative to other options, route option GC1a has a potentially higher impact on the environment due to the road widening works along R137 Patrick's Street and R137 Nicholas Street and the removal of the central median and trees.

Based on the assessment undertaken, while there is little to distinguish between routes, route option GC1a appears to offer advantages over other options. Route option GC1a is therefore preferred for the City Centre area for the following reasons:

- It provides significantly better facilities for cyclists along an identified secondary cycle route and along the core bus corridor route;
- It serves a good residential and employment catchment;
- It provides good legibility for both north and southbound bus users;
- It serves a large number of key trip attractors; and
- Notwithstanding that Option GC1a was considered to have some disadvantages in environmental terms when compared to the other options, option GC1a is considered to have more advantages in terms of meeting the Proposed Scheme objectives.

3.3.2.1.11 Fixed Route Section: Dolphin's Barn / Cork Street between the Grand Canal and Patrick Street

Following the Stage 1 sift only one route option was identified between the Grand Canal and R137 Patrick Street as described below. This route is formed by a combination of route options CC02, CC03 and CC08 which are presented in Image 3.9. This section of route would run along Dolphin's Barn, R110 Dolphin's Barn Street and R110 Cork Street before turning right onto Dean Street.

Between the canal and R811 South Circular Road, minor kerb realignments as well as the reallocation of a traffic lane to a bus lane are proposed along Dolphins Barn to facilitate bus lanes and cycle lanes in each direction. It is proposed to maintain the existing tree lined median in this location. To facilitate bus lanes to the stop line, it is proposed to ban the left turn from Dolphins Barn south of its junction with R811 South Circular Road. This is currently a lightly trafficked movement with only approximately 20 vehicles making this movement in the morning peak hour and 70 in the evening peak hour. Traffic currently making this turn would be rerouted to the Herberton Road junction, which better accommodates traffic travelling from the Crumlin to Rialto. Similarly, it is proposed to ban the left turn from R110 Cork Street to R811 South Circular Road, which currently only accommodates 36 vehicles in the morning peak hour and 56 vehicles in the evening peak hour. Traffic currently making the movement would be rerouted to Donore Avenue, further north. The existing right turn only lane would be converted to a right and straight ahead lane to facilitate this.

There are currently bus and cycle lanes provided along the length of R110 Cork Street. It is proposed to upgrade these to meet current standards, particularly the cycle lanes which will be converted to raised adjacent facilities. To facilitate this, minor road widening is required along the length of R110 Cork Street. Existing on-street parking and loading bays will be maintained under this proposal.

Along Dean Street, the road is significantly constrained by the proximity of buildings on either side of the road. As such, it is not possible to provide bus lanes in either direction. It is, however, possible to provide a raised adjacent cycle lane in the inbound direction. To maintain some degree of priority for buses along this section it is proposed to manage queuing on Dean Street using the signalised junctions on either side. To minimise the impact on outbound buses, it is proposed to ban the right turn from Francis Street onto Dean Street.

3.3.2.2 Clondalkin to City Centre Corridor: Route Options Assessment

3.3.2.2.1 Section 2: Route Options Assessment

Following the Stage 1 sifting process, four viable route options for Section 2 were taken forward for assessment and further refinement as follows:

- Option S2-1 via Old Nangor Road, Main Street, Monastery Road and Naas Road (part of Option S2-2);
- Option S2-2 via Fonthill Road South and Naas Road;
- Option S2-3 via R134 New Nangor Road; and
- Option S2-4 via Ninth Lock Road, Orchard Road, Watery Lane and R134 New Nangor Road (part of Option S2-3).

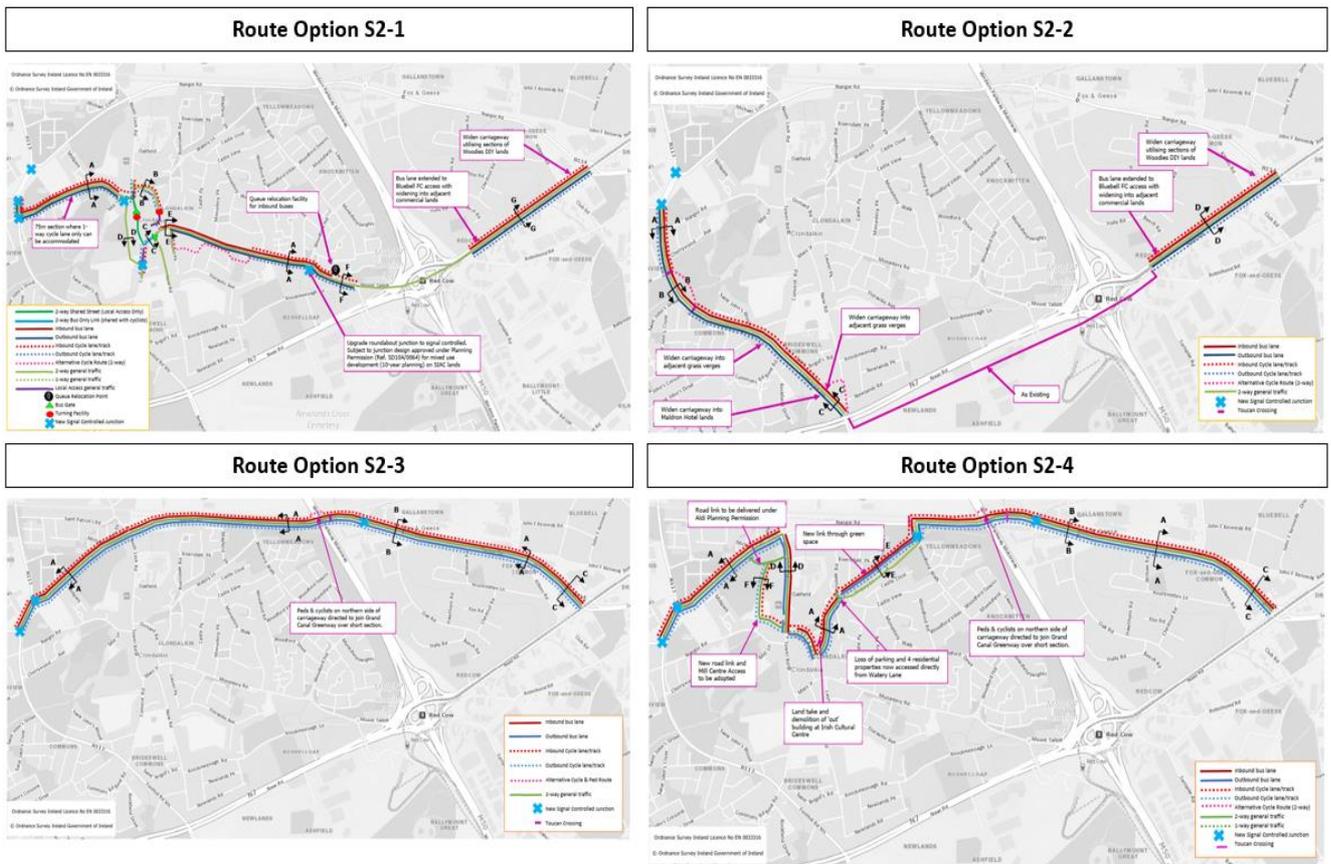


Image 3.25: Alternative Options S2

Option S2-1: This option will provide continuous bus priority in both directions along the Old Nangor Road. Cycle lanes will also be accommodated aligning with proposals for a feeder route as identified within the GDACNP. It should be noted there will be a gap in the cycle provision (approximately 75m) where cycle facilities cannot be accommodated due to an existing planning permission (Ref. SD15A/0304) on the Coláiste Chillian School lands for the provision of four additional classrooms. Carriageway widening to accommodate cycle facilities would encroach on the footprint of the proposed classrooms. The following interventions would be required to accommodate bus lanes on the Old Nangor Road:

- Carriageway widening into the adjacent residential zoned lands to the north (currently utilised as green space bordering the Coláiste Chillian School sports field);
- Carriageway widening into the Coláiste Chillian School lands whilst respecting the footprint of the existing planning permission (Ref. SD15A/0304) for the provision of four additional classrooms. The existing parking area outside the school would also be removed. However, an alternative parking area could be accommodated to the west within the residential zoned lands (currently utilised as green space bordering the Coláiste Chillian School sports field);
- Carriageway widening into the open space zoned lands to the south, which may also require a bridge structure over the River Camac which passes under the existing carriageway in this location (subject to further investigation);
- Carriageway widening into commercial lands to the south (currently occupied by green space and parking area). The slight loss of car parking would not impact the existing commercial premises as it currently benefits from a large car park with low occupancy; and
- Carriageway widening along the frontage of a house listed as a Protected Structure (Ref. 136 Semi-Detached Five Bay Two Storey House). This house currently appears to be unoccupied, with an unkempt driveway/front garden. The boundary wall of this property appears to be not from the same era as the house therefore we do not envisage the wall to be part of the protected structure (subject to further investigation).

The provision of a bus route (two way) from the Old Nangor Road to Main Street which would require a number of supplementary interventions within Clondalkin Village Centre. The following paragraphs describe these interventions:

- Tower Road – Northbound general traffic would no longer be permitted to travel between Tower Road and Ninth Lock Road. Local access would be permitted for general traffic however upon exiting the premises along Tower Road all general traffic must proceed south onto Convent Road. A turning area would be provided to the south of the Round Tower with the provision of a bus gate to ensure general traffic cannot proceed north. In the vicinity of the Round Tower, only a single bus lane can be accommodated. However, the aforementioned turning area would perform a dual function and also accommodate a passing place to enable northbound buses to wait should there be a southbound bus approaching. The northern vehicle access to the car park (serving the commercial units) on the western side of Tower Road would be closed with all vehicles entering / exiting the carpark being required to utilise the southern access on Convent Road. Carriageway widening into the adjacent properties on the western side of the carriageway would be required. The existing gated vehicle access to the Garda car park on Tower Road would be closed with vehicles accessing the car park utilising the existing gated access on Orchard Road. The aforementioned interventions would result in significantly reduced traffic flow along Tower Road. Accordingly, cyclists would share the carriageway with buses and the local access traffic over this short section. The GDACNP has identified the provision of Primary cycle route SO5 along Tower Road.
- Convent Road – the existing Tesco Car Park exit would be relocated to the south with the creation of a new 4-arm signal controlled junction with Convent Road. The fourth arm of this new junction would connect to a new road link (between the Moyle Park Gate House and no.1 Convent Road). Cycle lanes would be provided along the section of Convent Road affected by the proposals aligning with Primary cycle route SO5 identified within the GDACNP.
- Moyle Park – the existing access to Moyle Park College would be closed to vehicular traffic with the creation of the new 4-arm signal controlled junction to the south on Convent Road. A new road link (for general traffic) would be provided from the aforementioned new junction and would run in a north-south direction through the Moyle Park lands and subsequently connect with the Old Nangor Road (at a new signal controlled junction) via the lands adjacent to the Snooker Club premises. Vehicular access to Moyle Park College would be provided via this new road.
- Orchard Road – this link would now permit two-way vehicle traffic with the removal of the existing bus lane. Cycle lanes, in both directions would also be provided aligning with the GDACNP proposals for a Feeder cycle route. The Orchard Road / Ninth Lock Road traffic signal junction would be reconfigured.
- Main Street – General traffic would no longer be permitted to travel along Main Street beyond the New Road junction where a bus gate will be provided. Local access will be permitted (for loading) at specified times. The existing car park access on the northern side of Main Street would be closed, with a new access provided from Orchard Lane, shared with the adjacent car park plot. The aforementioned interventions would result in significantly reduced traffic flow along Main Street as such cyclists would share the carriageway with buses. The GDACNP has identified the provision of Secondary route 7E along Main Street.
- Orchard Lane – this link would only permit local access vehicle traffic with the closure of the vehicle connection onto Main Street / Monastery Road. A turning facility would be provided in the vicinity of the new/upgraded car park access. The aforementioned interventions would result in significantly reduced traffic flow along Orchard Lane as such cyclists would share the carriageway with local access traffic. Cyclists would be permitted to travel (two-way) between Orchard Lane and Main Street / Monastery Road aligning with the GDACNP proposals for the provision of a Feeder cycle route.
- New Road – Vehicles exiting New Road will no longer be permitted to turn left along Main Street.

To the east of Clondalkin Village Centre, with the exception of a section of approximately 190m where eastbound buses only can be accommodated, bus lanes will be provided in both directions along Monastery Road. This is achieved by widening the carriageway into the adjacent commercial and residential properties along the route. There is also an existing disused petrol filling station which would require demolition to facilitate two-way buses.

The Monastery Road / Woodford Hill roundabout junction would be upgraded to traffic signal control. However, this has also been identified under an approved 10-year planning permission (Ref. SD10A/0064) for a mixed-use development on the SIAC lands. Between Monastery Heights and Laurel Park cycle facilities cannot be accommodated. However, an alternative cycle route can be provided through the disused petrol filling station lands connecting to Floraville Avenue and Laurel Park. To facilitate this cycle link between Floraville Avenue and Laurel Park a bridge structure over an existing water course may be required, subject to further investigation.

Bus lanes and cycle lanes (in both directions) will be provided between the upgraded Monastery Road / Woodford junction and the Monastery Road / R810 Naas Road junction. These bus and cycle lanes can be achieved by widening the carriageway in the green space / verge area on the northern side of the carriageway. A queue relocation facility will be required in advance of the Monastery Road / R810 Naas Road junction to enable eastbound buses to bypass any vehicle queues at the junction. The provision of cycle facilities along Monastery Road aligns with the GDACNP proposals for the provision of Secondary route 7E.

Between the Monastery Road / R810 Naas Road junction and the M50 interchange on the R810 Naas Road no changes are proposed.

Between the M50 interchange and the R110 Long Mile Road junction the existing eastbound bus lane would be extended to the west to begin at the access to the Bluebell United Football Club. This is facilitated by widening the carriageway into the commercial premises lands to the north (currently green space). Westbound there is an existing bus lane along this section. Upgraded segregated cycle facilities would also be accommodated. The Naas Road / Long Mile Road traffic signal control junction would be upgraded to provide bus lanes up to the stop lines at the junction.

Option S2-2: The provision of bus priority in both directions between the New Nangor Road and the Old Nangor Road requires the upgrading of the following two roundabout junctions to traffic signal controlled. Due to the proximity of these junctions in relation to each other, the traffic signals at these junctions should be linked. The upgrading of these junctions could generally be achieved within the existing road reservation:

- New Nangor Road / Fonthill Road South roundabout junction; and
- New Nangor Road / R113 Fonthill Road North roundabout junction.

Cycle lanes will also be provided along this route between the New Nangor Road and the Old Nangor Road aligning with Secondary route SO5a as identified in the GDACNP. It is proposed to provide continuous bus priority in both directions along Fonthill Road South.

The route option comprises Secondary Route SO5a and an element of Primary Route SO5 as identified within the GDACNP. Cycle lanes will generally be accommodated along the route. However, to the south of the Fonthill Road South / Cladbeck Way junction, cycle lanes cannot be accommodated. As a result, cyclists will be diverted along Cladbeck Way and New Road where they can access a new cycle track through the green area adjacent to the Fonthill Road South / N7 junction.

There are no changes proposed along the N7 Naas Road as the route has recently undergone upgrading. Between the Monastery Road / R810 Naas Road junction and the M50 interchange on the R810 Naas Road no changes are proposed.

Between the M50 interchange and the R110 Long Mile Road junction the existing eastbound bus lane would be extended to the west to begin at the access to the Bluebell United Football Club, facilitated by widening the carriageway into the commercial premises lands to the north (currently green space). Westbound there is an existing bus lane along this section. Upgraded segregated cycle facilities would also be accommodated. The Naas Road / Long Mile Road traffic signal control junction would be upgraded to provide bus lanes up to the stop lines at the junction.

Option S2-3: The provision of bus priority in both directions along the section of the New Nangor Road between the Fonthill Road South and the R113 Fonthill Road North requires the upgrading of the following two roundabout junctions to traffic signal controlled. Due to the proximity of these junctions in relation to each other, the traffic

signals at these junctions should be linked. The upgrading of these junctions could generally be achieved within the existing road reservation:

- New Nangor Road / Fonthill Road South roundabout junction; and
- New Nangor Road / R113 Fonthill Road North roundabout junction.

Cycle lanes will also be provided along this section of the New Nangor Road between the Fonthill Road South and the R113 Fonthill Road North aligning with Secondary route 8C2 as identified in the GDACNP.

It is proposed to provide continuous bus priority in both directions along the New Nangor Road with the reconfiguration of the signal controlled junctions along the route and the upgrading of the Riverview Business Park roundabout junction to signal controlled.

Due to width constraints at the M50 flyover, it is not possible to provide two-way cycle facilities (or pedestrian footways); nonetheless eastbound cyclists and pedestrians will be directed to join the adjacent Grand Canal Greenway over the short section of the underpass and will then be given the opportunity to re-join the New Nangor Road.

It is proposed to provide continuous bus priority through the New Nangor Road / R810 Naas Road / Long Mile Road junction with the provision of bus lanes through the junction; however, these proposals will be subject to further analysis at detailed design stage.

The route option comprises Secondary Route 8C2 as identified within the GDACNP. Cycle lanes will be accommodated along the route.

Option S2-4: The provision of bus priority in both directions between the New Nangor Road and the R113 Fonthill Road North requires the upgrading of the following two junctions to traffic signal controlled. Due to the proximity of these junctions in relation to each other, the traffic signals at these junctions should be linked. The upgrading of these junctions could generally be achieved within the existing road reservation:

- New Nangor Road / Fonthill Road South roundabout junction; and
- New Nangor Road / R113 Fonthill Road North roundabout junction.

Cycle lanes will also be provided along this section of the New Nangor Road between the Fonthill Road South and the R113 Fonthill Road North aligning with Secondary route 8C2 as identified in the GDACNP.

Bus priority (in both directions) will be provided along the Ninth Lock Road with the exception of a 40m gap in outbound bus provision in the vicinity of the Mill Centre. Nonetheless outbound buses will be given priority at the preceding traffic signal junction (Ninth Lock Road / Orchard Road / Mill Centre); as such there should be no notable delays to buses as a result of the gap in the bus lane provision. The GDACNP has identified the provision of Primary route SO5 along Ninth Lock Road. However, due to insufficient widths available cyclists cannot be accommodated in parallel with the above bus infrastructure. Accordingly, an alternative north-south cycle route is proposed.

An existing planning permission (Ref. SD14A/0221 & SD13A/0100, granted Jan 2015) for an Aldi Store includes the provision of a new access road (with cycle lanes) linking the Ninth Lock Road and the New Nangor Road. This permitted scheme incorporates new signal controlled junctions on both the Ninth Lock Road and the New Nangor Road. As part of the CBC scheme the existing Mill Shopping Centre internal car park road could be publicly adopted and extended to connect with the aforementioned Aldi access road to be delivered under the Aldi planning permission. New cycle facilities could be provided along the adopted road which would connect with the Aldi access road, thereby providing a north-south cycle route to align with the GDACNP proposals.

Bus priority (in both directions) will also be provided along Orchard Road with the exception of a 75m gap where an inbound bus lane cannot be accommodated due to width constraints. Nonetheless outbound buses will be given priority at the preceding traffic signal junction (Ninth Lock Road / Orchard Road / Mill Centre); as such there should be no delays to buses as a result the gap in the bus lane provision. The GDACNP has identified the provision of a Feeder cycle route along Orchard Road which will also be incorporated into the CBC scheme.

Bus priority (in both directions) will be provided along Watery Lane up to the Riversdale junction, after which buses will divert along the green area to the south of Riversdale Crescent and through open space zoned lands to the north of Watery Lane before exiting onto Woodford Walk at a new signal controlled junction. Cycle lanes will also be provided in parallel with bus facilities along this route thereby aligning with the GDA proposals for the provision of Secondary route 7C (and a greenway).

It is proposed to provide continuous bus priority in both directions along Woodford Walk and the New Nangor Road with the reconfiguration of the signal controlled junctions along the route and the upgrading of the Riverview Business Park roundabout junction to signal controlled.

Due to width constraints at the M50 flyover, it is not possible to provide two-way cycle facilities (or pedestrian footways), nonetheless eastbound cyclists and pedestrians will be directed to join the adjacent Grand Canal Greenway over the short section of the underpass and will then be given the opportunity to re-join the New Nangor Road.

It is proposed to provide continuous bus priority through the New Nangor Road / R810 Naas Road / Long Mile Road junction with the provision of bus lanes through the junction. However, these proposals will be subject to further analysis at detailed design stage.

The route option comprises Secondary Route 8C2 as identified within the GDACNP. Cycle lanes will generally be accommodated along the route.

Each 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 'Economy', the primary differentiator between the four options is the Transport Quality & Reliability. Route option 2-3 is the only option which delivers full priority along the entire section ensuring good journey time reliability.

Under criterion 'Integration', route option 2-3 ranks the highest in three out of the five sub-criteria. The primary differentiators are 'Cycling Integration' and 'Traffic Network Integration' whereby route option 2-3 aligns the most with the GDACNP in terms of the provision of proposed cycle infrastructure, whilst the CBC proposals also result in the lowest impact on general vehicle traffic as the majority of the schemes bus infrastructure along the R134 New Nangor Road is already existing onsite.

Under criterion 'Safety', route option 2-3 ranks the highest as the route has a relatively straight alignment and contains the lowest quantum of junctions, the majority of which are / will be signal controlled and will include the provision of pedestrian crossings.

In terms of 'Environment', route option 2-3 again ranks the highest as the route does not contain any protected structures, monuments or sites of archaeological interest. Furthermore, as there is existing bus infrastructure along the majority of the route, there will be little to no impact on 'Air Quality', 'Landscape & Visual' or 'Noise & Vibration'. In addition, the requirement for the removal of trees to facilitate carriageway widening is minimised in comparison to the other three options.

Based on the assessment undertaken, route option 2-3 offers more benefits over the other three options under assessment. Route option 2-3 is therefore preferred route for Section 2 for the following reasons:

- It delivers end to end bus lanes through Section 2 of the study area providing improved journey time reliability;
- It serves a high level of residential and employment catchments within 5, 10 and 15-minute walking distance;
- Users of the CBC service will be able to integrate with existing and future proposed public transport infrastructure;
- It provides a variety of cycle facilities in line with the GDACNP;
- It would provide an improvement on road safety for all users in comparison to the other options; and

Option S3-1: The proposals for the CBC service for the S3-1 option include the extension / upgrading of the existing bus lanes (in both directions) along the R110 with the implementation of the following traffic management measures:

- The provision of a right turn pocket for vehicles turning from R110 Crumlin Road into Windmill Road;
- The banning of right turn movements into Bangor Drive from R110 Crumlin Road; and
- The provision of a right turn pocket for vehicles turning from R110 Crumlin Road into Ardagh Road.

Between Kildare Road and Old County Road, cycle facilities cannot be accommodated. However, an alternative east-west cycle route can be provided via Kildare Road - Windmill Road - Old County Road with the provision of cycle lanes along Kildare Road, and a two-way cycle track along Old County Road.

Between the Ardagh Road junction (50m to the east) and the Coombe / Dean Street / R110 St Luke's Avenue junction bus lanes and cycle facilities will be accommodated within the existing road reservation, achievable by reconfiguring the signal controlled junctions along the route.

Between the Coombe / Dean Street / R110 St. Luke's Avenue junction and the R137 Patrick Street junction bus lanes will be accommodated by widening the carriageway into the adjacent land (southern side, zoned for mixed service facilities) and the wide footway area on the northern side.

Along R137 Patrick Street bus lanes and cycle facilities will be accommodated within the existing road reservation, achievable by reconfiguring the signal controlled junctions along the route.

Option S3-2:1: The proposal for this option includes the provision of bus lanes (in both directions) along the R810 Naas Road.

The GDACNP has identified the provision of Secondary route 7D Cycle along the R810 Naas Road. Therefore, to align with the GDACNP proposals, cycle lanes will be provided along this section of the R810 with the exception of:

- Between Old Naas Road and Davitt Road, a southbound cycle lane cannot be accommodated due to width constraints between properties and the Luas line. However, cyclists are provided with an alternative route via Lansdowne Valley Park and Muirfield Drive resulting in an increase of 200m (approximately) journey distance. This alternative route aligns with the River Camac Greenway, as identified in the GDACNP; and
- Similarly, along Tyrconnell Road between Hampton Court and Davitt Road, a southbound cycle lane cannot be accommodated due to width constraints between properties and the Luas line, as such cyclists are again diverted via the River Camac Greenway after which they can re-join the R810 at the Davitt Road junction. This diversion will result in an addition of 100m (approximately) to the cyclists' journey.

It is proposed to provide continuous bus priority in both directions along Inchicore Road and the R811 South Circular Road. There would be a gap of approximately 50m in the outbound bus lane provision on Grattan Crescent between the Inchicore South Terrace junction and the Tyrconnell Road / Emmet Road / Grattan Crescent junction. However, the Grattan Crescent / Inchicore South Terrace junction would be signalised to ensure buses had priority along the aforementioned section with no bus lane. At the R811 South Circular Road / Emmet Road / Old Kilmainham junction the CBC proposals would include the banning of the right turn manoeuvre from the R811 South Circular Road to Emmet Road to provide bus priority (inbound) at the aforementioned junction.

The route option comprises Secondary Route 7D and Primary route 7A as identified within the GDACNP. A northbound cycle lane can be accommodated along Grattan Crescent, thus respecting the requirements of Secondary Route 7D. However, southbound from the Grattan Crescent / Inchicore South Terrace junction a southbound cycle lane cannot be provided. In order to provide a route for southbound cyclists, they will be provided with an alternative route through the adjacent Grattan Crescent Park and travel along the proposed greenway adjacent to the River Camac (as identified in the GDACNP) after which they can exit onto Emmet Road and continue with their journey onto Tyrconnell Road. There would be no right turn manoeuvre permitted from

Emmet Road to Grattan Crescent to accommodate the provision of cycle lanes on approach to the Tyrconnell Road / Emmet Road / Grattan Crescent junction.

The CBC proposals cannot accommodate Primary route 7A along Inchicore Road and R811 South Circular Road, nonetheless an alternative route via Emmet Road is provided for east-west cyclists whilst for north-south cyclists an alternative route through Grattan Crescent Park along the proposed greenway (as identified in the GDACNP) will be provided. In addition, a cycle connection through Kilmainham and the lands to the south to/from Emmet Road (with the provision of a bridge crossing) is proposed to facilitate north-south cycle movements to/from Inchicore Road (eastern end).

Due to the width constraints along the Old Kilmainham section of the route the bus lane provision ranges from two-way bus priority (short sections of up to 150m) to no bus provision. Furthermore, cyclists cannot be accommodated along this section between the Emmet Road / R811 South Circular Road / Old Kilmainham junction and the St. James's Hospital junction. The GDACNP has identified the provision of Primary route 7A along Old Kilmainham therefore to align with the GDACNP proposals cyclists are provided with an alternative route via R811 South Circular Road, James's Walk, and St. James's Hospital, resulting in an increase of 1km (approximately) journey distance.

To the east of the Bow Lane West junction the proposals include provision of bus lanes and cycle lanes (in both directions) along James's Street and Thomas Street. With the exception of the route length east of the Bridgefoot St junction it is not possible to accommodate an eastbound cycle lane. As a result, cyclists are diverted via Bridgefoot St, Oliver Bond St and Augustine St after which they can re-join Thomas Street. This diversion results in an increase of 70m (approximately) journey distance.

Option S3-2:2: The proposals for this option include the provision of bus lanes (in both directions) along the R810 Naas Road.

The GDACNP has identified the provision of Secondary route 7D Cycle along the R810 Naas Road. Therefore, to align with the GDACNP proposals, cycle lanes will be provided along this section of the R810 with the exception of:

- Between Old Naas Road and Davitt Road, a southbound cycle lane cannot be accommodated due to width constraints between properties and the Luas line. However, cyclists are provided with an alternative route via Lansdowne Valley Park and Muirfield Drive resulting in an increase of 200m (approximately) journey distance. This alternative route aligns with the River Camac Greenway as identified in the GDACNP; and
- Similarly, along Tyrconnell Road between Hampton Court and Davitt Road a southbound cycle lane cannot be accommodated due to width constraints between properties and the Luas line. Accordingly cyclists are again diverted via the River Camac Greenway after which they can re-join the R810 at the Davitt Road junction. This diversion will result in an addition of 100m (approximately) to the cyclists' journey.

It is proposed to provide bus priority along Inchicore Road and the R811 South Circular Road for inbound bus services. At the South Circular Road / Emmet Road / Old Kilmainham junction the CBC proposals would include the banning of the right turn manoeuvre from the R811 South Circular Road to Emmet Road to provide bus priority (inbound) at the aforementioned junction.

The route option comprises Secondary Route 7D and Primary route 7A as identified within the GDACNP. A northbound cycle lane can be accommodated along Grattan Crescent, thus respecting the requirements of Secondary Route 7D. However, southbound from the Grattan Crescent / Inchicore South Terrace junction a southbound cycle lane cannot be provided. In order to accommodate a southbound cyclist, they will be provided with an alternative route through the adjacent Grattan Crescent Park and travel along the proposed greenway adjacent to the River Camac (as identified in the GDACNP) after which they can exit onto Emmet Road and continue with their journey onto Tyrconnell Road. There would be no right turn manoeuvre permitted from Emmet Road to Grattan Crescent to accommodate both the provision of cycle lanes and an outbound bus lane on the approach to the Tyrconnell Road / Emmet Road / Grattan Crescent junction.

The CBC proposals cannot accommodate Primary route 7A along R811 South Circular Road, nonetheless an alternative route through Kilmainham and the lands to the south to/from Emmet Road (with the provision of a bridge crossing) is proposed to facilitate north-south cycle movements to/from Inchicore Road (eastern end).

Due to the width constraints along the Old Kilmainham section of the route the bus lane provision ranges from two-way bus priority (short sections of up to 150m) to no bus provision in places. Furthermore, cyclists cannot be accommodated along this section between the Emmet Road / South Circular Road / Old Kilmainham junction and the St James's Hospital junction. The GDACNP has identified the provision of Primary route 7A along Old Kilmainham therefore to align with the GDACNP proposals cyclists are provided with an alternative route via R811 South Circular Road, James's Walk, and St James's Hospital, resulting in an increase of 1km (approximately) journey distance.

To the east of the Bow Lane West junction the proposals include provision of bus lanes and cycle lanes (in both directions) along James's Street and Thomas Street. With the exception of the section to the east of the Bridgefoot Street junction it is not possible to accommodate an eastbound cycle lane. As a result cyclists are diverted via Bridgefoot Street, Oliver Bond Street and Augustine Street after which they can re-join Thomas Street. This diversion results in an increase of 70m (approximately) journey distance.

Option S3-2:3: The proposals for this option include the provision of bus lanes (in both directions) along the R810 Naas Road.

The GDACNP has identified the provision of Secondary route 7D Cycle along the R810 Naas Road. Therefore, to align with the GDACNP proposals, cycle lanes will be provided along this section of the R810 with the exception of:

- Between Old Naas Road and Davitt Road, a southbound cycle lane cannot be accommodated due to width constraints between properties and the Luas line. However, cyclists are provided with an alternative route via Lansdowne Valley Park and Muirfield Drive resulting in an increase of 200m (approximately) journey distance. This alternative route aligns with the River Camac Greenway as identified in the GDACNP; and
- Similarly, along Tyrconnell Road between Hampton Court and Davitt Road a southbound cycle lane cannot be accommodated due to width constraints between properties and the Luas line. As a result cyclists are again diverted via the River Camac Greenway after which they can re-join the R810 at the Davitt Road junction. This diversion will result in an addition of 100m (approximately) to the cyclists' journey.

It is proposed to provide continuous bus priority in both directions along Emmet Road with the exception of a gap in the inbound provision (approximately 95m) where there is a width constraint. Nonetheless buses will be given priority at the preceding Tyrconnell Road / Emmet Road / Grattan Crescent junction and as such there should be no delays experienced by inbound buses due to the lack of bus lane.

Cycle facilities have not been identified in the GDACNP along Emmet Road.

It is proposed to provide bus priority along Inchicore Road and the R811 South Circular Road for inbound bus services. At the South Circular Road / Emmet Road / Old Kilmainham junction the CBC proposals would include the banning of the right turn manoeuvre from the R811 South Circular Road to Emmet Road to provide bus priority (inbound) at the aforementioned junction.

The route option comprises Secondary Route 7D and Primary route 7A as identified within the GDACNP. A northbound cycle lane can be accommodated along Grattan Crescent, thus respecting the requirements of Secondary Route 7D. However, southbound from the Grattan Crescent / Inchicore South Terrace junction a southbound cycle lane cannot be provided. In order to provide a route for southbound cyclists, they will be provided with an alternative route through the adjacent Grattan Crescent Park and travel along the proposed greenway adjacent to the River Camac (as identified in the GDACNP) after which they can exit onto Emmet Road and continue with their journey onto Tyrconnell Road. There would be no right turn manoeuvre permitted from Emmet Road to Grattan Crescent to accommodate both the provision of cycle lanes and an outbound bus lane on approach to the Tyrconnell Road / Emmet Road / Grattan Crescent junction.

The CBC proposals cannot accommodate Primary route 7A along R811 South Circular Road, nonetheless an alternative route through Kilmainham and the lands to the south to / from Emmet Road (with the provision of a bridge crossing) is proposed to facilitate north-south cycle movements to / from Inchicore Road (eastern end).

Due to the width constraints along the Old Kilmainham section of the route the bus lane provision ranges from two-way bus priority (short sections of up to 150m) to no bus provision. Furthermore, cyclists cannot be accommodated along this section between the Emmet Road / South Circular Road / Old Kilmainham junction and the St James's Hospital junction. The GDACNP has identified the provision of Primary route 7A along Old Kilmainham therefore to align with the GDACNP proposals cyclists are provided with an alternative route via South Circular Road, James's Walk, and St. James's Hospital, resulting in an increase of 1km (approximately) journey distance.

To the east of the Bow Lane West junction the proposals include provision of bus lanes and cycle lanes (in both directions) along James's Street and Thomas Street with the exception of east of the Bridgefoot Street junction where it is not possible to accommodate an eastbound cycle lane. As a result cyclists are diverted via Bridgefoot Street. Oliver Bond Street and Augustine St after which they can re-join Thomas Street. This diversion results in an increase of 70m (approximately) journey distance.

Each 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 'Economy', the primary differentiator between the 4 options is the Transport Quality & Reliability. Option 3-1 delivers the highest quantum of bus priority along the corridor ensuring good journey time reliability.

Under criterion 'Integration', route option 3-1 ranks the highest in four out of the five sub-criteria. The primary differentiator is 'Cycling Integration' whereby route option 3-1 aligns the most with the GDACNP in terms of the provision of proposed cycle infrastructure.

Under criterion 'Accessibility & Social Inclusion', route option 3-1 ranks the highest as the corridor serves the quantum of Key Trip Attractors. Furthermore, the corridor primarily serves Disadvantaged to Below Average means classified areas along the western extents of the section. It is not until it reaches the City Centre area (eastbound from St. Luke's Avenue) that it serves Marginally Above means areas. In comparison, the other corridors serve Marginally Above Average to Affluent areas between Tyrconnell Road to Old Kilmainham.

Under criterion 'Safety', the primary differentiator is 'Pedestrian Safety' whereby route option 3-1 ranks the highest as the route provides good pedestrian facilities and associated accessibility levels throughout. In comparison, the provision of pedestrian facilities along the Naas Road are restricted by Luas tracks running along the centre of the road carriageway.

In terms of 'Environment', route option 3-1 again ranks the highest as the route does not impact upon any protected structures /monuments. Furthermore, the corridor briefly passes through a conservation area at the Crumlin Road / Parnell Road junction in comparison to the other options passing through an area designated as a 'Zone of Archaeological Interest' along Thomas Street to High Street.

Based on the assessment undertaken, route option 3-1 offers more benefits over the other three options under assessment. Route option 3-1 is therefore preferred route for Section 3 for the following reasons:

- It proves to be a more cost effective solution than the other options;
- It provides a higher level of bus priority to the other options providing improved journey time reliability;
- It serves a high level of residential and employment catchments within five, 10 and 15-minute walking distance;
- Users of the CBC service will be able to integrate with existing and future proposed public transport infrastructure;
- It provides a variety of cycle facilities in line with the GDACNP; and

- It is considered to have the least potential for environmental impact, when compared to the other options.

Based on the multi-criteria assessment undertaken for this section of the study area, option 3-1 is identified as the preferred route and as such will form part of the emerging preferred route. In the EPR Option, a variation to option S3-1 was presented, with the route following the R810 Naas Road towards the Kylemore Luas stop and then returning to R110 Long Mile Road via R112 Walkinstown Avenue, as opposed to being routed directly along the R110 Long Mile Road as in option S3-1. The EPR Option allows the CBC to interact directly with the Luas line and provides for better integration between the modes by facilitating passenger interchange.

As previously mentioned, route option S3-1 overlaps with the recommended preferred route for the proposed Greenhills to City Centre CBC on R110 Drimnagh Road (in the vicinity of the Drimnagh Road / Walkinstown Road junction). As such, to avoid confusion and to ensure there are no discrepancies in the proposals for the corridor, the Clondalkin CBC proposals will terminate on R110 Drimnagh Road. Between R110 Drimnagh Road and the City Centre, the Clondalkin CBC will tie into the proposals as outlined for the Greenhills to City Centre CBC.

3.3.3 Cycling Options

Consideration of alternative cycling route options was fundamental in the process of defining the EPR. In general, the EPR aligns with the primary Cycle Routes SO5, 9A, 8, 8B and 7B / N10 on the GDACNP.

During the EPR stage, identification of alternative cycle routes separate to the core bus corridor EPR 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 PRO 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 measure of the number of potential conflicts on the route and therefore a measure of the potential for a collision. ▪ The type of movement required by the 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.

Appraisal Criteria	Rationale
	<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.
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 EPRs were identified. As previously mentioned, the Proposed Scheme previously comprised of two Core Bus Corridors, the Greenhills to City Centre Core Bus Corridor and the Clondalkin to Drimnagh Core Bus Corridor and were summarised as follows:

'The Greenhills Core Bus Corridor (CBC) commences on Belgard Square West at the junction with Cookstown Way. From here the CBC is routed along Belgard Square West and Belgard Square North as far as the junction with Belgard Road. At this point the CBC enters the Institute of Technology Tallaght campus and follows the existing internal road through the campus, exiting at the existing junction on Greenhills Road. From here the CBC is routed along the R819 Greenhills Road, Ballymount Avenue, Calmount Road, and Walkinstown Road as far as the junction with the R110 Long Mile Road. It is proposed to realign the existing Greenhills Road in two locations on this section: along an existing road reservation between Parkview and Treepark Road, and through Ballymount Industrial Estate by way of extending both Ballymount Avenue and Calmount Avenue to connect to Greenhills Road at new signalised junctions. From the junction of the R110 Long Mile Road and the R819 Walkinstown Road the CBC is routed along the R110 Drimnagh Road, Crumlin Road, Dolphin's Barn, Cork Street, St. Luke's Avenue, The Coombe, and Dean Street to the junction with the R137 Patrick Street. The CBC is then routed along Patrick Street and Nicholas Street to the junction with Christchurch Place where it will join the prevailing traffic management regime in the City Centre.' and

'The Clondalkin to Drimnagh Core Bus Corridor (CBC) commences on the R134 New Nangor Road at the junction with Woodford Walk and is generally routed via the R134 along the New Nangor Road as far as the junction with the Naas Road. From here it is generally routed along Naas Road as far as the junction with Walkinstown Avenue. The corridor continues down Walkinstown Avenue on to the R110 Long Mile Road to the junction with Walkinstown Road, where it joins the Greenhills Core Bus Corridor.'

Priority for buses is provided along the entire route, consisting primarily of dedicated bus lanes in both directions.'

A public consultation on this EPR was undertaken from 14 November 2018 to 31 May 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 EPR, 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 PRO.

This additional design development took account of:

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

Where substantial revisions had been made to the design since the publication of the EPR, options were assessed using the same process as adopted in the original assessment to determine the preferred option. The MCA assessed any newly developed options against the previously identified EPR. 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 EPR.

3.4.1.1 Alternatives Considered at Draft Preferred Route Option Stage – Tallaght to City Centre

For the portion of the Proposed Scheme which relates to the Tallaght to City Centre Core Bus Corridor (previously the Greenhills to City Centre Core Bus Corridor Scheme), the main alternatives considered during the development of the draft PRO consisted of the following:

3.4.1.1.1 Section 1: Tallaght to Ballymount

The EPR commences on Belgard Square West at the junction with Cookstown Way and continues along Belgard Square West before turning right onto Belgard Square North. It then continues into the TUD Tallaght campus, exiting at the TUD Tallaght junction on R819 Greenhills Road. The route continues along R819 Greenhills Road as far as the Parkview housing estate, where the R819 Greenhills Road will be realigned before re-joining the existing R819 Greenhills Road south of the M50 overbridge and continue over the road bridge to Ballymount. The draft PRO for this section proposed the following:

- A bus interchange on Belgard Square West to facilitate interchange between bus, Luas and the Town Centre, on Belgard Square North;
- A segregated cycle lane in each direction on Belgard Square North for improved cycle access to the Hospital from Belgard Road;
- Route alteration to pass through Tallaght village rather than TUD Tallaght (necessitating 24 hr. / 365 day access through the TUD Campus), which will require the reopening of Old Greenhills Road to form a new bus only junction with R819 Greenhills Road;
- At Parkview, the proposed alignment has been altered to allow a northbound, right turn lane to Castletymon Road and also to provide more landscaping space between the proposed road and the adjoining properties. The existing road will continue to be used for southbound buses and cyclists; and

- Over the M50, a new bridge will provide continuous bus lanes and higher quality cycle lanes on R819 Greenhills Road.

3.4.1.1.2 Section 2: Ballymount to Crumlin

The EPR continues at Ballymount with a new link road connecting the R819 Greenhills Road to Ballymount Avenue allowing buses to directly serve the industrial estate. Access to and from R819 Greenhills Road at this location would be closed to traffic. Buses would continue along Ballymount Avenue before turning right onto Calmount Road. Calmount Road would be extended to meet the R819 Greenhills Road. The route would again continue along R819 Greenhills Road through Walkinstown Roundabout and onto R819 Walkinstown Road as far as R110 Drimnagh Road. The draft PRO for this section proposed the following:

- Walkinstown Roundabout altered to include a segregated two-way cycle track around the junction. This will reduce conflicts with pedestrians and allow the cyclists to take the shortest route around. Parallel signal-controlled pedestrian / cycle crossings on all arms of the roundabout are also provided.

3.4.1.1.3 Section 3: Crumlin to Grand Canal

The EPR continues along the R110 Crumlin Road to the Grand Canal / R111 Parnell Road, with bus lanes in each direction requiring encroachment on adjacent properties. Cyclists will be rerouted along Kildare Road / Clogher Road / Sundrive Road. The draft PRO for this section proposes the following:

- A three-lane option with signal controlled priority along R110 Crumlin Road between the Health Centre and Clonard Road to reduce the impact on properties. To facilitate this arrangement, it is proposed to close the R110 Crumlin Road junctions with both Clonard Road and Bangor Drive. Urban realm improvements will be provided along this section; and
- The proposed alternative cycle route on Kildare Road is redirected towards the Grand Canal via Clogher Road along with cycle lanes.

3.4.1.1.4 Section 4: Grand Canal to Christchurch

The EPR continues north of the Grand Canal / R111 Parnell Road on R110 Dolphin's Barn Street, Cork Street, St. Luke's Avenue, Dean Street, R137 Patrick Street and Nicholas Street, before turning right onto Christchurch Place where the route ends. The draft PRO for this section proposes the following:

- On R137 Patrick Street, the design has been altered to retain the tree-lined median. In addition, the junction of R137 Nicholas Street and High Street is to be re-modelled to provide improved facilities for buses, cyclists and pedestrians.

3.4.1.2 Alternatives Considered at Draft Preferred Route Option Stage – Clondalkin to Drimnagh

For the portion of the Proposed Scheme which relates to the Clondalkin to Drimnagh Core Bus Corridor (previously the Clondalkin to City Centre Core Bus Corridor Scheme), the main alternatives considered during the development of the draft PRO consisted of the following:

3.4.1.2.1 Fonthill Road South to Naas Road / Long Mile Road junction

The EPR commences at the R134 New Nangor Road / Fonthill Road South junction with continuous bus priority on the R134 New Nangor Road between the R113 Fonthill Road North / R134 New Nangor Road junction as far as the R810 Naas Road / R110 Long Mile Road junction. Two-way cycle facilities will be provided for this section also with a diversion at the M50 flyover where due to space constraints, cyclists will be locally rerouted via the Grand Canal Greenway. The draft PRO for this section proposes the following:

- Proposed Scheme to commence at the R134 New Nangor Road / Woodford Walk junction;
- Provide one eastbound bus lane and a general traffic lane under the M50 flyover. Due to width constraints beneath the bridge westbound bus priority will be achieved on the general traffic lane using signal controlled priority; and

- Provide an overbridge for pedestrians and cyclists over the Naas Road / Long Mile Road junction. This will greatly reduce conflicts with traffic.

3.4.1.2.2 New Nangor Road / Naas Road / Long Mile Road junction to Drimnagh Road / Walkinstown Road junction

The EPR continues eastbound via R810 Naas Road, the R112 Walkinstown Avenue and the R110 Long Mile Road to the R110 Drimnagh Road. From R110 Drimnagh Road, in the vicinity of the R110 Drimnagh Road / R819 Walkinstown Road junction, the route will merge with the Tallaght to City Centre Core Bus Corridor Scheme. Bus lanes and cycle facilities will be provided in both directions along this section. The draft PRO for this section proposes the following:

- To modify the bus stop facilities on the eastbound carriageway at the junction of Kylemore Road / Naas Road to improve the interchange between bus and the Luas Red Line at this location. This will require the diversion of left-turning traffic to John F Kennedy Drive.

3.4.2 Consideration following Draft Preferred Route Option Consultation

The draft PRO was published in March 2020 and a second round of public consultation occurred between 4 March 2020 and 17 April 2020. Due to COVID-19 restrictions in mid-March 2020, the planned Public Information Events were impacted. There was a total of 12 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 PRO 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 PRO include:

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

- The location of bus stops was reviewed and rationalised, including the introduction of layby facilities to reduce delays to through buses and stops being located closer to signalised crossing points;
- The layout of all bus stops along the proposed scheme was enhanced;
- A new priority junction was proposed for Greenhills Road at the new Ballymount Avenue link road to maintain access to the Greenhills Road and Kilakee Drive from the south; and
- At the Calmount Road extension tie-in to Greenhills Road, the alignment was adjusted northward to minimise construction over existing 1200mm diameter watermain and avoid demolition of existing structures.

For the portion of the Proposed Scheme relating to the Clondalkin to Drimnagh Core Bus Corridor:

- The location of bus stops was reviewed and rationalised, including the introduction of layby facilities to reduce delays to through buses and stops being located closer to signalised crossing points;
- The layout of all bus stops along the proposed scheme was enhanced;
- A two-way cycle track was proposed on the north side of Nangor Road and Naas Road between Killeen Road and John F Kennedy Drive; and
- At the junction of the Naas Road / Kylemore Road / Walkinstown Avenue facilities for cyclists were improved and a second bus lane provided for services continuing to the City Centre via the Naas Road.

3.4.3 Further Consideration following Preferred Route Option Consultation

Arising from the limitations imposed on public engagement during the March / April 2020 consultation process due to COVID-19 restrictions, it was decided that an additional round of public consultation would be conducted in November 2020, prior to finalising the PRO.

A third round of non-statutory public consultation on the draft PRO took place from the 4 November to 16 December 2020 and was held virtually due to the continuing effect of the COVID-19 pandemic and associated Irish Government restrictions. There were a total of 490 submissions received during the third round of public consultation.

Virtual consultation rooms were developed and published, offering a 'call-back' facility along with descriptions, supporting documentation and mapping of the draft Preferred Route Option as well as information on all revisions, if any, made since the second round of non-statutory public consultation in March / April 2020. Submissions were accepted through the virtual consultation rooms, by email or by post.

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 PRO include the following:

- Design details of junctions were altered along the length of the proposed scheme to improve facilities for both pedestrians and cyclists;
- Following concerns from local residents, the Kildare Road bus gate was reassessed, and it was concluded that it should be removed and replaced with higher quality cycle facilities along Kildare Road, between Windmill Road and St Mary's Road;
- The proposed road closures of both Clonard Road and Bangor Road, at the Crumlin Road end, were altered to permit traffic to enter from Crumlin Road; and
- The previously permitted scheme for South Circular Road / Dolphin's Barn was incorporated into the Proposed Scheme so that works can be advanced if necessary.

3.4.4 Specific Design Alternatives

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

- Route alignment at R819 Greenhills Road / Parkview;
- Greenhills Road Bridge;
- Greenhills Road, avoidance of building demolition; and
- R134 New Nangor Road, avoidance of watercourse.

3.4.4.1 Route alignment at R819 Greenhills Road / Parkview

Between Mayberry Road and Tymon Lane, the draft PRO proposed that the local road network be reconfigured, with a new road alignment catering for general through traffic (inbound and outbound) and inbound bus and cycle lanes routed through the existing green area between Parkview and Birchview Avenue / Treepark Road. A new junction and link road was proposed to connect Castletymon Road to this new road alignment. The Old Greenhills Road was proposed to become a cul-de-sac for general traffic with bus gates either end allowing outbound buses and cyclists to follow the Old Greenhills Road alignment.

Following a review of the public consultation feedback, updated traffic modelling and noise assessment modelling which indicated that a potential modification to the Parkview boundary walls may be required to mitigate the noise impacts from general traffic on the new link road, this proposed alignment was reviewed to seek a solution which would mitigate noise impacts and possible resulting landscape and visual impacts.

This design review resulted in an alternative alignment option which provides a sustainable transport link road within the green area between Treepark Road and Parkview to cater for pedestrians, cyclists, bus movements in both directions and other authorised vehicles. General traffic movements would remain on the existing Greenhills Road. Two bus gates would be provided at either end for outbound bus priority to allow buses to navigate between the new sustainable link road and the existing R819 Greenhills Road. Inbound buses from Castletymon road will be provided with a short bus only link road opposite the Tallaght Theatre to mitigate against potential congestion

from the northern outbound bus gate. Two-way cycle tracks and footpaths would be provided to enhance the permeability and accessibility, formalising existing desire lines between Birchview Avenue and Treepark Road to local amenities including Tymon Park, Tallaght Theatre and Castletymon Road, where a number of schools exist.

This revised alignment was taken forward into the final PRO.

3.4.4.2 Greenhills Road Bridge

For the Tallaght to City Centre section of the Proposed Scheme, the draft PRO proposed that a new Greenhills Road Bridge be provided to cross the M50. The existing Greenhills Road Bridge spans over nine lanes of the M50 carriageway between Junction 10 and 11 and currently provides designated traffic lane, cycle lane and pedestrian footpath in both directions along Greenhills Road. To accommodate the proposed corridor, an additional designated bus lane is required in both directions. To provide the additional capacity, a new bridge(s) is required.

The following design alternative options were assessed:

- **Option 1 – New Two Span Road Bridge:** Option 1 proposes a new 2-span integral concrete road bridge. The bridge will include reinforced cast in-situ abutments, central supports, crossbeam, diaphragms and bridge deck slab. The cross section of the proposed bridge will include a 2m wide pedestrian footpath, 2m wide cycle lane, 3m bus lane and 3m traffic lane over the M50. The bridge will be 11.6m in width from external face to external face. The proposed spans will be 25.30m over the M50 northbound carriageway and 25.25m over the M50 southbound carriageway;
- **Option 2 – Two New Pedestrian / Cycle Bridges:** Option 2 proposes two new single span pedestrian/cycle bridges located adjacent to the existing Greenhills Bridge. The pedestrian/cycle bridges will be designed as fully through steel warren truss with longitudinal top and bottom chords formed with circular hollow sections. As this option assumes single spans no central supports will be required within the M50 central reserve. The new pedestrian / cycle bridges will provide access to users travelling in both directions along Greenhills Road. Traffic and bus lanes will be accommodated on the existing Greenhills Road Bridge. The new bridges will span 48.55m over the entire M50 carriageway. The width of the new pedestrian / cycle bridges will be 4.65m wide providing a 2.65m segregated cycle lane and 2m pedestrian footpath; and
- **Option 3 – Two New Pedestrian / Cycle Bridges and Widening of Existing Greenhills Road Bridge:** Option 3 proposed the same two new single span pedestrian / cycle bridges located adjacent to the existing Greenhills Bridge as detailed for Option 2, above. Along with the new steel truss pedestrian / cycle bridges, Option 3 will include widening works to the existing Greenhills Road Bridge. These works will alter the current carriageway arrangement to provide a 0.6m concrete verge, 3m bus lane and 3m traffic lane in both directions over the existing bridge. To successfully accommodate the 3m bus and traffic lanes widening works will be required to the existing Greenhills Road Bridge increasing the overall width by 0.2m.

An MCA was carried out on the three options presented above. The assessment criteria considered for each option for this MCA were technical, economic, aesthetics, durability and maintenance, environmental, health and safety, constructability and buildability, and ground conditions.

From the MCA results, Option 2 was found to be the most economical solution, maximises off-site fabrication advantages and had the lowest and most favourable material solution in relation to the bridges carbon footprint as steel construction has lower embodied energy to concrete and lower harmful emission production. Option 2 requires the lowest quantity of concrete works offering an environmental advantage over Options 1 and 3 and so was considered the most favourable option when compared to the alternatives. Option 2 was therefore taken forward into the final PRO.

3.4.4.3 Greenhills Road – Avoidance of Building Demotion

At the connection of Calmount Road and Greenhills Road, the constraints imposed by gradients and access points result in a requirement to demolish an existing warehouse structure within the Chadwicks premises should the standard cross section be utilized. Realigning the road away from this building was investigated but was not deemed possible due to impacts on entrances to other premises opposite the building. In addition, a 1,200mm

diameter watermain is located beneath the building which is a significant constraint as this is one of the primary water feeds into the City Centre.

In order to avoid the building an alternative cross-section was required. The removal of the general traffic lane or cycle lane in either direction was not feasible. For this reason, consideration was given to removing a section of bus lane in one of the directions. As traffic can queue back from the Walkinstown Roundabout past this location during peak periods it was decided to consider the removal of the outbound bus lane only.

Removing the outbound bus lane for a distance of approximately 200m in the outbound direction will have a minimal impact on bus journey times as this section rarely has traffic congestion in the Tallaght direction, with a predicted impact on the bus journey times of approximately 20 seconds. As the disadvantages of removing this section of outbound bus lane are far less than the demolition of a building in close proximity to a large watermain, this revised layout was taken forward into the final PRO.

3.4.4.4 R134 New Nangor Road – Avoidance of Watercourse

On the R134 New Nangor Road, between Woodford Walk and the M50, a watercourse runs parallel to the carriageway and is impacted by the provision of the full BusConnects Cross-section. The impact would include removal of trees and other vegetation along the banks of the watercourse over a distance of approximately 300m. Following a review of the potential environmental impacts it was considered that a revised proposal was required to minimise, or preferably eliminate the impact on the watercourse.

Realigning the corridor in the south would also result in negative environmental impacts including removal of vegetation along the banks of the Cammock River. Therefore, an alteration to the cross-section was required. Consideration focused on the removal of the footway on the north side of the road as this was a lightly used footpath and an existing footway was available immediately parallel along the Grand Canal Greenway. The removal of this footway eliminates the impact on the watercourse and its banks and has negligible impact on pedestrians as connections are available at either end of the section that was removed. For night-time, where some may be concerned about using the Greenway as it has less passive surveillance, a footway continues to be available along the southern side of the road and signalised pedestrian crossings are provided on either end to allow pedestrians to cross the road easily. The removal of the footpath eliminates environmental impacts, with only a marginal decrease in the level of service for pedestrians.

The revised cross-section was taken forward into the final PRO.

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

- Irish Rail Website. [Online] Dart Expansion Programme available from - <https://www.irishrail.ie/Admin/IrishRail/media/Content/projects-and-investments/DART-brochure.PDF>
- NTA (2012). Bus Rapid Transit (BRT) – Core Network Report.
- NTA (2016). Transport Strategy for the Greater Dublin Area 2016 – 2035.
- NTA (2017a). Greenhills to City Centre Core Bus Corridor Options Study – Volume 1: Feasibility and Options Assessment – Main Report [Online] Available from: <https://busconnects.ie/media/1434/volume-1-feasibility-and-options-assessment-main-report-issue-1.pdf>
- NTA (2017b). Clondalkin to City Centre Core Bus Corridor Feasibility Study and Options Assessment Report [Online] Available from: <https://busconnects.ie/media/1433/162060-rep-006-cbc-main-report-final.pdf>
- NTA (2019a). Greenhills to City Centre Core Bus Corridor Emerging Preferred Route. Public Consultation January 2019 [Online] Available from: <https://busconnects.ie/media/1450/9-busconnects-cbc-greenhills-to-city-centre-040119-fa.pdf>
- NTA (2019b). Clondalkin to Drimnagh Core Bus Corridor Emerging Preferred Route. Public Consultation January 2019 [Online] Available from: <https://busconnects.ie/media/1449/8-busconnects-cbc-clondalkin-to-drimnagh-040119-fa.pdf>
- NTA (2020a). Greenhills to City Centre Core Bus Corridor Preferred Route. Public Consultation March 2020 [Online] Available from: <https://busconnects.ie/media/1808/09-greenhills-to-city-centre-preferred-route-180220-fa-web.pdf>
- NTA (2020b). Clondalkin to Drimnagh Core Bus Corridor Preferred Route. Public Consultation March 2020 [Online] Available from: <https://busconnects.ie/media/1823/08-clondalkin-to-drimnagh-preferred-route-18220-fa-web.pdf>
- NTA (2020c). Greenhills to City Centre Core Bus Corridor Preferred Route. Public Consultation November 2020 [Online] Available from: <https://busconnects.ie/media/2186/09-greenhills-to-city-centre-preferred-route-221120fa-web.pdf>
- NTA (2020d). Clondalkin to Drimnagh Core Bus Corridor Preferred Route. Public Consultation November 2020 [Online] Available from: <https://busconnects.ie/media/2110/08-clondalkin-to-drimnagh-preferred-route-301020fa-web.pdf>
- UITP (The International Association of Public Transport) (2009). Public Transport: making the right mobility choices.
- Directives and legislation
- Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment
- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment
- S.I. No. 279/2019 - European Union (Roads Act 1993) (Environmental Impact Assessment) (Amendment) Regulations 2019
- S.I. No. 296/2018 – European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018