Appendix I1

Greenhills to City Centre Core Bus Corridor - Feasibility and Options Assessment

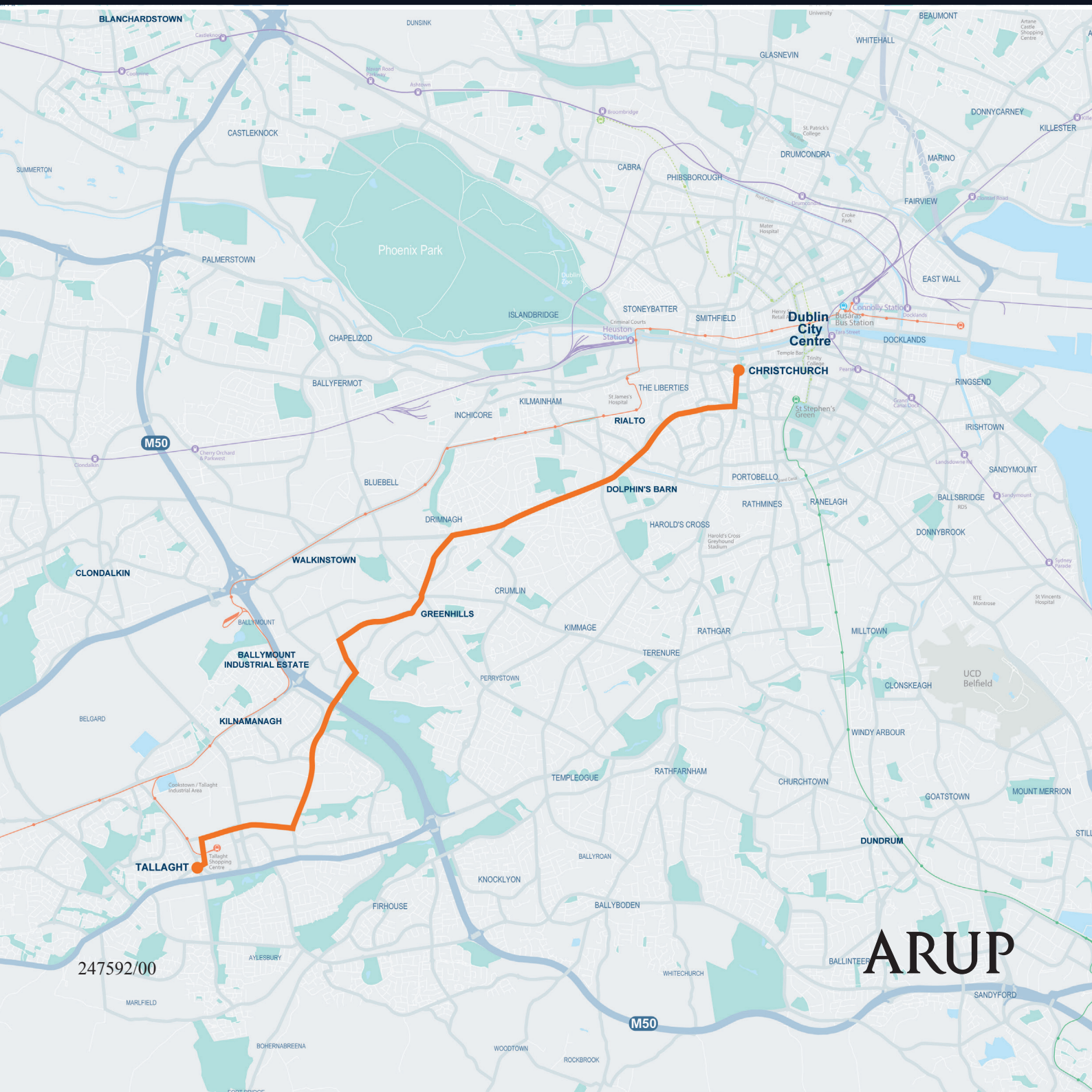
Main Report

National Transport Authority

ISSUE 1

Greenhills to City Centre Core Bus Corridor Options Study

Volume 1: Feasibility and Options Assessment - Main Report



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Executive Summary

This report presents the route options assessment work undertaken for the Greenhills to City Centre Core Bus Corridor (CBC) scheme and makes a recommendation on a **preferred route**.

A concept scheme design for the CBC has been prepared and has been presented.

Transport Context

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

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

The Greenhills to City Centre CBC is identified as part of the Core Bus Network and is presented in **Figure (i)**. For context, the Greenhills CBC is highlighted in orange.

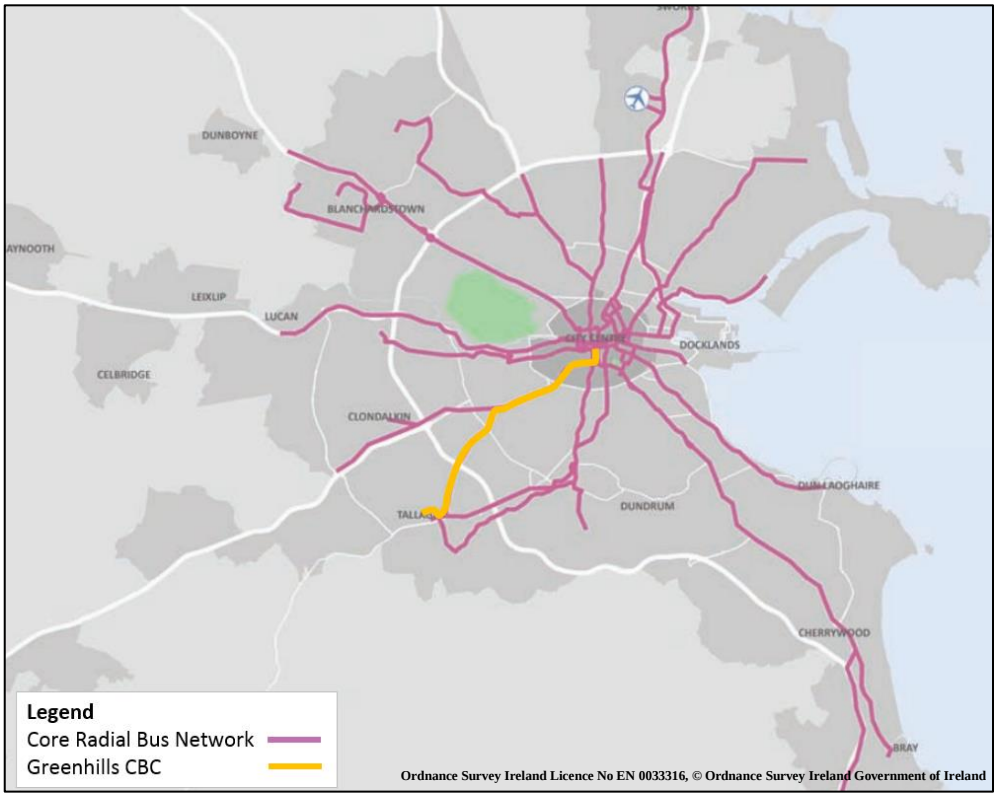


Figure (i): 2035 Radial Core Bus Network (Source: Figure 5.5 Transport Strategy 2016 – 2035)

CBC Scheme Objectives

Having regard to the findings of the transport context for the proposed CBCs in the GDA, the following objectives have been established for the Greenhills CBC Corridor:

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

The Study Area

Generally speaking, the study area was taken to include roads within 500 m of the existing bus corridor, but extends beyond this in places to consider potentially feasible route options. The study area also considers the presence of other existing or proposed transport service routes (as part of the GDA Transport Strategy) in the vicinity such as other adjacent CBCs, the Luas red line and the proposed Clongriffin to Tallaght Swiftway BRT route.

The study area considered, and the subsections into which it was divided, is presented in **Figure (ii).**

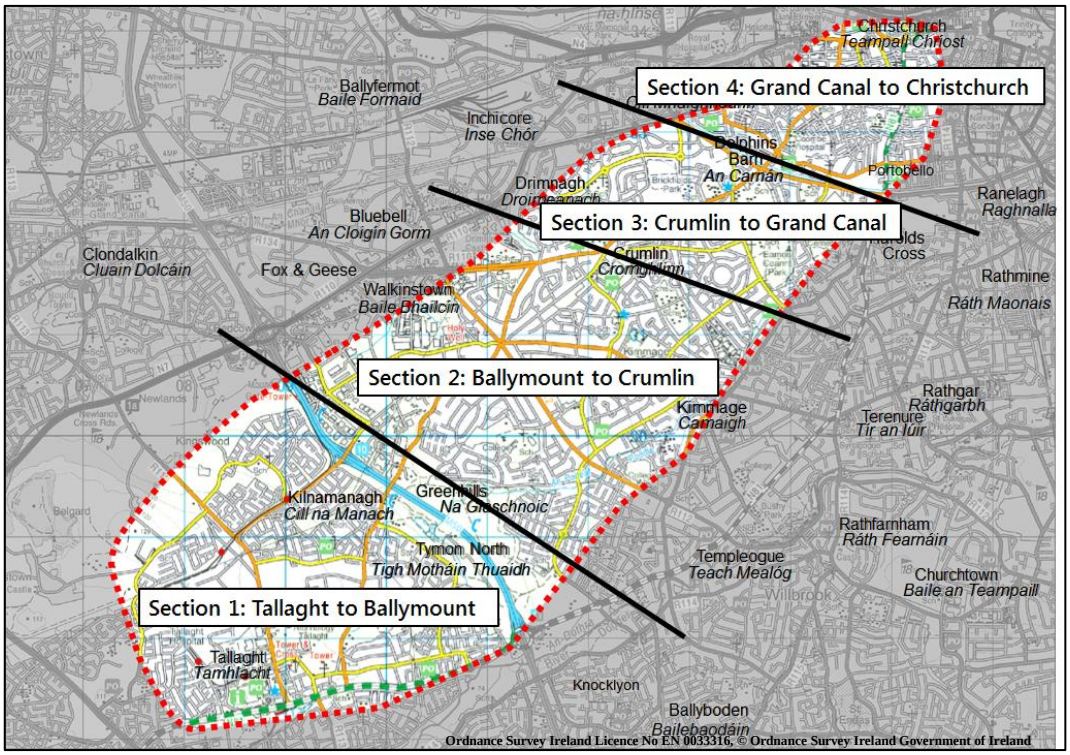


Figure (ii): Study Area

Route Options Assessment Methodology

A two-stage assessment was adopted:

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

At the start of the Stage 1 assessment, an initial 'spider's web' of potential route options that could accommodate a CBC was identified for each study area section. Route options considered in the Stage 1 assessment are presented in **Figure (iii).**

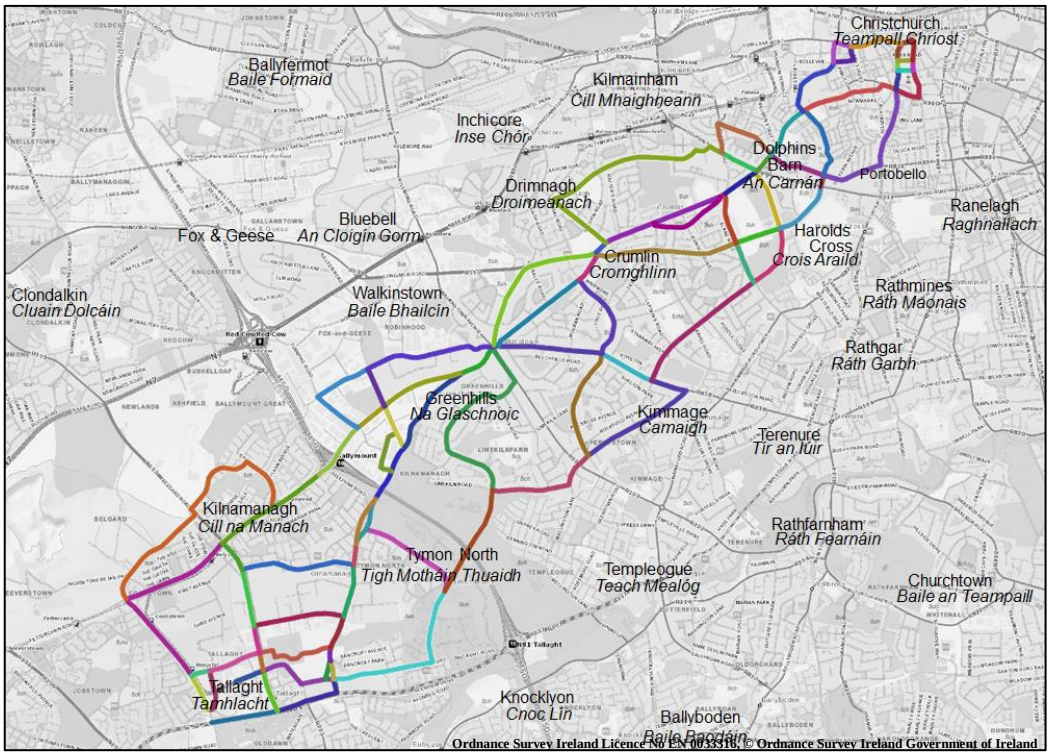


Figure (iii): Spider's Web of Route Options

This was narrowed down using a high level qualitative method based on professional judgement and a general appreciation for existing physical conditions/constraints within the study area from available survey information and site visits. This exercise screened and assessed technically feasible route options, based on distinct, project specific objectives. In addition to being assessed on their individual merits, routes were also screened relative to each other allowing some routes to be ruled out if more suitable alternatives existed.

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

The Stage 2 assessment comprised a more detailed qualitative and quantitative assessment, using criteria established to compare route options. The first step in the Stage 2 assessment was to combine shorter route options which passed the Stage 1 assessment, to form longer end-to-end routes within each study area section.

Following this, an initial indicative scheme for each route option was determined based on the specific constraints along the route (e.g. bus lane in each direction with raised adjacent cycle lanes, bus lanes in each direction only, bus lane in one direction only etc.). In particularly constrained locations, a number of variant scheme options were considered and assessed as necessary.

The indicative scheme for each route option was then progressed to a 'Multi-Criteria Analysis' (MCA) of route options under the following main criteria:

- Economy;

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

An appreciation of the constraints and opportunities within the study area, as well as the defined project objectives, led to establishment of project-specific route options assessment sub-criteria under each of the main criteria listed above. **Table (i)** presents a summary of the CBC assessment criteria and sub criteria used as part of the Stage 2 detailed route options assessment process. The assessment criteria are described further in Section 4.

Table (i): Assessment Criteria

Assessment Criteria	Assessment Sub-Criteria
1. Economy	1.a. Capital Cost
	1.b. Transport Reliability and Quality (Journey Time)
2. Integration	2.a. Land Use Integration
	2.b. Residential Population and Employment Catchments
	2.c. Transport Network Integration
	2.d. Cycle Network Integration
3. Accessibility & Social Inclusion	3.a. Key Trip Attractors (Education/Health/Commercial/Employment)
	3.b. Deprived Geographic Areas
4. Safety	4.a. Road User Safety
5. Environment	5.a. Archaeology and Cultural Heritage
	5.b. Architectural Heritage
	5.c. Flora & Fauna
	5.d. Soils and Geology
	5.e. Hydrology
	5.f. Landscape and Visual
	5.g Air Quality
	5.h. Noise & Vibration
	5.i. Land Use Character

Options Assessment

The routes assessed in the MCA for each route section are summarised in this section. Full details of the assessment are presented and discussed in Sections 5 to 8 of this report, with the full assessment presented in **Appendix A**.

Study Area Section 1: Tallaght to Ballymount

Belgard Road to Greenhills Road

Following the Stage 1 sift for the Tallaght to Ballymount study area, only one feasible route option was identified from the CBC starting point to Belgard Road. The remaining route options between Belgard Road and Greenhills Road were combined to form 4 cohesive route options as follows (see **Figure (iv)**):

- BG1 - A route option via Belgard Road, Old Blessington Road and Greenhills Road (see **Figure 5.3** for further details);
- BG2 - A route option via Institute of Technology Tallaght and Greenhills Road (see **Figure 5.7** for further details);
- BG3 - A route option via Belgard Road, Airton Road and Greenhills Road (see **Figure 5.10** for further details); and
- BG4 - A route option via Belgard Road, Mayberry Road and Greenhills Road (see **Figure 5.15** for further details).

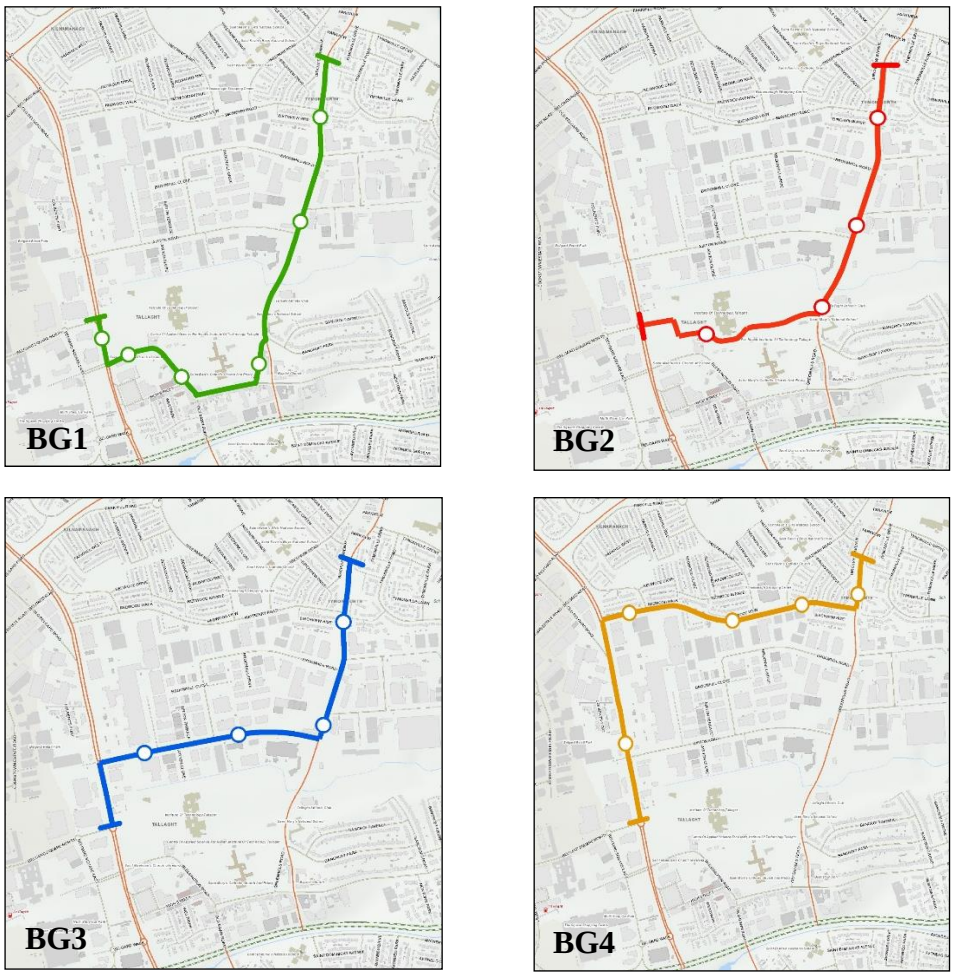


Figure (iv) Route Options in Tallaght

Based on the multi-criteria assessment undertaken, route option **BG2** is preferred for the Tallaght area for the following reasons:

- It has 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 the Institute of Technology Tallaght;
- It is the most direct route offering faster and reliable journey times (4 – 5 minutes); and
- It has comparatively lower potential to impact on the environment across most sub criteria (with the exception of Flora and Fauna).

This route option is however subject to reaching satisfactory agreement with ITT on the operational arrangements for routing buses through the campus. In the absence of such an agreement, route option BG1 is considered to offer a viable alternative. Although this route option is more expensive than the next highest ranked option (BG3) it offers substantially better coverage in terms of serving both residential and employment populations and key trip attractors.

Parkview Area

In the vicinity of the existing Parkview residential estate, two route options passed the Stage 1 Assessment (see **Figure (v)**):

- PV1 - A route option via Greenhills Road (see **Figure 5.19** for further details);
- PV2 - A route option via a realigned Greenhills Road to the rear of Parkview residential estate (see **Figure 5.22** for further details).

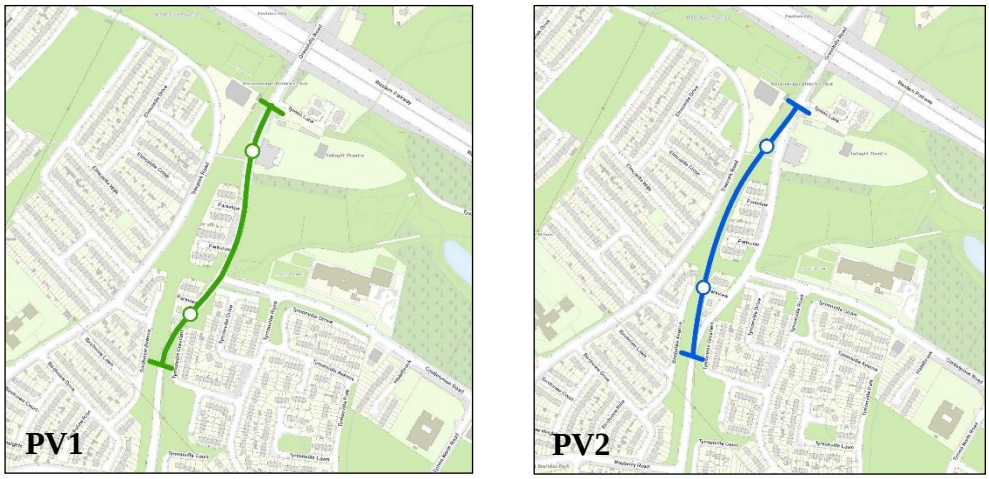


Figure (v) Route Options in Parkview

Based on the multi-criteria assessment undertaken, route option **PV2** is preferred 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 is consistent with and delivers road links which are included as objectives in the South Dublin County Council Development Plan 2016 – 2022; and
- Although it has the potential for relatively higher environmental impacts than PV1, the severity of these impacts are not at this stage of the assessment process considered to be significant.

Study Area Section 2: Ballymount to Crumlin

Ballymount to Walkinstown Roundabout

Following the Stage 1 sift the remaining route options between Ballymount and Walkinstown were combined to form 3 cohesive route options (see **Figure (vi)**):

- BW1 - A route option via Greenhills Road (see **Figure 6.3** for further details);
- BW2- A route option via Ballymount Avenue and Calmount Road (see **Figure 6.7** for further details);
- BW3 - A route option via Greenhills Road, with traffic rerouted to the BW2 routing (see **Figure 6.12**for further details).

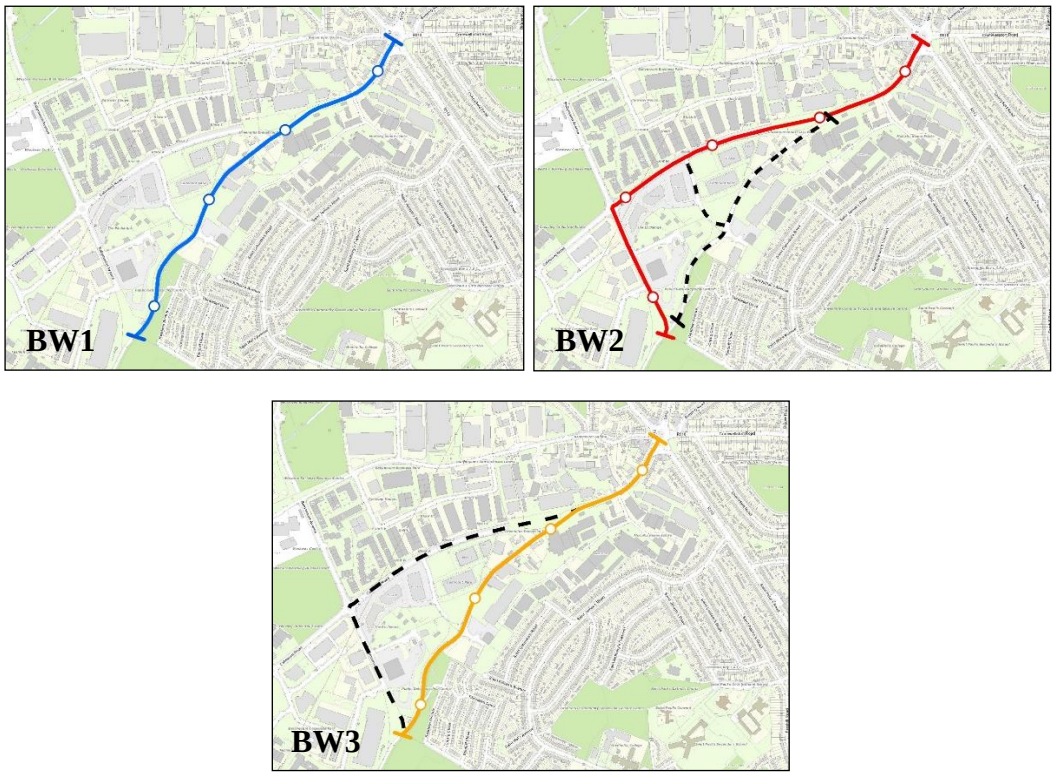


Figure (vi) Route Options in Ballymount

Based on the multi-criteria assessment undertaken, 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 Greenhills Road. Cycle access to Greenhills Road, which is identified as a feeder route, could also be maintained in this option;
- Compared to option BW3, this option removes the need for additional signalised junctions associated with bus access to and from the current Greenhills Road alignment. Furthermore it directly serves Ballymount Industrial Estate, which is a major trip attractor with a large employment catchment;
- It is consistent with and delivers road links which are included as objectives in the South Dublin County Council Development Plan 2016 – 2022. It also allows 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.

Walkinstown Roundabout

A number of traffic management and junction arrangement options for Walkinstown Roundabout were assessed as part of the options assessment process. The assessment built on some preliminary junction upgrade assessment work undertaken by Arup on behalf of South Dublin County Council and the NTA in 2013.

Following the stage 1 sift of junction and traffic management options, the following scheme options were assessed in further detail (see **Figure (vii)**):

- Scheme Option 1: Modified Roundabout Dual Lane (see **Figure 6.21** for further details);
- Scheme Option 2: Modified Roundabout Dual Lane, Ballymount Road Local Access Only (see **Figure 6.22** for further details);
- Scheme Option 3: Modified Roundabout Single Lane (except Greenhills Road and Walkinstown Road), Dual Lane Gyratory (see **Figure 6.23** for further details);
- Scheme Option 4: 4-arm Signalised Junction, Ballymount Local Access Only, Cromwellsfort Road LILO (see **Figure 6.24** for further details);
- Scheme Option 5: Double Signalised Junction North/South with Ballymount Road Local Access Only (see **Figure 6.25** for further details); and
- Scheme Option 6: Double Signalised Junction East/West (see **Figure 6.26** for further details).

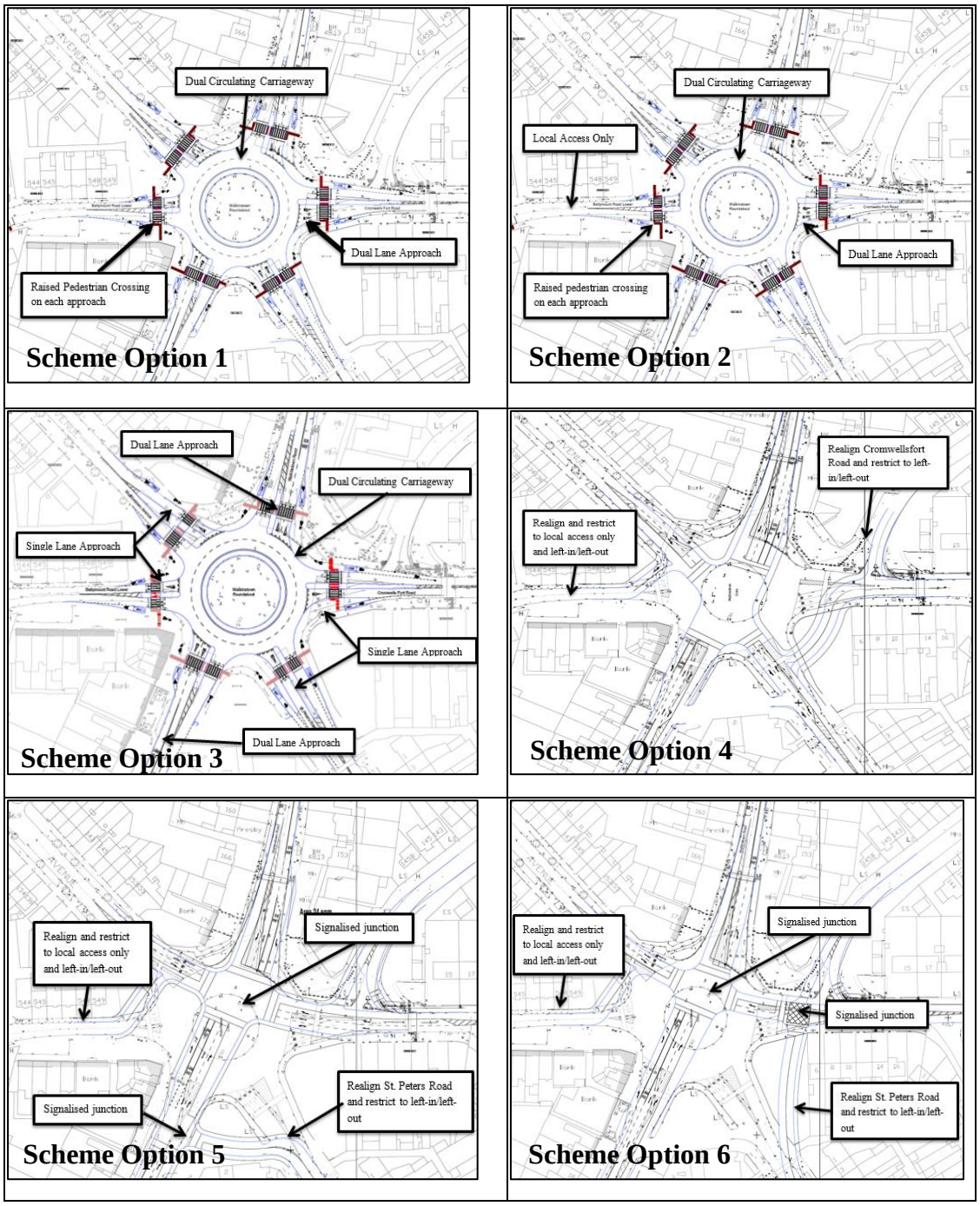


Figure (vii) Scheme Options Walkinstown Roundabout

On the basis of this assessment, **Option 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 3 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.

Options considered to signalise the junction also have the potential to improve bus priority and journey time reliability through the junction, but would require additional assessment at the next design stage to confirm whether the impact as a result of diverting traffic away from the junction would be manageable across the wider road network. Of the signalised junction arrangements, **Option 5** (Double Signalised Junction North-South) is considered to offer the most benefits to the proposed scheme for the following reasons:

- It has potential to provide good journey time reliability for buses;
- It provides good separation between the two signalised junctions to allow the junctions to work together to maximise capacity for all users (would provide the most capacity of all signalised options explored);
- It provides safe signal controlled crossing points for pedestrians; and
- It would facilitate safe movement of cyclists through the junction.

Walkinstown Roundabout to Crumlin

North of Walkinstown Roundabout, two core route options in this area were taken forward from the Stage 1 sift. In addition to these, a route option which utilised both core route options (one for inbound and one for outbound) was considered (see **Figure (viii)**):

- WC1- A route option via Walkinstown Road and Drimnagh Road (see **Figure 6.27**);
- WC2 - A route option via Bunting Road (see **Figure 6.36**);
- WC3 - Inbound routing via Walkinstown Road and Drimnagh Road and outbound via Bunting Road (see **Figure 6.44**).

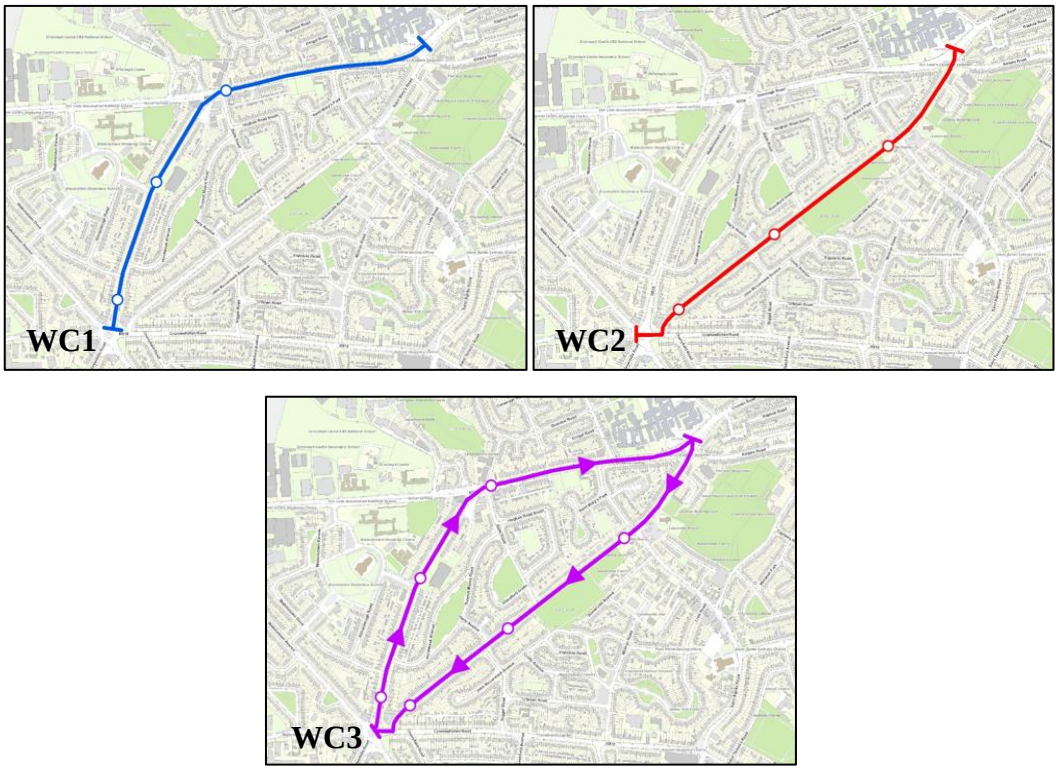


Figure (viii) Route Options in Walkinstown

Given the 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 ranged 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 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 necessitates reductions in the provision for cyclists (i.e. shared provision with bus lanes, rerouting of cycle facilities to nearby roads or streets) and reductions in 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, the extent of engineering works required etc.).

Based on the multi-criteria assessment undertaken, on balance route option **WC1 with bus lanes in each direction** emerges as 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 and services;
- It also delivers high quality cycle facilities along Drimnagh Road;
- It offers a safer route compared to other options due to fewer turn movements being required; and
- While road widening associated with this option impacts on several properties, at this stage of the assessment process it is considered that potential impacts on the environment can be mitigated against.

Study Area Section 3: Crumlin to Grand Canal

Following the Stage 1 sift 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 (see **Figure (ix)**):

- CG1 - A route option via Crumlin Road (see **Figure 7.3** for further details);
- CG2 - A route option via Kildare Road and Sundrive Road (see **Figure 7.16** for further details);
- CG3 - Inbound routing via Crumlin Road and outbound via Kildare Road and Sundrive Road (see **Figure 7.24** for further details).

Figure (ix) Route Options in Crumlin

As for the Walkinstown Roundabout to Crumlin study area section, given the 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.

Based on the multi-criteria assessment undertaken, on balance route options **CG1b with bus lanes in each direction** (and raised adjacent cycle lanes provided on Kildare Road/Sundrive Road), emerges as 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 and services;
- Cycle route network objectives are achievable by providing high quality cycle facilities along a parallel route (Kildare Road/Clogher Road/Sundrive Road;
- 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. Furthermore it is considered that the scheme design can be sufficiently sensitive to each buildings status and would unlikely result in any significant material impacts.

Study Area Section 4: Grand Canal to Christchurch

Following the Stage 1 sift for the Grand Canal to Christchurch study area, there was only one route option identified between the canal and Patrick Street. However, there were 2 route options available for the remainder of the route (see **Figure (x)**):

- GC1 - A route option via Patrick/Nicholas Street (see **Figure 8.3** for further details); and
- GC2 - A route option inbound via Patrick/Nicholas Street and outbound via Werburgh Street, Bride Street and Kevin Street Upper (see **Figure 8.13** for further details).

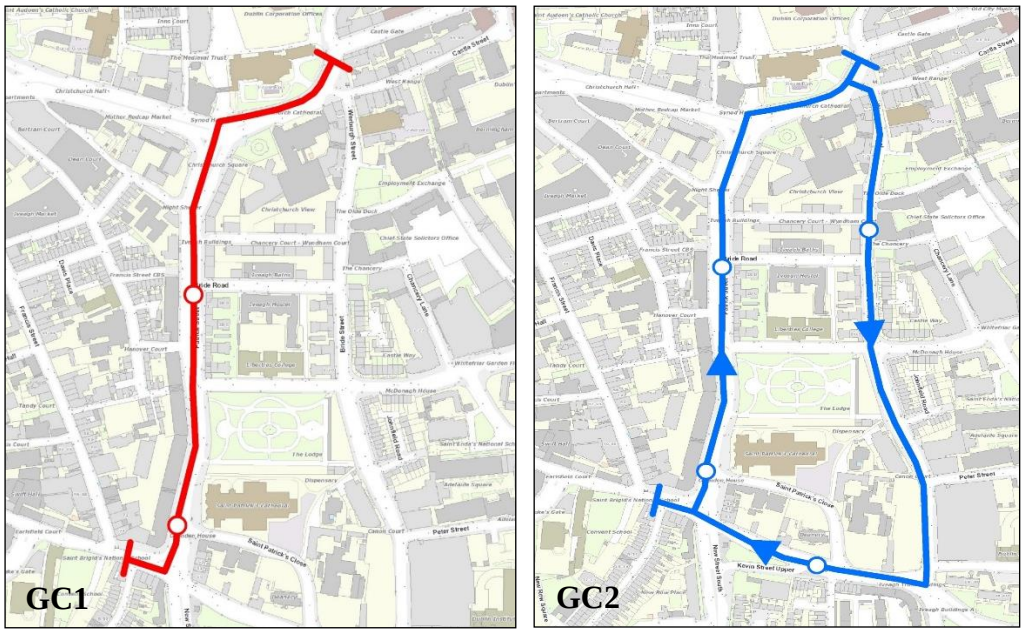


Figure (x) Route Options in City Centre

A number of scheme options along the routes described above were considered, covering a range of potential design interventions.

Based on the assessment undertaken, while there is little to distinguish between routes, on balance route option **GC1a with bus lanes and raised adjacent cycle lanes in each direction** is 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 larger 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
- Although it would have relatively higher environmental impact compared to other options, based on this stage of assessment, the severity of impacts are not considered to be significant.

The Emerging Preferred Route

Based on the conclusions from the route options assessment process, an emerging preferred route for the CBC Scheme has been identified, as presented in **Figure (xi),** and is described in the following section.

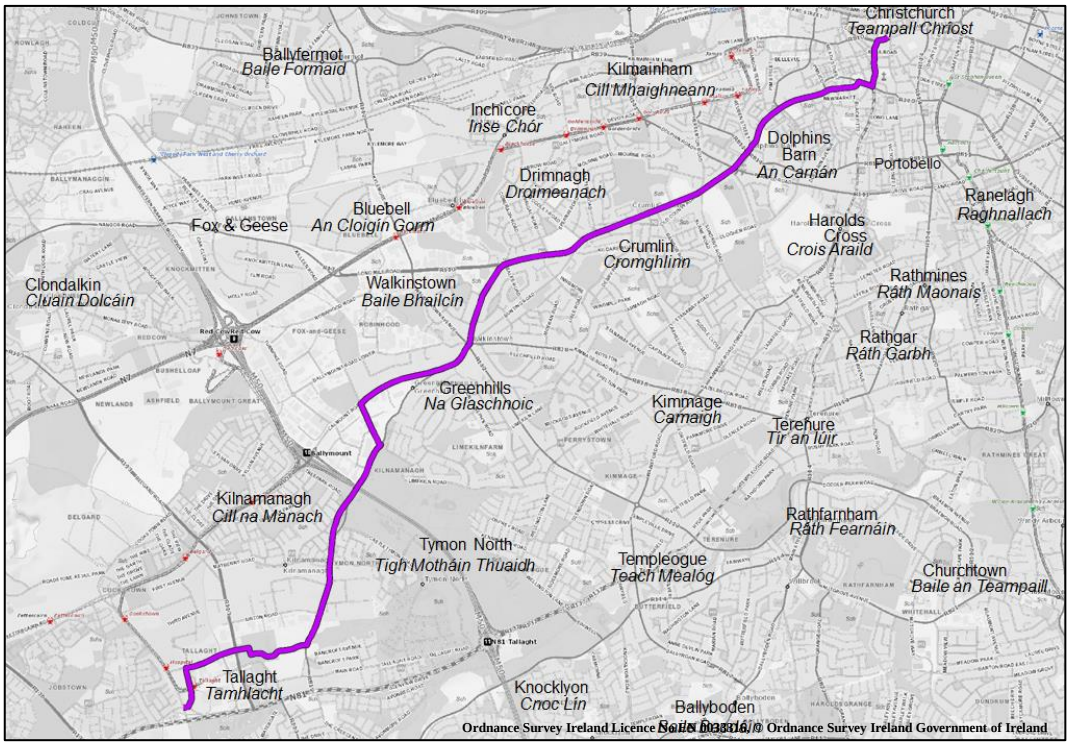


Figure (xi): Emerging Preferred Route

Describing the emerging preferred route in the Tallaght to city centre direction, the CBC commences on Belgard Square West at the junction with Cookstown Way just west of Tallaght Town Centre. It is proposed to relocate the existing bus gate on Belgard Square South to Belgard Square West, thereby creating a bus only link between Belgard Square South and Old Blessington Road. This also aligns with the traffic management proposals set out in the 'Tallaght Movement Framework Plan'. The preferred route continues along Belgard Square West, before turning right onto Belgard Square North. Along Belgard Square North, it is proposed to convert the three roundabouts on Belgard Square North to signalised junctions to improve bus priority as well as safety for pedestrians and cyclists. At the junction with Belgard Road, buses would continue straight through the junction and into the IT Tallaght campus grounds. Buses would follow the existing road through the campus exiting at the existing IT Tallaght junction on Greenhills Road. Based on current traffic management arrangements on the campus, no bus lanes are proposed through the IT Tallaght campus due to low traffic volumes.

Once on Greenhills Road, buses would continue north along the existing Greenhills Road alignment. It is proposed to widen the road by 6-10m to accommodate bus and raised adjacent cycle lanes in each direction. From a point approximately 200m south of Castletymon Road, it is proposed to realign the existing Greenhills Road between Parkview and Treepark Road, which is included in the South Dublin County Council Development Plan as a roads objective. This would involve the construction of a new road, 500m in length, consisting of bus lanes and raised adjacent cycle lanes in each direction in addition to traffic lanes.

It is not considered practical, due to width constraints on the bridge, to provide dedicated bus and cycle lanes across the existing Greenhills Road M50 overpass.

Bus priority would therefore be dropped in advance of the bridge. A queue relocation facility is proposed for outbound buses crossing the M50 overpass, due to the proximity of a pedestrian crossing south of the bridge and the potential to cause delay to buses. 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.

Buses would continue north along the existing Greenhills Road alignment as far as a point approximately 250m north of the existing Ballymount Industrial Estate entrance on Greenhills Road. At this location it is proposed to create a new road link which would connect Greenhills Road to Ballymount Avenue allowing buses to directly serve the industrial estate. Access to and from Greenhills Road at this location would be closed to traffic. Buses would continue along Ballymount Avenue before turning right onto Calmount Road. Both Ballymount Avenue and Calmount Road would be widened to accommodate bus lanes and raised adjacent cycle lanes in each direction.

Calmount Road is currently a cul-de-sac but it is proposed as part of this scheme to extend Calmount Avenue to meet Greenhills Road. Between Calmount Road and Walkinstown Roundabout, it is proposed to widen the road, primarily to the east, to facilitate bus lanes and raised adjacent cycle lanes in each direction. This section of road would potentially require significant earthworks/retaining structures to maintain the new extended Calmount Road and widened Greenhills Road at its present level. Alternatively, the road could be lowered but there could be equally extensive works associated with the diversion of services through this section. The works required would be investigated further at the detailed design stage.

Two junction upgrade options are presented for Walkinstown Roundabout for more detailed consideration at the next design stage. The first option (Drawing T0100-08A) proposes maintaining a roundabout arrangement, but reducing the number of circulation lanes and entry lanes to two lanes on all approaches. A second option is also presented (Drawing T0100-08B) which would see the creation of two signalised junctions in close proximity, which would operate as two linked traffic signal controlled junctions.

Buses would continue through this junction onto Walkinstown Road where it is proposed to widen the road to accommodate bus lanes in each direction.

Buses would then turn right onto Drimnagh Road, where bus lanes are currently provided. However, some road widening is proposed to provide raised adjacent cycle lanes in each direction. Buses would continue onto Crumlin Road, where it is proposed to widen the road to provide bus lanes in each direction. Cycle facilities are not considered practical along Crumlin Road, which is identified as a primary route in the GDA Cycle Network Plan. As such, it is proposed to reroute the primary cycle route in this area, with facilities to be provided along a parallel route consisting of Kildare Road, Clogher Road and Sundrive Road.

Between Sundrive Road and the Canal, there are currently bus lanes in each direction. Under these proposals, these bus lanes would be maintained. However it is not considered practical to provide cycle lanes in either direction through this section.

At the canal, buses would continue straight onto Dolphin's Barn, Cork Street and St. Luke's Avenue where some minor road widening is required to facilitate improved bus priority and higher quality cycle facilities.

At the junction with Dean Street, buses would turn right onto Dean Street where it is not possible to provide bus lanes in either direction. On Dean Street, to maintain some degree of priority for buses along this section of the route, it is proposed to manage queuing using the signalised junctions on either side of the street. Furthermore, it is proposed to ban the right turn from Francis Street to minimise the interference with outbound buses.

Buses would then turn left onto Patrick Street where it is proposed to widen the road and remove the central median to provide bus and cycle facilities in each direction. Buses would continue straight along Patrick Street and Nicholas Street before turning right onto Christchurch Place where the route ends.

Outbound services running along the CBC would take the same route to return to Tallaght.

Concept Scheme Design Summary

An initial concept scheme design on the emerging preferred route has been prepared and is presented in **Volume 3** of this report. In total, the emerging preferred route measures 11.2km. Along the existing bus route most similar to the emerging preferred route between Tallaght and the city centre (Route 27), existing bus priority infrastructure is only present along approximately 29% (3.2km) of the inbound direction and 26% (2.9km) of the outbound direction of the total route length. The proposed scheme would significantly improve this provision to approximately 91% (10.2km) in each direction along the emerging preferred route. The only place where bus lanes are not provided are along Dean Street, the M50 overpass at Tymon Park and through the grounds of IT Tallaght. Importantly, the concept scheme design improves bus priority to the stop line at signalised junctions and therefore significantly minimises the potential for delays to buses at these locations along the route.

In addition to improvements to bus priority infrastructure along the emerging preferred route, high quality cycle infrastructure is also included in the concept scheme design which incorporates sections of primary routes 7, 8 and 8B and secondary routes 8A, 8C and 9B as identified in the GDA Cycle Network Plan. The overall provision of new/upgraded high quality raised adjacent cycle lanes as part of this scheme equates to approximately 8km in each direction (75% of overall route).

Cost Estimate

A high level cost estimate has been prepared based on the concept scheme design and a number of assumptions regarding the scheme details. Based on this, the proposed CBC scheme infrastructure cost is anticipated to be in the region of €60m - €70m.

Journey Time Benefits

Through the provision of increased bus priority infrastructure, the proposed scheme would improve both the overall journey times for buses along the route and the journey time reliability. A review of available journey time data along the route illustrates the issues that will be largely addressed by the proposed scheme.

Currently, journey times for bus route 27 between The Square and Dame Street during the core hours of bus operation (07:00 – 19:00) are observed to vary between 37 minutes and 47 minutes in the inbound direction and between 39 minutes and 53 minutes in the outbound direction (see **Figure 9.2** and **Figure 9.3** for further detail). The variation in journey times is most likely due to the lack of bus priority on large sections of the route and subsequent turbulence caused by traffic congestion, as well as long passenger boarding times at stops (due to requirements for driver interaction).

As such, the journey times outside of these hours, when traffic volumes and passenger volumes are lower, are more reflective of the journey times which could be achieved through a combination of the proposed bus priority infrastructure improvements, better enforcement of bus lanes and the introduction of cashless fares. In other words, the proposed infrastructure would effectively create an uncongested network for buses.

Currently, after 19:00 in the evening, the inbound journey time is observed to reduce to between 27 minutes and 33 minutes. Similarly, outbound journey times are seen to reduce to between 32 minutes and 39 minutes. For both inbound and outbound journey times after 19:00, the overall journey time is seen to drop by up to 14 minutes with the variance between the upper and lower limits halved for each direction.

Similarly, comparing the average speed of buses in the peak and off-peak hours it can be seen that the average speed for buses along the route is consistently higher at night, in uncongested conditions, compared to the morning peak hour where congestion slows the progression of buses (see **Figure 9.4** and **Figure 9.5** for further detail). This further illustrates the benefits improved bus priority will bring to buses operating along the proposed route.

Based on the above, a conclusion can be drawn that by improving the provision of bus lanes along the route (coupled with the introduction of cashless fares), the risk of turbulence to buses would be significantly reduced, allowing buses to move along the route more quickly and with more consistent journey times. The extent of these benefits will be confirmed and quantified at the next design stage.

Next Steps

The next project stage (Preliminary Design Stage) will further refine and update the initial concept design developed as part of this study for the emerging preferred CBC route. This will define the final practically achievable scheme for the CBC, taking account of more detailed studies of constraints, impacts and environmental assessment required at a local level.

Prior to finalisation of the CBC scheme design, a public consultation process will be undertaken, with inputs and feedback received incorporated where practical and appropriate to do so.

Due to the extent of the works required, and in particular the widening of existing roads from two to four lanes in some places, an environmental impact statement will be required. The preferred scheme will also be the subject of a detailed business case appraisal in accordance with the NTA's Project Management Guidelines before progressing through the statutory planning process.

1 Introduction and Background

1.1 Preamble

This report presents the findings of the route options assessment undertaken for the Greenhills to City Centre Core Bus Corridor (CBC) and makes a recommendation on a preferred route.

The report also details the initial concept design developed for the bus priority and cycle infrastructure provision along the CBC. While a bus service is yet to be defined for the CBC, it is assumed that a number of high frequency bus services will avail of the CBC infrastructure.

1.2 Report Structure

The report structure is set out below:

- **Section 2** – The strategic transport policy context which has led to the identification of a need for the delivery of a CBC on this corridor is discussed in this section. The objectives for the CBC scheme are also set out.
- **Section 3 –** The objectives of the Greater Dublin Area Core Bus Network (CBN) and the proposed scheme are presented. The extent of the CBC study area assessed, effectively defining the proposed scheme corridor, is described in this section. Key constraints and opportunities are identified and the integration of the corridor with the wider public transport network, and the compatibility with other road users is presented. The study area is split into 4 sections.
- **Section 4** – The methodology for identifying and assessing the feasibility of the various potential route options available within the study area is discussed in this section including:
  - the selection and determination of initial criteria for screening and assessing technically feasible route options, based on distinct, project-specific objectives;
  - the definition of assessment criteria; and
  - the identification of study area sections where practical route options have been considered, and presentation of an initial network ('spider's web') of options examined.
- **Sections 5, 6, 7 and 8** –Details of the route options assessment undertaken for each of the four study area sections is presented in these sections.
- **Section 9** – In this section, the Emerging Preferred Route identified is described.
- **Section 10** - The concept scheme design, including design options explored where necessary, for the proposed scheme is described and presented.
- **Section 11** – The next steps for the project are set out in this section.

2 Transport Context and Scheme Objectives

2.1 Transport Strategy for the Greater Dublin Area 2016 – 2035

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

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

The Greenhills to City Centre CBC is identified as part of the Core Bus Network. The radial and orbital Core Bus Network identified in the GDA Transport Strategy are illustrated in **Figure 2.1** and **Figure 2.2** respectively. For context, the Greenhills CBC is highlighted in orange.

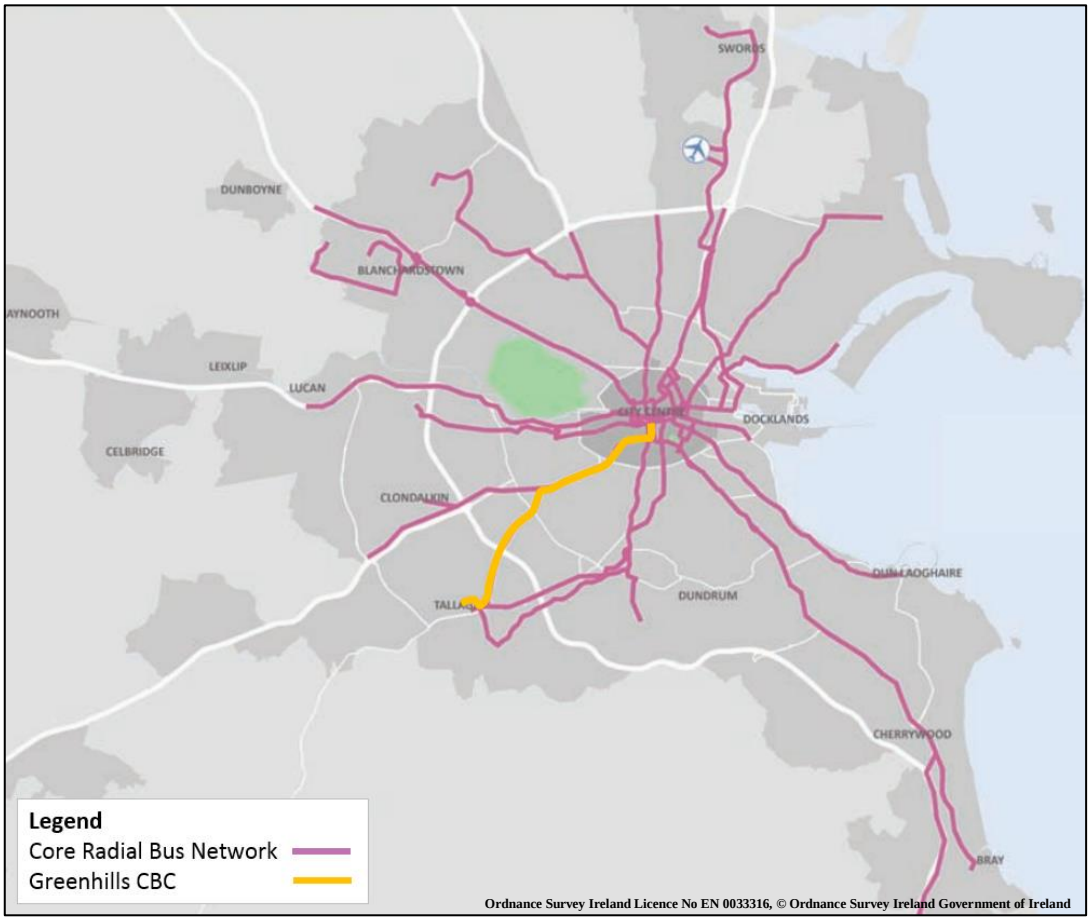


Figure 2.1: 2035 Radial Core Bus Network (Source: Figure 5.5 Transport Strategy 2016 – 2035)

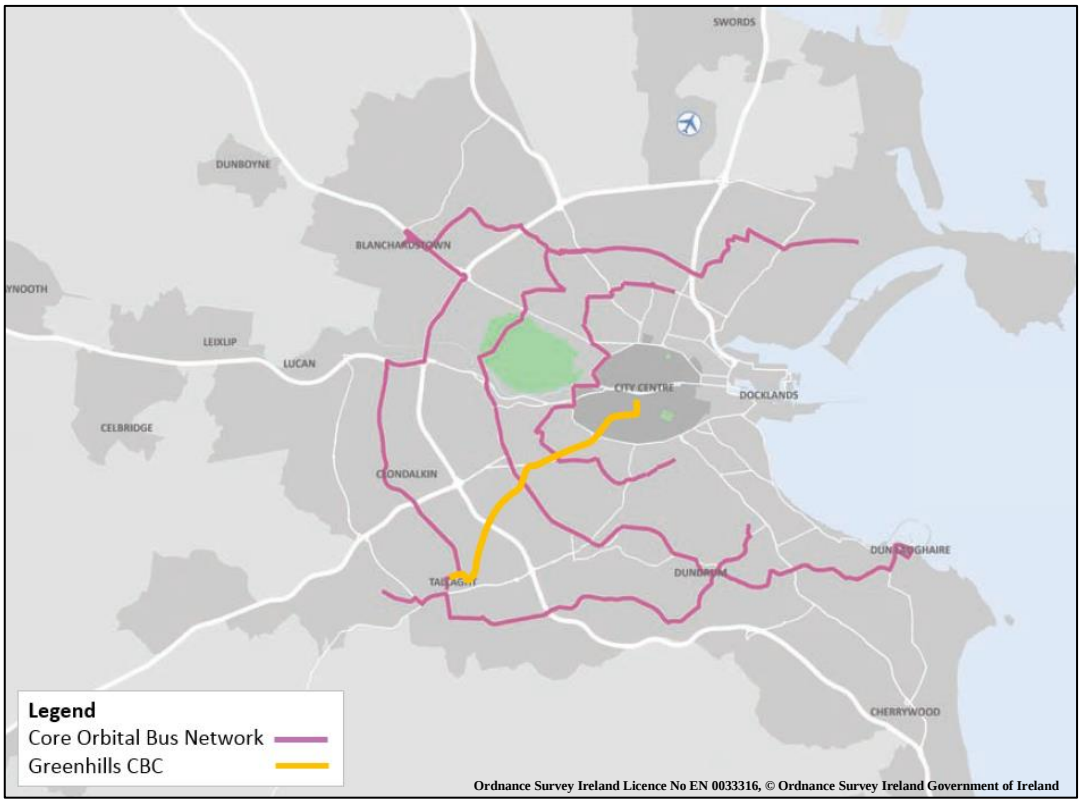


Figure 2.2: 2035 Orbital Core Bus Network (Source: Figure 5.6 Transport Strategy 2016 – 2035)

2.2 Infrastructure and Capital Investment 2016-21: Medium Term Exchequer Framework

The 'Medium Term Exchequer Framework' was published by the Department of Public Expenditure and Reform in September 2015. It presented the findings of a Government-wide review of infrastructure and capital investment policy and outlined the Government's commitment to ensuring that the country's stock of infrastructure is capable of facilitating economic growth.

This report identifies the need to improve public transport facilities noting:

"It is therefore essential that road, rail and public transport networks are developed and maintained to the standard required to ensure the safe and efficient movement of people and freight. In addition, getting people out of cars and onto public transport has a key role to play in reducing Ireland's carbon emissions, by providing a viable, less polluting alternative to car and road transport for many journeys."

The report also provided commitment with regard to funding for a variety of transport related projects including:

"There will be funding for:

- *Further upgrading of Quality Bus Corridors".*

2.3 Integrated Implementation Plan 2013 – 2018

The NTA published the Integrated Implementation Plan 2013 – 2018 in February 2014. This report sets out the short term infrastructure investment programme for the Greater Dublin Area for a five year period up to 2018.

This report identified the need to further develop the quality bus network in the Greater Dublin Area so as to achieve:

> *"….as far as practicable, continuous inbound priority and the maximum possible outbound priority on key bus routes into Dublin City Centre"*

2.4 Greater Dublin Area Cycle Network Plan

In August 2013, the NTA published the Greater Dublin Area Cycle Network Plan. Following a period of consultation with the public and various stakeholders, it was officially adopted and published in early 2014. The plan undertook a review of existing cycle facilities in the GDA and sets out the strategy for the development of an integrated cycle network for the future.

The plan identified that the existing Greenhills to City Centre corridor would form part of the primary cycle network (Routes 8, 8B, 9, 9A, S05), secondary cycle network (Route 8A, 9B) thus forming a key part of the strategic cycle network. It is therefore important that any upgrade to bus priority infrastructure along the corridor takes cognisance of this objective and, where practical, provides cycle infrastructure to the appropriate level and quality of service (as defined by the NTA National Cycle Manual) required for a primary and secondary cycle route.

2.5 CBC Scheme Objectives

Having regard to the findings of the transport context for the proposed CBCs in the GDA, the following objectives have been established for the Greenhills CBC Corridor:

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

3 Study Area

3.1 Introduction

Based on the transport context and scheme objectives set for the Greenhills CBC corridor, the broad study area identified for the proposed scheme is as identified in **Figure 3.1**. Generally speaking, the study area was taken to include roads within a 500 m radius of the existing bus corridor, but extends beyond this in places to consider potentially feasible route options. The starting point (Tallaght Town Centre area) was chosen to generally reflect the meeting of existing bus routes from the west and south of Tallaght or future routes which may commence/terminate in the town centre area. The end point was identified as being the junction of Christchurch Place and Werburgh Street as the purpose of this study was to identify a route which would get buses from Tallaght to the city centre (and vice versa) but not through it. Details of bus infrastructure through the city centre will form part of the City Centre Traffic Management Plan.

The study area also considers the presence of other existing or proposed corridors (as part of the GDA Transport Strategy) in the vicinity such as other adjacent CBCs, the Luas red line, and the proposed Clongriffin to Tallaght Swiftway BRT route.

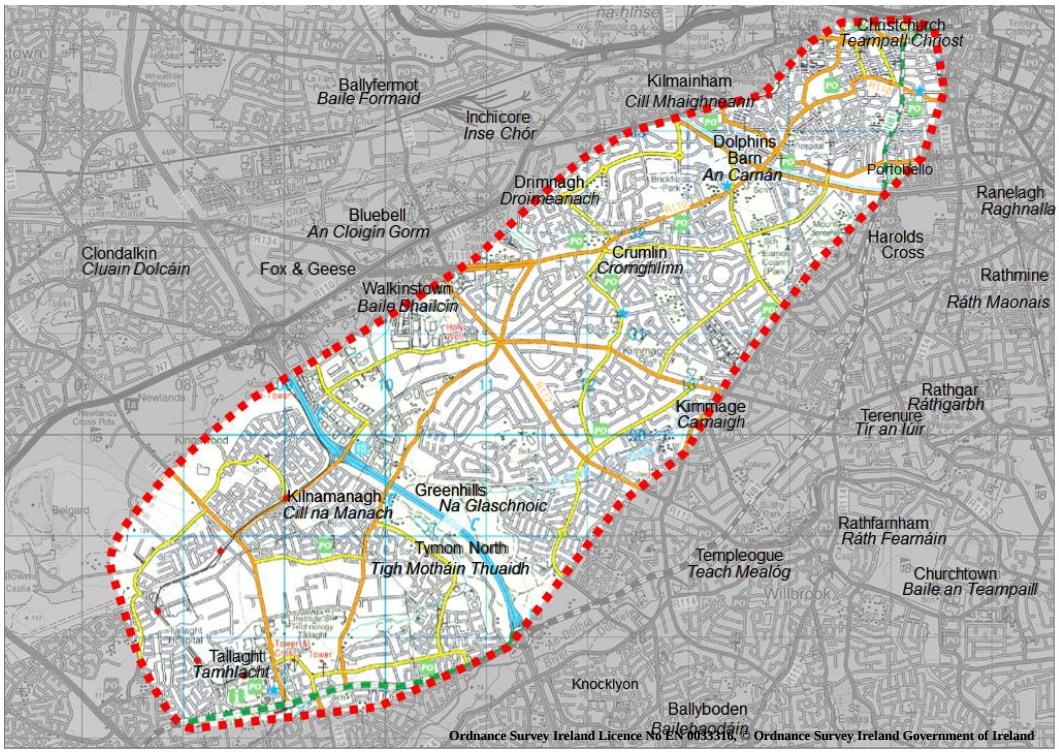


Figure 3.1: Study Area

3.2 Study Area Sections

The study area has been divided into four more manageable sections to simplify the assessment process, being:

- Section 1 – Tallaght to Ballymount;
- Section 2 – Ballymount to Crumlin;
- Section 3 – Crumlin to Grand Canal; and
- Section 4 – Grand Canal to Christchurch.

The extent of each of these corridor sections is presented in **Figure 3.2**.

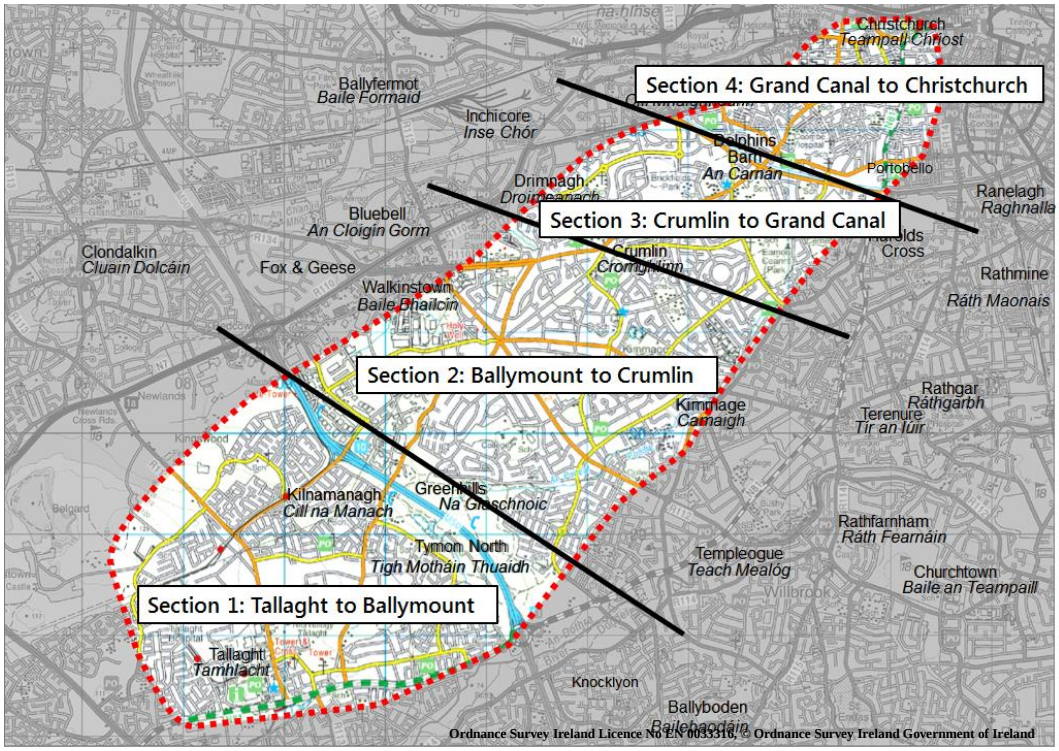


Figure 3.2: Study Area Sections

3.3 Physical Constraints and Opportunities

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

- The M50 motorway, with existing overpasses located at Ballymount and Greenhills Road;
- Grand Canal (including protected structures);
- Luas Red Line;
- Existing and committed future development along the route;
- Existing protected monuments within the study area;
- Significant numbers of street trees and other natural features along the potential route options within the study area;
- The existing urban and sub-urban roads and street network;

- Limited availability of land in urban and suburban areas; and
- Public parks including Tymon Park and Eamonn Ceannt Park.

3.4 Integration with existing and proposed public transport network

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

- The Luas Red Line at Tallaght;
- Future plans for DART Underground at Christchurch;
- Planned Swiftway routes from Clongriffin to Tallaght in the vicinity of Christchurch and at Tallaght;
- Existing Dublin Bus services at numerous locations along the route; and
- Future orbital Dublin Bus routes such as the Tallaght to Dundrum/UCD, Tallaght to Blanchardstown, Dundrum to Finglas and Ranelagh to Drumcondra services.

3.5 Compatibility with other users

A key objective of the proposed scheme is to improve pedestrian and cyclist facilities along the route. In general, segregated facilities (i.e. off-road) should be proposed for these modes.

Where it is considered impractical to construct pedestrian or cycle facilities along a particular section of the CBC route, such facilities will need to be provided along a suitable alternative route.

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

General traffic flow and local access will generally be maintained along the CBC corridor although it is inevitable that there will be impacts on traffic capacity along the route associated with the reallocation of road space to CBC priority and cycle facilities and the introduction of turning movement restrictions. However, reductions in traffic carrying capacity of the road network need to be considered in the context of the overall planned significant increase in quality and level of service (including increased capacity provision) on the CBC route once implemented.

4 Assessment Methodology

4.1 Assessment Process

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

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

4.2 Stage 1: Route Options Assessment – Sifting Stage

An initial 'spider's web' of potential route options that could accommodate a CBC was identified for each study area section. This 'spider's web' of route options was chosen with reference to the CBC characteristics and specifically the potential to meet the scheme objectives as set out in Section 2 of this report. Initial route options identified also took cognisance of the physical constraints and opportunities present (Section 3.3), and the ability to integrate with other public transport modes and routes (Section 3.4). Of particular relevance in developing the 'spider's web' was the potential for the road or route sections to facilitate fast and reliable journey times, and thereby have the potential to practically accommodate bus lane priority.

The resulting study area corridor 'spider's web' of route options identified is presented in **Figure 4.1**.

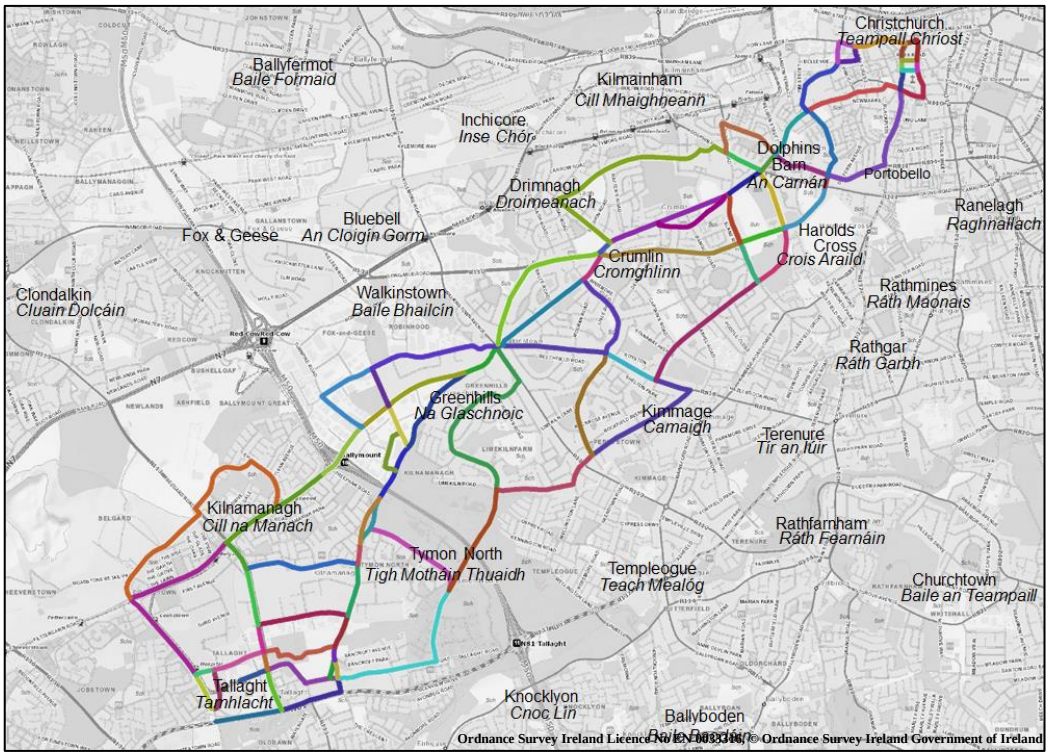


Figure 4.1: Spiders Web of Route Options

As part of the Stage 1 'sifting', the initial 'spider's web' of route options presented in **Figure 4.1** was narrowed down using a high level qualitative method based on professional judgement and a general appreciation for existing physical conditions/constraints within the study area from available survey information and site visits. This exercise screened and assessed technically feasible route options, based on distinct, project specific objectives. In addition to being assessed on their individual merits, routes were also screened relative to each other allowing some routes to be ruled out if more suitable alternatives existed.

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

4.3 Stage 2: Route Options Assessment - Detailed Assessment

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

The first step in the Stage 2 assessment was to combine shorter route options which passed the Stage 1 assessment, to form longer end-to-end routes within each study area section.

Following this, an initial indicative scheme for each route option was determined based on the specific constraints along the route (e.g. bus lane in each direction with cycle lanes, bus lanes in each direction only, bus lane in one direction only etc.). In particularly constrained locations, a number of variant scheme options were considered and assessed as necessary.

The indicative scheme for each route option was then progressed to 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) under the following criteria;

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

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

Project-specific route options assessment criteria have been established for the GDA CBC schemes by the NTA. This have been tailored to have commonality with the Common Appraisal Framework guidelines where practical.

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

Table 4.1: Assessment Criteria

Assessment Criteria	Assessment Sub-Criteria
1. Economy	1.a. Capital Cost
	1.b. Transport Reliability and Quality (Journey Time)
2. Integration	2.a. Land Use Integration
	2.b. Residential Population and Employment Catchments
	2.c. Transport Network Integration
	2.d. Cycle Network Integration
3. Accessibility & Social Inclusion	3.a. Key Trip Attractors (Education/Health/Commercial/Employment)
	3.b. Deprived Geographic Areas
4. Safety	4.a. Road User Safety
5. Environment	5.a. Archaeology and Cultural Heritage
	5.b. Architectural Heritage

Assessment Criteria	Assessment Sub-Criteria
	5.c. Flora & Fauna
	5.d. Soils and Geology
	5.e. Hydrology
	5.f. Landscape and Visual
	5.g Air Quality
	5.h. Noise & Vibration
	5.i. Land Use Character

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

4.3.1 Economy (1)

4.3.1.1 Capital Cost (1.a.)

Capital cost estimates consist of both the indicative infrastructure cost estimate and land acquisition costs. The methodology used in determining these costs, standardised to per-kilometre rates, is described below.

1.a.i. Indicative Infrastructure Cost Estimate

This sub-criterion is established to assess route options for their likely capital infrastructure cost. Each route option has been assessed relative to the nature and extent of infrastructure works requirements to deliver the scheme objectives.

As part of the route optioneering process, constraints and associated mitigation measures, which provide improved / full bus lane provision, have been identified, grouped and categorised based on the extent of works likely for the indicative scheme determined.

All cost estimates quoted exclude VAT.

Corridor Sections (between junctions)

Table 4.2 presents the construction categories for route sections (between junctions), the assumed level of works for each category and the per kilometre rate.

Table 4.2: Route Sections Infrastructure Cost Estimate Assumptions

Construction Category	Construction Works Assumption	Cost Rate (€/km)
Minor	Minor works: • Kerbs improvement locally (removal and replacement); • Footpaths improvement locally (breaking out/additional concrete); • Road resurfacing locally (milling/reinstatement or overlay); • Road markings (non-destructive removal of existing road markings, new road markings); and • Signage (removal/relocation/replacement of existing and/or installation of new).	€650,000
Moderate	Roadway widening (**excluding** boundary works): • General site clearance; • Safety barriers/guardrails (removal and relocation); • Services protection/relocation/diversion (power supply, communications); • Drainage works (removal of and installation of new drainage systems); • Limited earthworks; • Pavement full depth build-up for new section. Milling and overlay for existing; • Road markings (non-destructive removal of existing road markings, new road markings) • Kerbs footways and paved areas (removal and new); • Road lighting (relocation, cabling, ducting) • Signage (removal/relocation/replacement of existing and/or installation of new); • Street furniture removal/relocation; and • Landscaping works (top soiling, fence, trees relocation, hedges, road margins re-grading, etc.).	€1,300,000
Major	Roadway widening (**including** boundary works): • General site clearance; • Safety barriers/guardrails (removal and new); • Services protection/relocation/diversion (power supply, communications, water, gas); • Drainage works (removal of and installation of new drainage systems); • Earthworks (embankment treatments, retaining walls, slopes regrading, etc.); • Pavement full depth reconstruction; • Kerbs footways and paved areas (removal and new);	€2,500,000

Construction Category	Construction Works Assumption	Cost Rate (€/km)
	• Road markings (non-destructive removal of existing road markings, new road markings); • Signage (removal/relocation/replacement of existing and/or installation of new); • Road lighting (replacement, cabling, ducting); • Landscaping works (top soiling, fence, trees relocation, hedges, road margins Re-grading, etc.); and • Property boundary reinstatement works (walls, gates, driveways landscaping etc.).	

For each route option, the length of the route for each construction category has been calculated and multiplied by the relevant cost rate to derive the cost estimate for the route section.

Junctions

Similar to the route sections, the scale of construction works at junctions have been identified, grouped and categorised based on the extent of works likely for the indicative scheme determined. **Table 4.3** presents the construction categories for junctions, the assumed level of works for each category and the per junction rate.

Table 4.3: Junctions Infrastructure Cost Estimate Assumptions

Construction Category	Construction Works Assumption	Cost Rate (€/junction)
Minor	Modifications to existing signal controlled junctions to introduce bus priority (i.e. changing method of control, etc.), without significant alteration to their existing geometry and layout: • Road markings (non-destructive removal of existing road markings, new road markings); • Anti-skid surface; • Signage (removal/relocation/replacement of existing and/or installation of new); • Dished kerbs and tactile paving; • Guardrails/Bollards; • Additional signal poles/heads; • Additional traffic signals ducting, cabling and chambers; • Modifications to the signal controller and associated traffic signal installation works (including electrical); and • Additional loop detectors.	€70,000
Moderate	Upgrading existing minor/major junctions (including roundabouts) to signal control junctions, without	€230,000

Construction Category	Construction Works Assumption	Cost Rate (€/junction)
	significant alteration to their existing geometry and layout (**excluding** boundary works): • Kerbs improvement locally (removal and new); • Footpaths improvement locally (breaking out and new); • Road markings (non-destructive removal of existing road markings, new road markings); • Signage (removal/relocation/replacement of existing and/or installation of new); • Anti-skid surface; • Dished kerbs and tactile paving; • Guardrails/Bollards; • New signal poles/heads; • New traffic signals ducting, cabling and chambers; • New signal controller and associated traffic signal installation works (including electrical); • New loop detectors; • Services protection/relocation/diversion (power supply, communications); • Limited earthworks; • Pavement reconstruction; and • New road lighting (relocation, cabling, ducting).	
Major	Significant modifications to existing signal controlled junctions (**including** boundary works): • General site clearance (street furniture removal/relocation, etc.); • Safety barriers/guardrails (removal and new) • Services protection/relocation/diversion (power supply, communications, water, gas); • Drainage works (removal of and installation of new drainage systems); • Earthworks (embankment treatments, retaining walls, slopes re-grading, etc.); • Pavement full depth reconstruction; • Kerbs footways and paved areas (removal and new); • Road markings (non-destructive removal of existing, new road markings); • Anti-skid surface; • Signage (removal/relocation/replacement of existing and/or installation of new); • Dished kerbs and tactile paving; • Guardrails/ bollards; • Additional signal poles/heads; • Additional traffic signals ducting, cabling and chambers;	€1,000,000

Construction Category	Construction Works Assumption	Cost Rate (€/junction)
	• Modifications to the signal controller and installation works (incl. electrical); • Additional loop detectors; • Road lighting (replacement, cabling, ducting); • Landscaping works (top soiling, fence, trees, hedges, margins re-grading, etc.); and • Property boundary reinstatement works (walls, gates, driveways landscaping etc.).	

Where more significant junction upgrade or reconfiguration works are identified as part of the route section process initial indicative scheme designs and specific individual junction cost estimates are calculated as appropriate.

In addition bus stops have also been costed separately. For comparative cost estimation purposes only, CBC stops have been assumed to comprise the following items:

- Raised kerbs;
- Raised platform;
- Paving;
- Illuminated shelters;
- Identification posts;
- RTPI;
- Lighting;
- Associated ducting (communications and power); and
- CBC Furniture (i.e. passenger guardrails, benches, bollards, etc.).

Based on the above assumptions, outline costs for the CBC stops are estimated to be €20,000/stop.

These costs exclude VAT, professional fees, re-routing of services, preliminaries, traffic management, and contingency and are subject to refinement, based on a more detailed analysis at detailed design stage.

1.a.ii. Land Acquisition Cost Estimate

This criterion evaluates the likely costs associated with land acquisition and associated boundary/accommodation works for each route option. The assessment takes consideration of:

- 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.

For the purpose of route options comparison and assessment, the extent of land acquisition required for each route option is calculated by applying a typical cross-section to each option based on ordnance survey mapping, typically:

- 3.0 m bus lane in suburban and urban areas;
- 3.25 m traffic lane in suburban areas, 3.0m traffic lane in urban areas;
- 2.0 m footpath; and
- 2.0 m cycle raised adjacent cycle lane/cycle track.

Assessment of route options also considered any specific constraints and tailored the above assumptions where appropriate, based on initial scheme assessment to practically minimise land-take without compromising on the overall scheme objectives.

The areas of land-take required are presented as being either public land or private land. For the purposes of comparing route options, public land is generally defined as the space within the road reserve (e.g. property boundary wall to property boundary wall). Areas outside the road reserve are assumed to be private land except where it is clear that it is owned by a public entity (e.g. a public park). Any private land that may be located within the road reserve, but are not clearly private land, are considered as public areas as part of this methodology. This exercise has been based on available Ordnance Survey mapping and topographical survey.

The methodology typically adopted in calculating the land acquisition costs is very site specific (value of the property, costs of acquiring and moving to a new property etc.). However for the purpose of this assessment, a high level assessment methodology has been used to develop a cost per square metre (sqm) for private land acquisition based on valuations carried out by the NTA and TII for other public transport projects. Using this information, a rate of €1,500/sqm has been applied to route options to derive an indicative cost for private land-take for all route options.

For the purposes of this assessment, no cost has been assumed for public land acquisition.

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

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

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

- Enhancement of existing bus facilities and / or provision of new bus lanes along road links;
- Provision of bus lanes up to stop lines and through junctions;

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

Journey times for each route option have been calculated by comparing the time required by a bus to travel between common start and end points on each route. The following assumptions have been made in calculating the comparative journey times along route options:

- Top operational speed (free-flow) of 50 kph in suburban areas and 30 kph in city centre areas;
- Dwell time of 20 seconds per stop on average (assumes introduction of cashless fares as part of the CBC/Bus Service upgrade programme in the Greater Dublin Area);
- Delay of 15 seconds per junction on average (assumes buses stop at every second junction i.e. 30 second delay at every second junction)

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

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

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

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

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

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

4.3.2 Integration (2)

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

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

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

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

2.b.i. Residential Population Catchments: This criterion compares the existing residential populations within 5,10, and 15 minute walk catchments from bus stops and is representative of the number of potential bus users for a particular route option. The catchment contours are based on the locations accessible on foot within a 5, 10, and 15 minute walk of each bus stop, using the existing roads and paths in the vicinity of the stops. The assessment does not include future populations of zoned, but yet undeveloped residential development lands along route options. The analysis involved extracting 2011 population statistics from the Central Statistics Office (CSO) Small Areas dataset. This information was subsequently used to calculate the population living within the contours.

2.b.ii. Employment Population Catchments: This criterion compares the existing employment populations within a 10 minute walk catchment of each bus stop. The catchment contours are based on the locations accessible on foot within a 10 minute walk of each bus stop, using the existing roads and paths in the vicinity of the stops. The analysis involved extracting information from the 2011 POWSCAR (Place of Work, School or College - Census of Anonymised Records) data, which contains data on employment and school goers. Workplace and education locations are plotted to the nearest point in a 200m by 200m grid, and each person travelling to work or education is plotted to the nearest of these points. This information was subsequently used to calculate the number of people working within the contours. As with the residential population catchments, the assessment does not quantitatively assess the future populations of zoned, but yet undeveloped commercial development lands along route options.

4.3.2.3 Transport Network Integration (2.c.);

This criterion identifies the extent to which route options would maximise wider public transport usage and reach in terms of facilitating efficient interchange between other transport routes and modes (e.g. other core/feeder bus routes, Swiftway BRT routes, Luas, DART, suburban rail, future Metro).

Linked to this, is the availability of space at potential interchange locations for facilities such as cycle parking areas, covered interchange areas, safe walking areas to and from stops, kiss-and-ride etc.

The impact on movement of general traffic is also considered in this criteria (e.g. removal/conversion of traffic lanes to bus lanes etc.).

4.3.2.4 Cycle Network Integration (2.d.);

This criterion is established to assess route options for the practicality of achieving cycle track segregation and their potential to integrate with the GDA Cycle Network Plan. The assessment considers the following;

2.d.i. Compatibility with the GDA Cycle Network Plan; This criterion considers whether a route option forms part of the GDA Cycle Network Plan, with routes which overlap with designated cycle routes that can accommodate the necessary cycle infrastructure as part of the scheme, given a higher ranking. However, in some instances it may be more appropriate to modify an existing or proposed cycle route outlined in the GDA Cycle Network so that CBC and cycle network objectives can both be achieved within the broader corridor area.

2.d.ii. Quality of Infrastructure for Cyclists; The quality of cycle provision practically achievable on route options has been assessed, as this is considered to be a proxy for encouraging physical activity along the route. For comparison purposes, the highest level of practical cycle provision achievable on each route has been determined and compared between route options.

4.3.3 Accessibility and Social Inclusion (3)

4.3.3.1 Key Trip Attractors (3.a.)

This assessment criterion identifies key trip attractors located within approximate 10 minute walk catchments which would generate significant demand for bus services, but would not otherwise be picked up by either the employment or residential catchment analysis. For the purposes of this assessment, the following land-uses have been considered as key trip attractors:

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

4.3.3.2 Deprived Geographic Areas (3.b.)

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

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

The Pobal HP Deprivation Index is a method of measuring the relative affluence or disadvantage of a particular geographical area using various datasets from the 2011 census. For the purpose of this assessment, the HP Deprivation Index was examined by small area to determine which routes served deprived areas.

4.3.4 Safety (4)

4.3.4.1 Road User Safety (4.a.)

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

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

Pedestrian safety is not considered to be a differentiator, as all route and scheme options would be designed to a similar standard (e.g. footpaths throughout, pedestrian crossings at junctions and in the vicinity of bus stops). As such, pedestrian safety is not considered in this assessment.

4.3.5 Environmental (5)

The scope and methodology for the environmental assessment was established by considering what environmental aspects are likely to be impacted and are therefore of importance in evaluating the route options. Based on this, the following environmental parameters were scoped out of the Environmental Assessment:

- **Agronomy:** Given the urban/suburban nature of the proposed scheme and the assumption that buses will predominantly run on existing road infrastructure this aspect is not considered to be relevant to the assessment.
- **Hydrogeology:** Hydrogeology is not considered to be a determining factor in the selection of the preferred route option. Additionally, at this stage of the design process it is not possible to determine the quality, type or duration of these impacts, particularly as the location and type of structures e.g. underpasses, bridges etc. is unknown.

- **Property/Land Acquisition:** This aspect has been considered separately as part of the Economy criterion in the overall multi-criteria analysis commensurate with the information available at the route option assessment stage.
- **Socio-economics:** Elements of socio-economics such as journey times, catchment analysis, transport integration, quality of service for cyclists etc. are assessed under other non-environmental criteria and are therefore considered and captured elsewhere as part of the multi-criteria analysis.

For all remaining environmental criteria, the potential impacts of route options are assessed at a desktop study level. The results are then ranked to allow an order of preference to be established (refer to Section 4.3.6). The environmental constraints considered are outlined in the following sections.

4.3.5.1 Archaeological, Architectural and Cultural Heritage (5a/5b)

The provision of bus priority infrastructure has the potential to impact on the archaeological, architectural and cultural heritage environment. At this stage of the assessment, the exact nature and extent of potential impacts cannot be determined for all route sections assessed.

For the purposes of this assessment heritage features of archaeological, architectural and cultural heritage significance along or immediately adjacent to the route are identified and mapped. Impacts associated with each route are then compared and ranked in order of preference.

Features considered included the following:

- Sites recorded on the Record of Monuments and Places (RMP sites);

  Sites recorded on the Record of Protected Structures (RPS);
- Sites recorded on the National Inventory of Architectural Heritage (NIAH);
- Areas of Archaeological and Cultural Heritage Merit;
- Architectural Conservation Areas (ACAs) and other sites / areas of Architectural Heritage Merit;
- Sites/areas of archaeological potential and recently identified archaeological sites;
- Conservation Areas; and
- Greenfield areas with unknown archaeological potential.

It is important to note that the proposed route will primarily travel on existing established road networks. Other than locations of potential significant widening of the existing road reserve, it is currently not anticipated that adjacent structures and buildings will be impacted by the proposed CBC scheme (while acknowledging that the designation of, and protection afforded to a Protected Structure is not restricted to the structure itself but to all elements within its curtilage, e.g. coal cellars and boundary elements).

Within the city centre, the selection of route options will, in most instances, involve the running of bus services in the vicinity of numerous Protected Structures irrespective of which route section is preferred. The detailed design of the proposed scheme will seek to avoid and minimise impacts on architectural heritage.

4.3.5.2 Flora and Fauna (5c)

The provision of bus priority infrastructure has the potential to impact on flora and fauna.

A broad assessment of the likely impacts of each of the route options on the key ecological receptors was undertaken, with an indication as to which, if any, of these were likely to be significant, and at what geographical level. The impacts were compared to allow an order of preference to be determined.

Features considered included the following:

- Records of rare or protected plant species;
- Records of protected fauna;
- Identified designated ecological areas and other areas of ecological importance, including ecological corridors and areas of green infrastructure; and
- Watercourses and fisheries waters.

4.3.5.3 Soils and Geology (5d)

The provision of bus priority infrastructure has the potential to impact on soil and geology as a result of land-take and possible ground excavation (including potential to encounter ground contamination).

Attributes and impacts assessed for each route option included the following (where relevant):

- Historic land use and potential contamination;
- Geology/Areas of Geological Significance;
- Soil quality, drainage characteristics and range of agricultural uses of soil along each route corridor; and
- Potential implications for existing quarrying or mining activities and future extractable reserves.

The impact at each geographic level was compared to allow an order of preference to be determined.

4.3.5.4 Hydrology (5e)

The provision of bus priority infrastructure has the potential to impact on surface water bodies as a result of land-take (with particular emphasis on floodplains and flood zones).

Attributes (and impacts) assessed for each route option included the following (where relevant):

- watercourses crossed by each route corridor, and potential impact on water quality arising from re-alignment works;
- discharge to receiving waters and drainage network;
- aquatic ecological sites close to and downstream of water crossings;
- surface water abstraction close to and downstream of water crossings;
- established amenity value of surface waters traversed by each route corridor, and
- Potential increase (or reduction) in flood risk to existing properties.

The impact at each geographic level was compared to allow an order of preference to be determined.

4.3.5.5 Landscape and Visual (5f)

The provision of bus priority infrastructure has the potential to impact the townscape/streetscape along the route.

The assessment comprised the compilation of a desktop understanding of:

- the landscape/townscape, its character and features;
- the visual environment, including the location of residential and other properties and views over the landscape;
- the landscape planning context, including landscape designations, open spaces, identified views and prospects, etc.; and
- relationship with protected structures, conservation areas, national monuments etc.

The impact at each geographic level was compared to allow an order of preference to be determined.

4.3.5.6 Air Quality (5g)

The provision of bus priority infrastructure has the potential to impact the air quality along the route. The assessment considered each route section, in terms of sensitive receptors and density of development, in order to identify the most suitable route from an air quality perspective.

The TII guidelines define sensitive receptor locations as: residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present.

The impacts associated with each route option were compared to allow an order of preference to be determined.

It is important to note that the proposed route will primarily travel on existing established road networks.

For the purposes of this assessment, air quality impact is quantified based on whether the road is moving closer to sensitive receptors i.e. road widening. However, any road widening would result in only marginal impacts to air quality at sensitive receptors and therefore the severity of any air quality impact would be minimal.

4.3.5.7 Noise and Vibration (5h)

The provision of bus priority infrastructure has the potential to impact the noise environment along the route.

The assessment considered each route, in terms of sensitive receptors and density of development, in order to identify the most suitable route from a noise and vibration perspective. The TII guidelines define sensitive receptor locations as: residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present.

The impacts associated with each route option were compared to allow an order of preference to be determined.

Similar to Air Quality, noise and vibration impact is quantified based on whether the road is moving closer to sensitive receptors i.e. road widening. As noted above, any road widening would result in only marginal noise and vibration impacts at sensitive receptors and therefore the severity of any noise and vibration impact would be minimal.

4.3.5.8 Land Use Character (5i)

The provision of bus priority infrastructure has the potential to impact on land use character through land-take, severance or reduction of viability, which prevents or restricts it from being used for its intended use. This criterion assesses the intended scheme along a particular route with regard to its potential impact on land-use.

4.3.6 Route Options Summary Table

For each study area section, a route options summary table, in Project Appraisal Balance Sheet (PABS) format, has been prepared, which collates and summarises the appraisal of route options under each of the assessment criterion.

The route options summary table for each study area section is presented in **Appendix A,** with supporting Environmental Constraint Maps presented in **Appendix B,** and a summary of traffic count information presented in **Appendix C.**

For each individual assessment criterion considered, routes have been compared against each other based on a five point scale, ranging from having significant advantages to having significant disadvantages compared to other route options.

For illustrative purposes, this five point scale is colour coded as presented in **Table 4.4**, with advantageous routes graded as dark green and disadvantaged routes graded as dark red.

Table 4.4: Route Options Colour Coded Ranking Scale

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

The extent of reporting may vary between each study area section route options assessment, depending on the significance attached to a specific criterion in terms of route differentiation.

At the end of each study area section route options assessment, an overall Multi Criterion Appraisal (MCA) table is provided, bringing together each of the individual criterion assessments.

This is then summarised for each study area section under the main assessment criterion, as set out in **Table 4.1**.

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

The recommended route options from each study area section are then collated to provide the emerging preferred end-to-end route.

4.3.7 Conclusion

The outcome and the findings of the multi-criteria assessment are then finally considered in a holistic manner to derive a preferred end-to-end route for the proposed CBC scheme.

5 Study Area Section 1: Tallaght to Ballymount

5.1 Stage 1: Route Options Assessment

Within this study area section, there are a number of route options which have been considered. The route options considered are concentrated in the vicinity of Tallaght town centre.

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

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

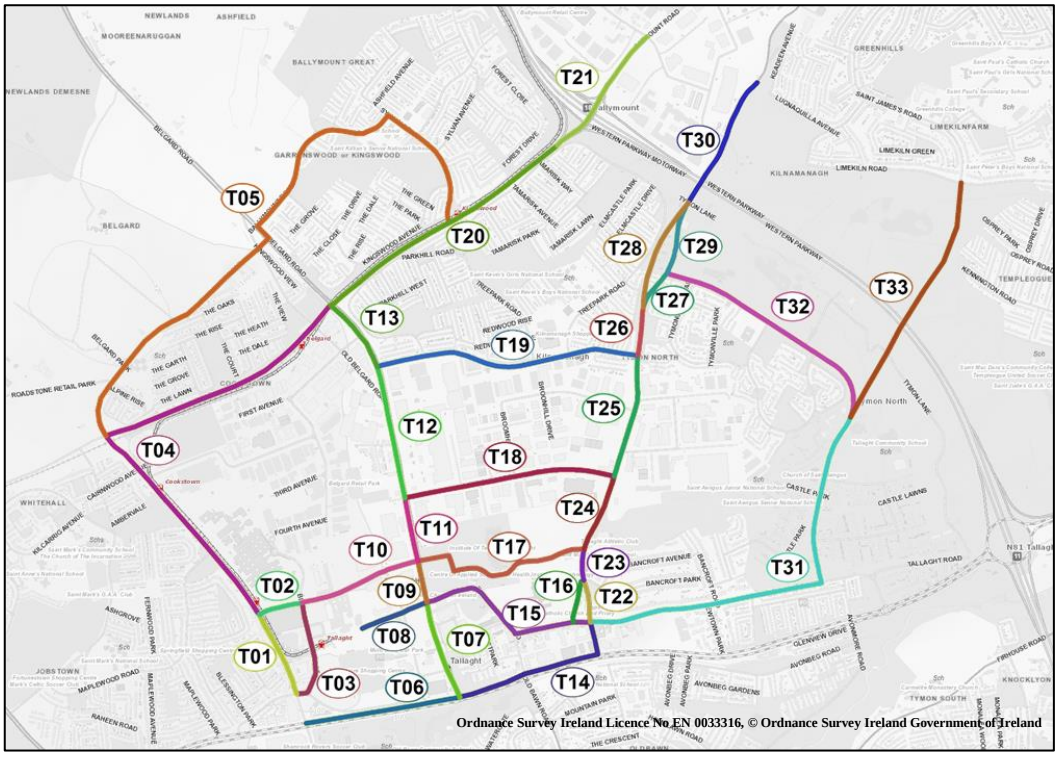


Figure 5.1: Section 1 Route Options – Tallaght to Ballymount

Table 5.1: Section 1 Route Option Sifting (Stage 1) Summary – Tallaght to Ballymount

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
T01	Cookstown Way (Belgard Square West to Belgard Square North)	Secondary Route 9C	Cookstown Way at this location consists of 2 lanes northbound (1 straight ahead lane and one right turn lane) and a single lane southbound. Past the junction with Old Blessington Road, this reduces to a single lane in each direction and the Luas lines run along the eastern side of the road. Bus and cycle lanes in each direction would not be possible along this section even if the adjacent footpaths were narrowed to 2m, although this may be possible in one direction only. This route option is already served by the Luas and does not serve central Tallaght areas and key trips attractors such as ITT. As such this route is not considered any further.	Fail
T02	Belgard Square North (Belgard Square West and Cookstown Way)	Feeder Route	Belgard Square West is a wide road with a single lane in each direction. Bus and cycle lanes in each direction would be possible along this section by reducing the width of the adjacent footpaths and removing a number of on-street car parking spaces. Consideration would need to be given to converting the Belgard Square North/Belgard Square West roundabout to traffic signals. However, this route does not tie into any feasible route option and is therefore not considered any further	Fail
T03	Belgard Square West (Cookstown Way to Belgard Square North)	Secondary Route 9C (between Cookstown Way and Old Blessington Road) Feeder Route (north of Old Blessington Road)	This road consists of a single lane in each direction. North of Old Blessington Road a third central lane is provided which facilitates right turn lanes into various car parks along its length. Northbound, access to the street is restricted with a bus gate on Belgard Square South at the southern end and turn bans from Old Blessington Road. South of Old Blessington Road, bus and cycle lanes in each direction would not be possible along this section even if the adjacent footpaths were narrowed to 2m. It would be possible to create a bus only link on this section through the relocation of the bus gate on Belgard Square South to Belgard Square West and additional turn bans at the Belgard Square West / Old Blessington Road junction (as proposed in the Tallaght Movement Framework Plan). North of Old Blessington Road, bus lanes in each direction could be provided through the removal of the central right turn lane and some road widening.	Pass
T04	Cookstown Way/ Katharine Tynan Road (Belgard Square North to Belgard Road)	Secondary Route 9C	The Cookstown Way section of this route currently consists of a single traffic lane in each direction with the Luas running along the eastern side of the road. There is potential to widen the road to the south/west to provide bus and cycle lanes along most of the route. There are bus and cycle lanes in each direction on Katherine Tynan Road. However, this route option would not serve the large catchments in Tallaght town Centre, Broomhill Industrial Estate and Tymon North. Furthermore, this route is already	Fail

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
			served by the Luas. As such this route option is not considered any further.	
T05	Cookstown Road/ Ballymount Road/Sylvan Drive	Feeder Route / Secondary Route 8A	Cookstown Road is a single lane in each direction. Bus and cycle lanes could be provided in each direction, but would require land acquisition from the northern/western side of the road. Similarly, Ballymount Road and Sylvan Drive are a single lane in each direction. Road widening is possible for most of the route length, but would require land acquisition. However, this route represents a circuitous route and is therefore not considered suitable for a CBC. As such, this route options is not considered further.	Fail
T06	N81 (Cookstown Way to Belgard Road)	Secondary Route 9C	The N81 is a wide road with 2 lanes and a hard shoulder in each direction. Bus and cycle lanes could be provided by replacing existing hard shoulders with bus and cycle lanes. However, the route does not pass through Tallaght town centre where demand is highest and this route is therefore not considered any further for this particular CBC.	Fail
T07	Belgard Road (N81 to Old Blessington Road)	Secondary Route 9C	Between Belgard Walk and the N81, Belgard Road is two lanes in each direction. Bus priority could be provided by converting one lane in each direction to a bus lane. However, this would increase the risk of queuing from the Belgard Walk Roundabout to the N81. North of Belgard Walk, Belgard Road consists of a single lane in each direction with a wide central reserve and verge on each side of the road. Bus and cycle lanes could be provided in each direction by narrowing the verge and/or central median. However, any route using this section would travel along the N81 (T06), which has already been ruled out, and as such this route option is not considered further.	Fail
T08	Old Blessington Road (Belgard Road to Tallaght Luas Stop)	Primary Route 9A	Between Belgard Road and Belgard Square East, this route consists of 2 lanes in each direction, one of which could be converted to bus lane. West of Belgard Square East, the road is a single lane in each direction and the provision of bus and cycle lanes in each direction would require land-take. The road serves as an access to The Square car parking areas. The road is a cul-de-sac beyond the turnoff to the car park with a pedestrianised area created between the South Dublin County Council Offices, The Square and the Tallaght Luas stop. For this option to work, it would be necessary to convert the majority of the pedestrianised area into a turnaround facility for buses. This option would only cater for services terminating in Tallaght. For the reasons outlined above, this route options is not considered further.	Fail
T09	Belgard Road (Old Blessington Road to Belgard Square North)	Primary Route S05	Along this section, Belgard Road is two lanes in each direction. Bus and cycle lanes could be provided by either converting one lane in each direction to a bus lane (with some widening for cycle facilities) or the removal of the central median and/or parts of the verge.	Pass

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
T10	Belgard Square North (Belgard Square West to Belgard Road)	Feeder Route	This section consists a single lane in each direction with a 3-5m verge/footpath. Bus and cycle lanes are possible in places by removing the verge and narrowing the footpath to 2m.	Pass
T11	Belgard Road (Belgard Square North to Airton Road)	Primary Route S05	Along this section, Belgard Road is two lanes in each direction. Bus and cycle lanes could be provided by converting one lane in each direction to a bus lane (with some widening for cycle facilities) or the removal of the central median and/or parts of the verge.	Pass
T12	Belgard Road (Airton Road to Mayberry Road)	Primary Route S05	Along this section, Belgard Road is two lanes in each direction. Bus and cycle lanes could be provided by converting one lane in each direction to a bus lane (with some widening for cycle facilities) or the removal of the central median and/or parts of the verge.	Pass
T13	Belgard Road (Mayberry Road to Katherine Tynan Road)	Primary Route S05	Along this section, Belgard Road is two lanes in each direction. Bus and cycle lanes could be provided by converting one lane in each direction to a bus lane (with some widening for cycle facilities) or the removal of the central median and/or parts of the verge. However, this route does not connect to any suitable route to the north and is therefore not considered any further.	Fail
T14	N81/Greenhills Road (Belgard Road to Main Street)	N/A	The N81 is a wide road with 2 lanes and a hard shoulder in each direction. Bus lanes could be provided by replacing existing hard shoulders with bus lanes. However, the route is removed from areas of high demand. Greenhills Road between in the N81 and Main Street is one lane in each direction, plus a third central lane which accommodates right turn pockets. Bus lanes in each direction cannot not be provided on this section. For the reasons outlined above, this route options is not considered further.	Fail
T15	Tallaght Main Street (Belgard Road to Greenhills Road)	Primary Route S05	Main Street in Tallaght Village is a single lane in each direction and the provision of bus and cycle lanes in each direction would require land-take from St. Marys Priory. However, as traffic is restricted along the western side of the route through the use of a bus gate, there may be no need to provide bus lanes (or cycle lanes) along the entire length of the route and as such this is considered to be a feasible route option.	Pass
T16	Old Greenhills Road (Main Street to Greenhills Road)	N/A	This is a short cul-de-sac which forms part of the old Greenhills Road alignment. The road now provides access to the Priory Institute and number of residential properties. A bus gate could be provided where this road meets Greenhills Road to bypass the Greenhills Road/Main Street junction.	Pass
T17	Institute of Technology Tallaght (Belgard Road to Greenhills Road)	Greenway	This route follows the existing through route through ITT private lands between Belgard Road and Greenhills Road. Bus lanes in each direction would not be possible, but may not be required due to low traffic volumes. The through road is closed between 08:00 - 10:00 and 17:00 - 19:00, but buses could be given access during these hours. Indented bus bays	Pass

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
			are already in place within the campus but may need to be relocated.	
T18	Airton Road (Belgard Road to Greenhills Road)	Feeder Route	Airton Road is a wide single carriageway road with one lane in each direction. A wide tree verge with trees is present on each side of the road. There are a number of unmetered on-street car parking spaces along its length. Bus lanes could be provided along the length of Airton Road through the removal of on-street car parking and adjacent verges and trees.	Pass
T19	Mayberry Road (Belgard Road to Greenhills Road)	Feeder Route	Mayberry Road consists of a single lane in each direction, with a hatched central median that provides for right turn lanes into adjacent side roads. A wide verge/footpath is present on each side of the road and could be narrowed to facilitate bus lanes and cycle lanes in each direction.	Pass
T20	Katherine Tynan Road (Belgard Road to Treepark Road)	Secondary Route 8A	Katherine Tynan Road is a single lane in each direction. The Luas line runs along the northern side of the road and any widening to provide bus and cycle lanes would be on the southern side of the road. However, while there is open space to the south for a large part of this route option which would accommodate some road widening, there is a section where no road widening would be possible due to the presence of residential properties (Parkhill Lawn). Furthermore, this route option is already well served by the Luas and as such it is not considered any further.	Fail
T21	Katherine Tynan Road (Treepark Road to Ballymount teardrop roundabout)	Secondary Route 8A	This route option passes through the Ballymount M50 interchange. This is a busy interchange and is the primary entrance point to Ballymount Industrial Estate. Across the M50 overpass, a bus lane could be provided in one direction by removing one of the right turn lanes from Ballymount Road onto the M50 northbound. However, this would likely have an unacceptable impact on traffic congestion at the interchange. North of the interchange, widening to the west to accommodate a bus and cycle lane northbound would require retaining structures and the current free flow lane from the M50 would need to be adjusted to suit (possibly amended to a merge lane). Southbound, retaining structures would also be required to provide an additional lane in this direction. While physically a solution does exist to provide bus and cycle lanes north of the interchange, any changes would likely impact on the operation of this busy interchange and priority across the interchange. Furthermore, this route option would have to connect to route option T20 which has been already ruled out. For this reason, and the reasons outlined above, this option is not considered any further.	Fail
T22	Greenhills Road (Main Street to Old	Primary Route 8B	Greenhills Road consists of a single lane in each direction at this location. There is little scope to provide bus and cycle lanes in either direction along this section owing to the narrow road reserve and	Fail

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
	Greenhills Road)		proximity of adjacent buildings. Route Option T16 offers more suitable alternative to using Greenhills Road in this area.	
T23	Greenhills Road (Old Greenhills Road to ITT access)	Primary Route 8B	Greenhills Road consists of a single lane in each direction at this location. Bus and cycle lanes could be provided in each direction by widening to the west of the road and acquiring land from St. Marys Priory and ITT.	Pass
T24	Greenhills Road (ITT access to Airton Road)	Primary Route 8B	Greenhills Road consists of a single lane in each direction at this location. Bus and cycle lanes could be provided in each direction by acquiring land and widening to the east and/or west of the road.	Pass
T25	Greenhills Road (Airton Road to Mayberry Road)	Primary Route 8B	Greenhills Road consists of a single lane in each direction at this location. Bus and cycle lanes could be provided in each direction by acquiring land and widening to the east of the road.	Pass
T26	Greenhills Road (Mayberry Road to Tymonville Crescent)	Primary Route 8B	Greenhills Road consists of a single lane in each direction at this location. Bus and cycle lanes could be provided by acquiring land and widening to the east and/or west of the road which is open space for the majority of this route option.	Pass
T27	Greenhills Road (Tymonville Crescent to Castletymon Road)	Primary Route 8B	Greenhills Road consists of a single lane in each direction at this location. There is a pinch point approximately 90m south of the Castletymon Road junction where bus and cycle lanes may need to be dropped	Pass
T28	New Link Road Between Greenhills Road and Treepark Road (Tymonville Crescent to the Tymon Lane)	N/A	This route option would provide a new link road bypassing the pinchpoint on Greenhills Road allowing bus and cycle lanes (including the rerouted Primary Route 8B) to be provided in each direction.	Pass
T29	Greenhills Road (Castletymon Road to Tymon Lane)	Primary Route 8B	Greenhills Road consists of a single lane in each direction at this location. Bus and cycle lanes in each direction could be achieved by widening into the adjacent open areas to the east and/or west of Greenhills Road.	Pass
T30	Greenhills Road (Tymon Lane to northern edge of Tymon Park)	Primary Route 8B	The current bridge across the M50 caters for only a single lane in each direction. Unless this bridge is widened, bus lanes would have to be dropped in each direction in advance of the bridge, but there may be potential to provide a shared pedestrian/cycle facility. Alternatively, a queue relocation facility could be introduced to ensure bus priority. The same cross-section is currently present north of the M50 overpass. There is scope to widen to the east of Greenhills Road to provide bus and cycle lanes in	Pass

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
			each direction, but some private land acquisition may be required.	
T31	Main Road/ Castletymon Road (Greenhills Road to Tallaght Community School)	Primary Route 9A / Secondary Route 9D	Main Road was recently upgraded to provide improved cycle facilities and a single traffic lane in each direction is provided for the majority of its length. A bus lane is provided in the inbound direction between Bancroft Road and Castletymon Road. There is some potential to provide a corresponding bus lane in the outbound direction by widening the road to the north. West of Bancroft Road the provision of bus lanes in either direction would require land acquisition from multiple landowners. Castletymon Road consists of a single lane in each direction with a hatched central median which also provides for right turn lanes into adjacent side roads. A wide verge/footpath is present on each side of the road and could be narrowed to facilitate bus and cycle lanes. However the route is somewhat circuitous and is therefore not considered to be appropriate for this particular CBC.	Fail
T32	Castletymon Road (Tallaght Community College to Greenhills Road)	Feeder Route	Castletymon Road consists of a single lane in each direction with a hatched central median which also provides for right turn pockets into adjacent side roads. A wide verge/footpath is present on each side of the road and could be narrowed to facilitate bus lanes in each direction. However, the route is somewhat circuitous, and is therefore not considered to be appropriate as the CBC. Furthermore, this route option would need to tie into route T31 which was ruled out.	Fail
T33	New Link Road through Tymon Park (Castletymon Road to Limekiln Road)	Secondary Route 9D	This route would require a new link through Tymon Park and a new bus only bridge (with cycle facilities) across the M50. This would require considerable expense. Furthermore, this route, when combined with other feasible options, would not serve a large portion of the study area (e.g. Broomhill Industrial Estate, Treepark residential area), and is therefore not considered further.	Fail

Following the Stage 1 sift, 19 of the 33 route options assessed passed the initial sifting stage and were progressed to the next assessment stage. These route options are presented in **Figure 5.2**.

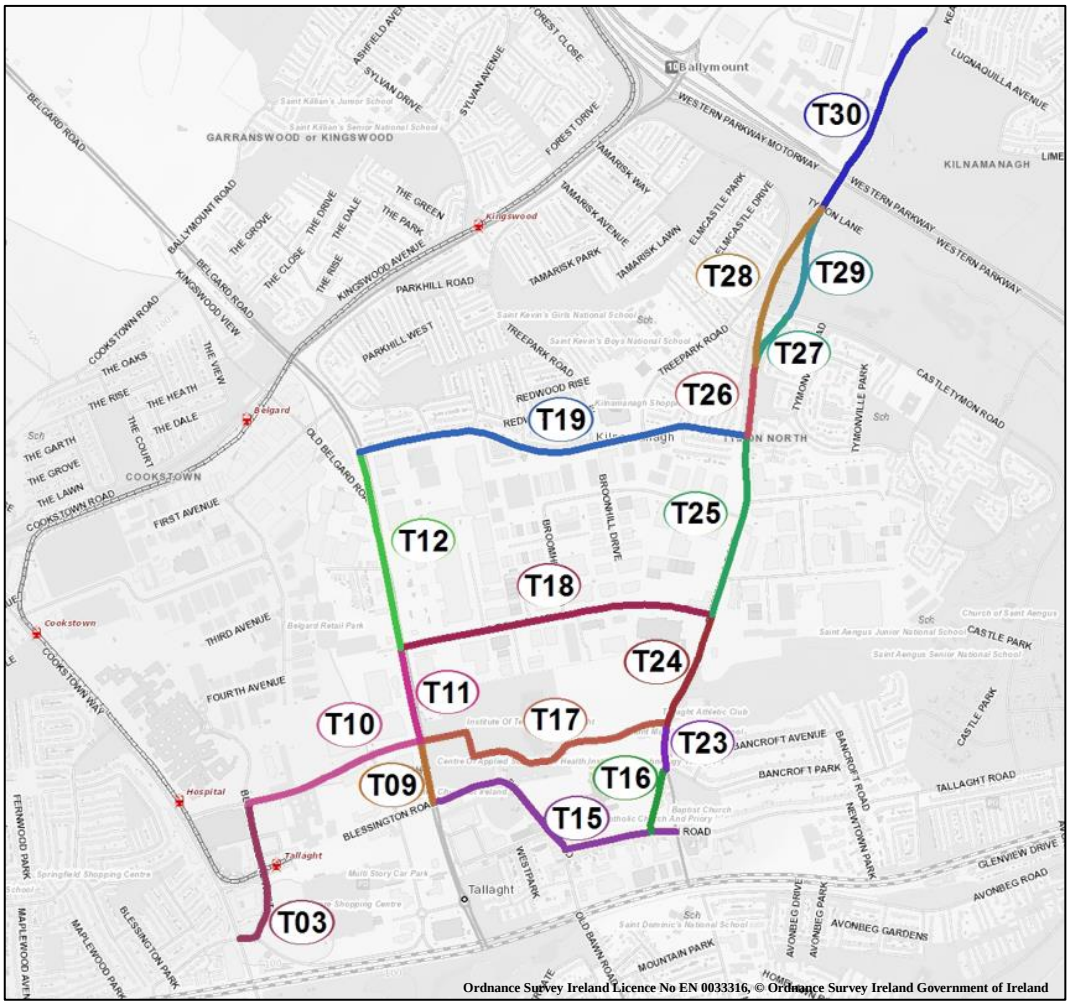


Figure 5.2: Section 1 Route Options Remaining After Stage 1 Assessment

5.2 Stage 2: Belgard Road to Greenhills Road Route Options Assessment

5.2.1 Introduction

Following the Stage 1 sift for the Tallaght to Ballymount study area, only one feasible route option was identified from the west of Tallaght Town Centre to Belgard Road. This route option generally coincides with existing bus routes operating in the area and as such was selected to form the starting section of the proposed route.

From this point, the remaining route options were combined to form 4 cohesive route options between Belgard Road and Greenhills Road as follows:

- BG1 - A route option via Belgard Road, Old Blessington Road and Greenhills Road;
- BG2 - A route option via Institute of Technology Tallaght and Greenhills Road;

- BG3 - A route option via Belgard Road, Airton Road and Greenhills Road; and
- BG4 - A route option via Belgard Road, Mayberry Road and Greenhills Road.

These route options are discussed in the following report sections.

5.2.2 Fixed Route Section: Cookstown Way to Belgard Road

5.2.2.1 Route Description

Following the Stage 1 sift, only one route option was identified between Cookstown Way and Belgard Road which is described below. This route is formed by combining route option T03 and T10 which are presented in **Figure 5.2**

Inbound: This section of route would commence 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.

Outbound: The outbound routing would follow the same roads as the inbound routing.

Stops: A total of 3 stops would likely be provided in each direction along this route section.

5.2.2.2 Concept Scheme Design

This fixed section of route commences at the Cookstown Way/Belgard Square South junction where buses would travel from Belgard Square South to a bus-only section of Belgard Square West as far as Old Blessington Road. To facilitate the proposed bus only section of Belgard Square West, it is proposed to modify the access to the shopping centre car parks from the west. This proposal would open the existing bus gate off Cookstown Way to general traffic, which would allow access to the car parks from the access point on Belgard Square South. This would include the provision of a right turn pocket for traffic turning from Cookstown Way onto Belgard Square South. A new bus gate would be provided at the Belgard Square South/Belgard Square West junction which would be upgraded from a roundabout to traffic signals. In addition, turning movements from Old Blessington Road into Belgard Square West, south of Old Blessington Road, would be banned to create a bus only link along Belgard Square West between Belgard Square South and Old Blessington Road. Under this proposal, Belgard Square West would consist of a bus lane in each direction.

On Belgard Square West, north of Old Blessington Road, it is proposed to provide bus lanes in each direction. This would be achieved by removing the central lane which acts as a right turn lane into adjacent properties, and by widening the road to the east.

It is proposed to convert the existing Belgard Square West/Belgard Square North/Tallaght Hospital roundabout to a signalised crossroads to better facilitate bus priority through the junction. Along Belgard Square North, it is proposed to widen the road (on each side) to facilitate bus lanes in each direction. Some land acquisition is required from a plot north of the South Dublin County Council offices (it is understood that this plot is currently owned by South Dublin County Council).

It is also proposed to convert the Belgard Square East/Belgard Square North roundabout to traffic signals to better facilitate bus priority. Due to space restrictions, it is not considered practical to provide a dedicated right turn pocket on Belgard Square North to accommodate vehicles turning into Belgard Square East. As it is likely that vehicles travelling straight along Belgard Square North would queue in the bus lane, potentially delaying buses, rather than behind a vehicle waiting to turn right, it was considered appropriate to ban the turn at the junction. Furthermore, traffic currently undertaking this manoeuvre is traffic coming from Cookstown Way and alternative routes exist for traffic coming from there which has a destination in this area (either via Belgard Road or Belgard Square South).

It is also proposed to convert the Belgard Road/Belgard Square North roundabout to a signalised crossroads. Given the conflict with left turning vehicles and the fact that the IT Tallaght access road is offset from the Belgard Square North alignment, a bus gate is proposed to facilitate the safe movement of buses through the junction. As the IT Tallaght access road currently accommodates inbound traffic only, it is proposed to convert one of the existing lanes to a contraflow bus lane.

5.2.3 Route Option BG1: Belgard Road to Greenhills Road via Main Street

5.2.3.1 Route Description

Route option BG1 is presented in **Figure 5.3** and described in the following text.

Figure 5.3: Route Option BG1

Inbound: Route option BG1 would commence on 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 Greenhills Road and Old Greenhills Road to buses only. The remainder of this route travels along Greenhills Road.

Outbound: The outbound routing would follow the same roads as the inbound routing.

Stops: A total of 6 stops would likely be provided in each direction along this route option.

5.2.3.2 Indicative Scheme Design

Route Sections:

Figure 5.4 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

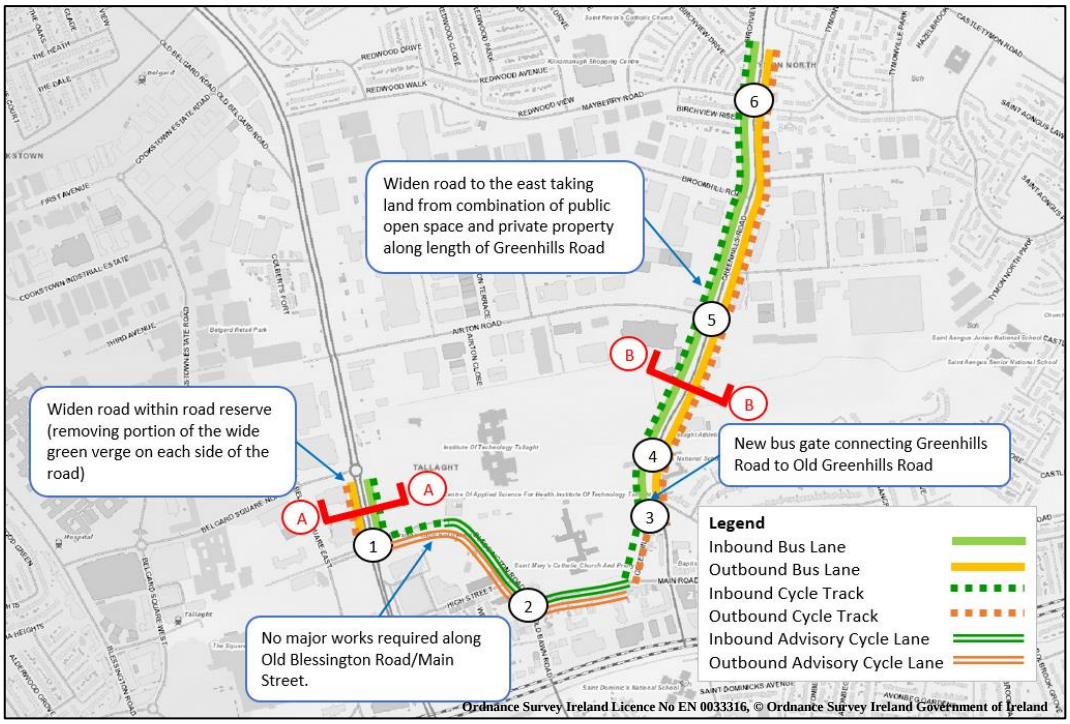


Figure 5.4: Route Option BG1 Indicative Scheme Design

Along 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.

Alternatively, one of the existing traffic lanes in each direction could be converted to bus lanes. Weekday peak hour volumes along Belgard Road (up to 500 vehicles per hour in each direction) would appear to be capable of operating satisfactorily with a reduction in lanes. However, this would likely impact on the operation of Belgard Road, particularly during weekend peak periods when traffic volumes accessing The Square are highest. Therefore, for the purposes of this assessment it is assumed that the verge is to be removed to accommodate the bus lanes and raised adjacent cycle lanes in each direction. A cross-section on Belgard Road is presented in **Figure 5.5**.

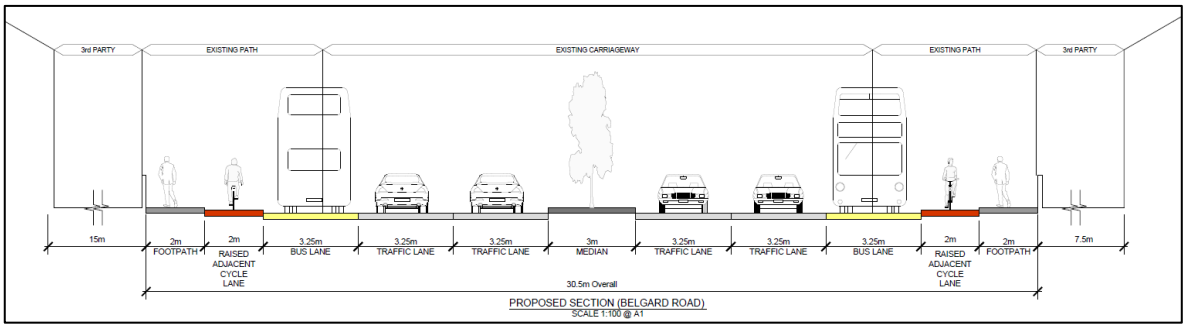


Figure 5.5: BG1 Cross-Section A-A: Belgard Road

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 However, the bus gate located to the east of the Belgard Road/Old Blessington Road junction restricts access to Tallaght Village reducing the amount of traffic with which buses must compete (up to 200 vehicles in each direction during the peak hour) . Given the constraints through the Village centre, for the purposes of this assessment it assumed that 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 already in place on the northern side of the carriageway between the junctions with Belgard Road and the pedestrian entrance to IT Tallaght.

Between Main Street and 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 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 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 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. A cross-section on Greenhills Road is presented in **Figure 5.6**.

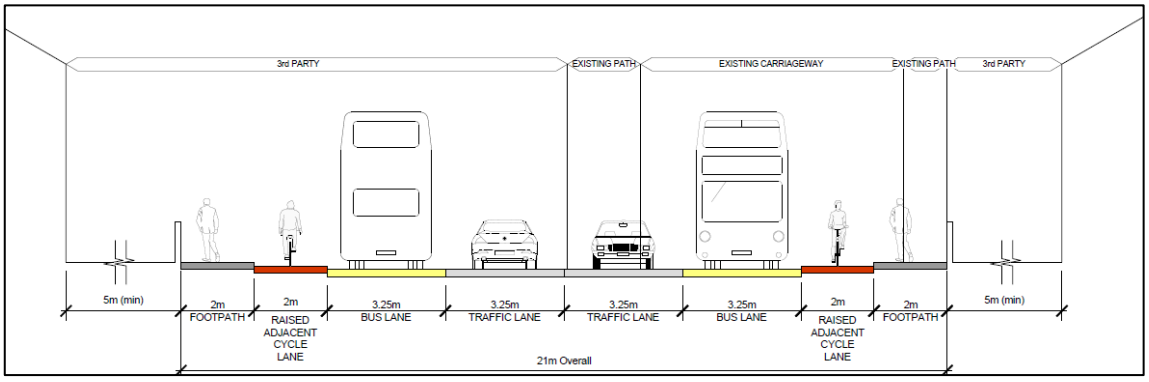


Figure 5.6: BG1 Cross-Section B-B: Greenhills Road

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Bus lanes and raised adjacent cycle lanes in each direction along Belgard Road;
- No bus lanes or cycle lanes along Old Blessington Road and Main Street;
- Opening of Old Greenhills Road for buses and cycles only; and
- Bus lanes and raised adjacent cycle lanes in each direction along Greenhills Road.

Junctions:

There are 6 signalised junctions (including 1 new bus gate) along this route option, some of which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 5.4** and discussed below.

1. **Belgard Road/Old Blessington Road:** Adjustments to the junction layout are required to facilitate bus lanes on approach to the junction. There is also a possible requirement to relocate/provide new signal equipment;
2. **Old Blessington Road Bus Gate:** No changes are required;
3. **Old Blessington Road/Main Street:** No changes to the existing layout are possible due to the proximity of adjacent buildings. Some changes to signalling may however improve movement of buses through the junction;
4. **Old Greenhills Road/Greenhills Road Bus Gate:** Adjustments to the Old Greenhills Road approach would be required comprising new traffic signals and associated infrastructure;
5. **Greenhills Road/Airton Road:** Adjustments to the existing junction layout would be required to facilitate bus lanes on approach to the junction. There would also be a requirement to relocate/replace traffic signal equipment (e.g. signal heads etc.); and
6. **Greenhills Road/Mayberry Road:** Adjustments to junction layout would be required to facilitate bus lanes on approach to the junction. Requirement to relocate/replace traffic signal equipment (e.g. signal heads etc.).

5.2.4 Route Option BG2: Belgard Road to Greenhills Road via ITT

5.2.4.1 Route Description

Route option BG2 is presented in **Figure 5.7** and described in the following text.

Figure 5.7: Route Option BG2

Inbound: Route option BG2 would commence on Belgard Road at the junction with Belgard Square North. From here the route travels through the ITT internal campus roads as far as Greenhills Road. The route then turns onto Greenhills Road which forms the remainder of the route.

Outbound: The outbound routing would follow the same roads as the inbound routing.

Stops: A total of 4 stops would likely be provided in each direction along this route option.

5.2.4.2 Indicative Scheme Design

Route Sections:

Figure 5.8 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

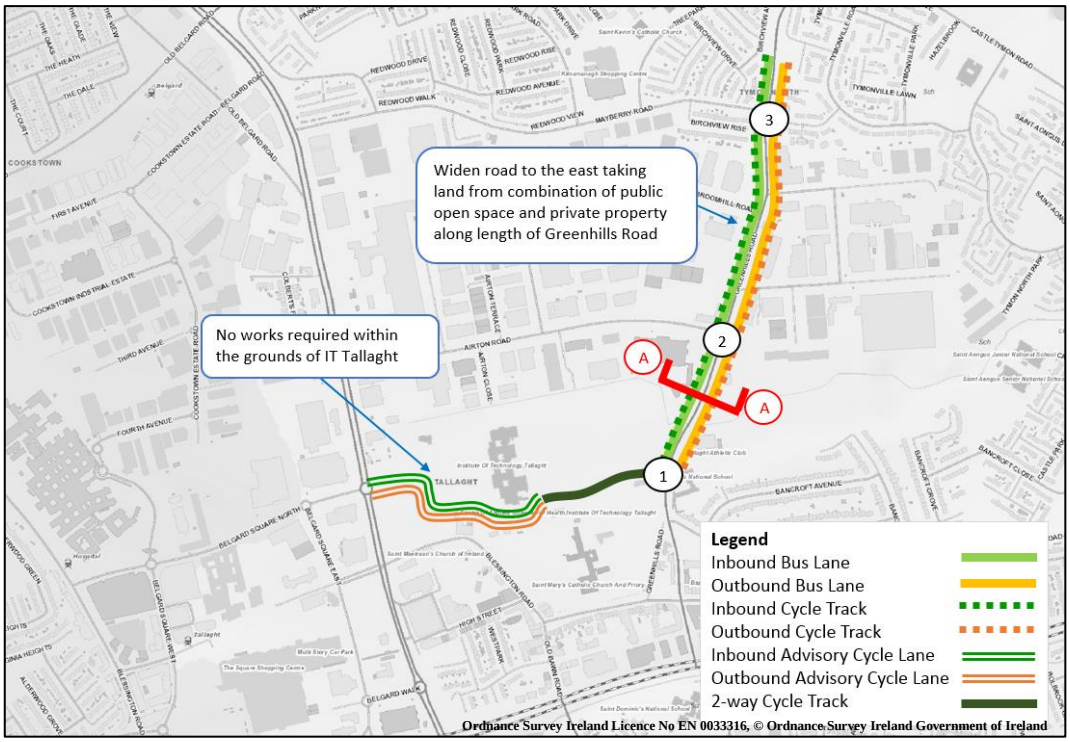


Figure 5.8: Route Option BG2 Indicative Scheme Design

On entry to ITT 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 Belgard Road. This junction currently only sees approximately 200 vehicles entering the campus during the morning and evening peak hours, and as such the proposal to remove a lane would not result in a material impact.

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 Greenhills Road). However, the road through the campus is currently physically closed to through traffic between 08:00 and 10:00 in the morning and 17:00 and 19:00 in the evening 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 Greenhills Road. This proposal assumes that no further cycle facilities would be provided.

Subject to agreement with IT Tallaght, it may be possible to improve permeability through the site from its northern boundary to further improve the catchment of the route. This could consist of opening a pedestrian and cyclist walkway between Airton Close and the IT Tallaght campus.

Along 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 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. For the purposes of this assessment this upgrade is assumed. A cross-section on Greenhills Road is presented in **Figure 5.9**.

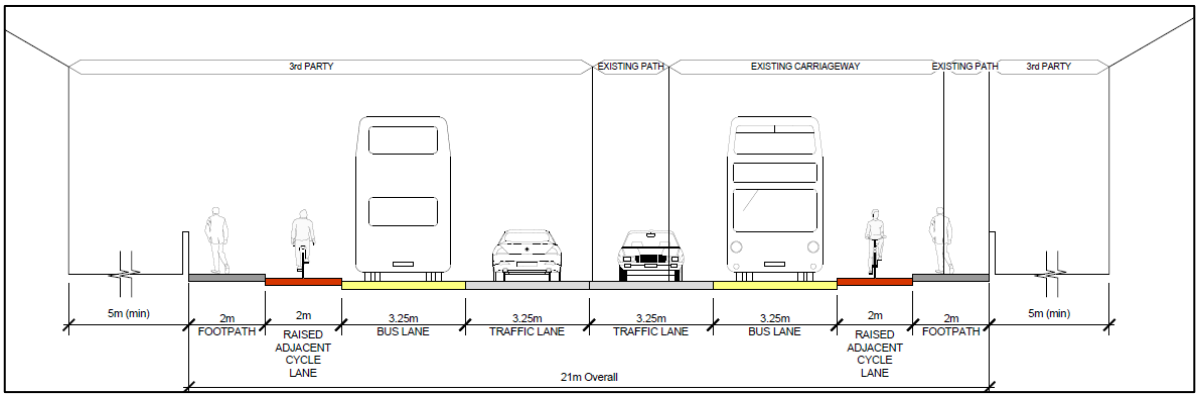


Figure 5.9: BG2 Cross-Section A-A: Greenhills Road

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- No bus lanes or additional cycle lanes through ITT; and
- Bus lanes and raised adjacent cycle lanes in each direction along Greenhills Road.

Junctions:

There are 3 signalised junctions along this route option, some of which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 5.8** and discussed below:

1. **Greenhills Road/ITT Access:** This junction may need to be upgraded to traffic signals to safely accommodate right turning vehicles into ITT. For the purposes of this assessment, this upgrade is assumed;
2. **Greenhills Road/Airton Road:** Adjustments to the existing junction layout would be required to facilitate bus lanes on approach to the junction. There would also be a requirement to relocate/replace traffic signal equipment (e.g. signal heads etc.); and
3. **Greenhills Road/Mayberry Road:** Adjustments to junction layout would be required to facilitate bus lanes on approach to the junction. There would be a

requirement to relocate/replace traffic signal equipment (e.g. signal heads etc.).

5.2.5 Route Option BG3: Belgard Road to Greenhills Road via Airton Road

5.2.5.1 Route Description

Route option BG3 is presented in **Figure 5.10** and described in the following text.

Figure 5.10: Route Option BG3

Inbound: Route option BG3 would commence on 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 Greenhills Road which forms the remainder of the route.

Outbound: The outbound routing would follow the same roads as the inbound routing.

Stops: A total of 4 stops would likely be provided in each direction along this route option.

5.2.5.2 Indicative Scheme Design

Route Sections:

Figure 5.11 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

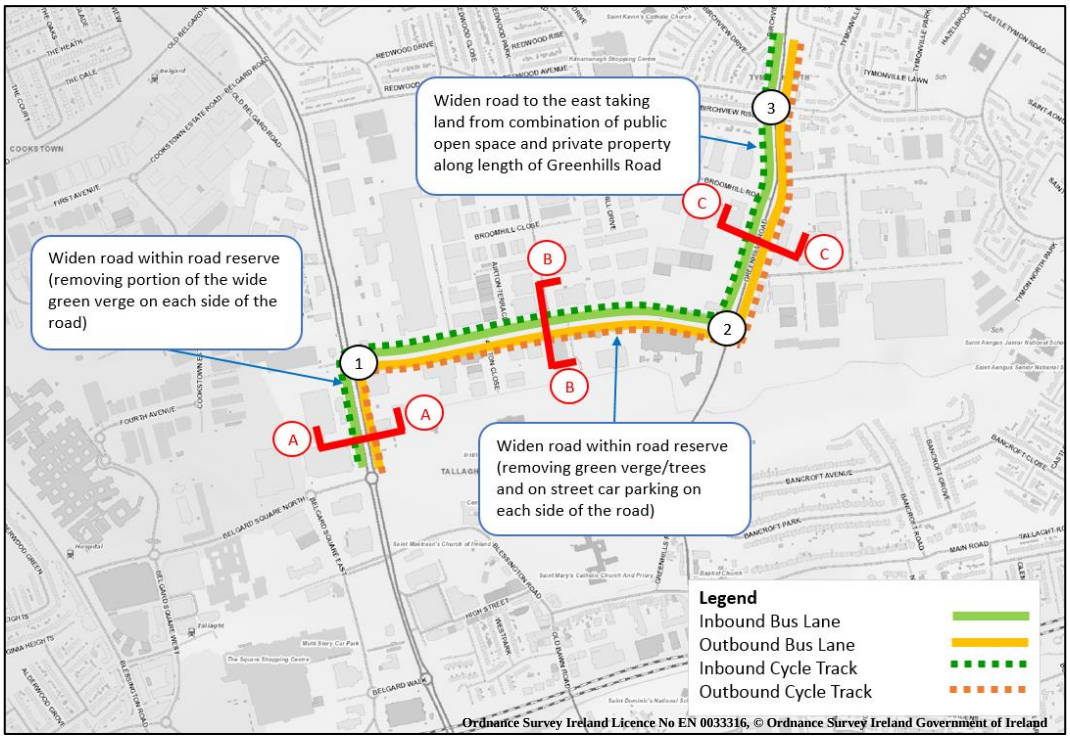


Figure 5.11: Route Option BG3 Indicative Scheme Design

Along 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.

Alternatively, one of the existing traffic lanes in each direction could be converted to bus lanes. Weekday peak hour volumes along Belgard Road on this section are observed to be up to 1,000 vehicles per hour in each direction. The removal of a lane would likely impact on the operation of Belgard Road, particularly during weekend peak periods when traffic volumes accessing The Square are highest. For the purposes of this assessment, it is assumed that the verge is removed to accommodate the bus lanes and raised adjacent cycle lanes in each direction. A cross-section on Belgard Road is presented in **Figure 5.12**. The location of the cross-section is illustrated in **Figure 5.11**.

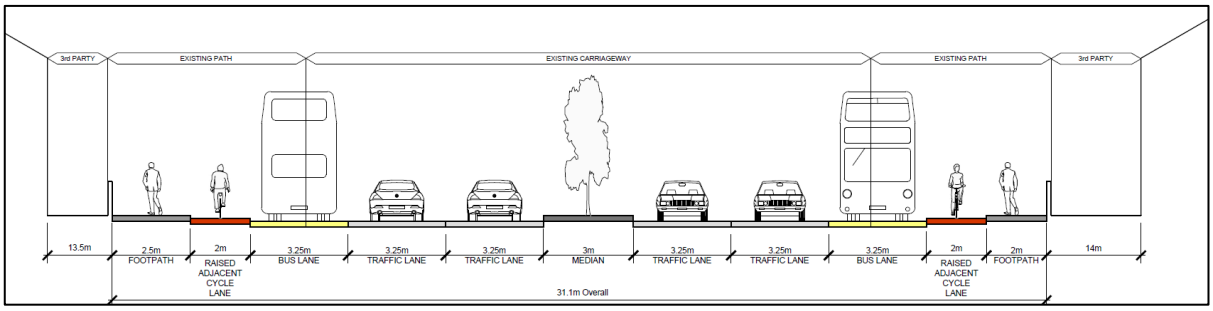


Figure 5.12: BG3 Cross-Section A-A: Belgard Road

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. For the purposes of this assessment this upgrade is assumed. A cross-section on Airton Road is presented in **Figure 5.13**.

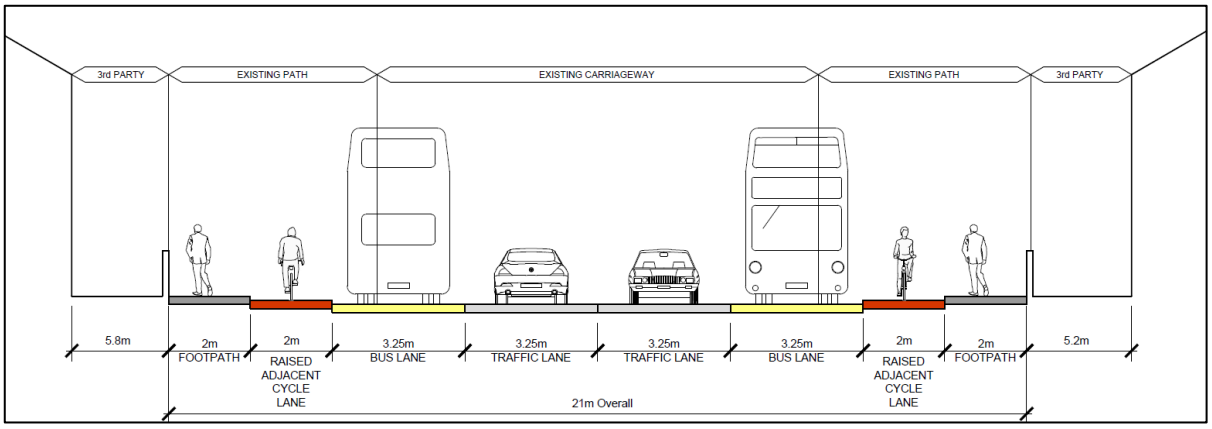


Figure 5.13: BG3 Cross-Section B-B: Airton Road

Along 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 Greenhills Road 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. For the purposes of this assessment this upgrade is assumed. A cross-section on Greenhills Road is presented in **Figure 5.14**.

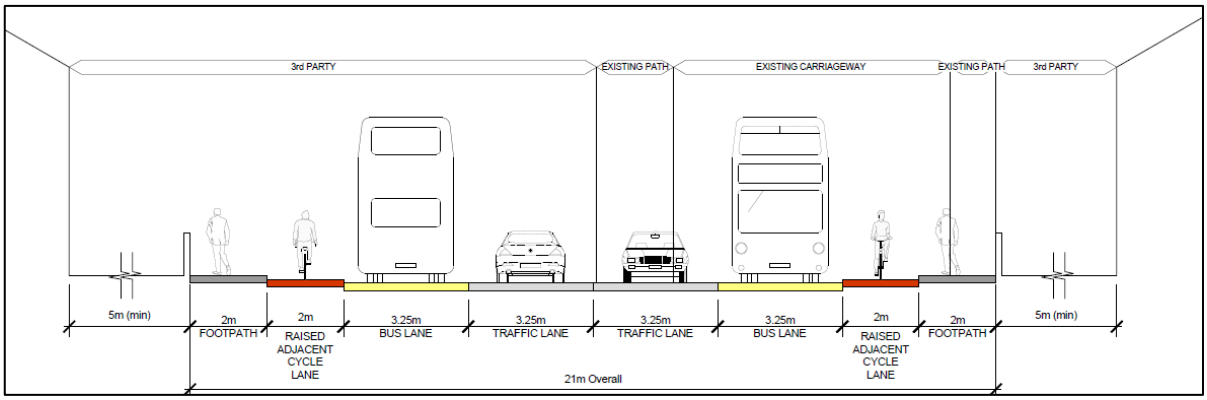


Figure 5.14: BG3 Cross-Section C-C: Greenhills Road

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Bus lanes and raised adjacent cycle lanes in each direction along Belgard Road;
- Bus lanes and raised adjacent cycle lanes in each direction along Airton Road; and
- Bus lanes and raised adjacent cycle lanes in each direction along Greenhills Road.

Junctions:

There are 3 signalised junctions along this route option, some of which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 5.11** and discussed below:

1. **Belgard Road/Airton Road:** Adjustments to the existing junction layout would be required to facilitate bus lanes on approach to the junction (may include dedicated bus traffic signal to allow buses to turn right from the kerbside lane). There would also be a requirement to relocate/replace traffic signal equipment (e.g. signal heads etc.);
2. **Greenhills Road/Airton Road:** Adjustments to the existing junction layout would be required to facilitate bus lanes on approach to the junction. There would also be a requirement to relocate/replace traffic signal equipment (e.g. signal heads etc.); and
3. **Greenhills Road/Mayberry Road:** Adjustments to junction layout would be required to facilitate bus lanes on approach to the junction. There would also be a requirement to relocate/replace traffic signal equipment (e.g. signal heads etc.).

5.2.6 Route Option BG4: Belgard Road to Greenhills Road via Mayberry Road

5.2.6.1 Route Description

Route option BG4 is presented in **Figure 5.15** and described in the following text.

Figure 5.15: Route Option BG4

Inbound: Route option BG4 would commence on 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 Greenhills Road.

Outbound: The outbound routing would follow the same roads as the inbound routing.

Stops: A total of 5 stops would likely be provided in each direction along this route option.

5.2.6.2 Indicative Scheme Design

Route Sections:

Figure 5.16 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

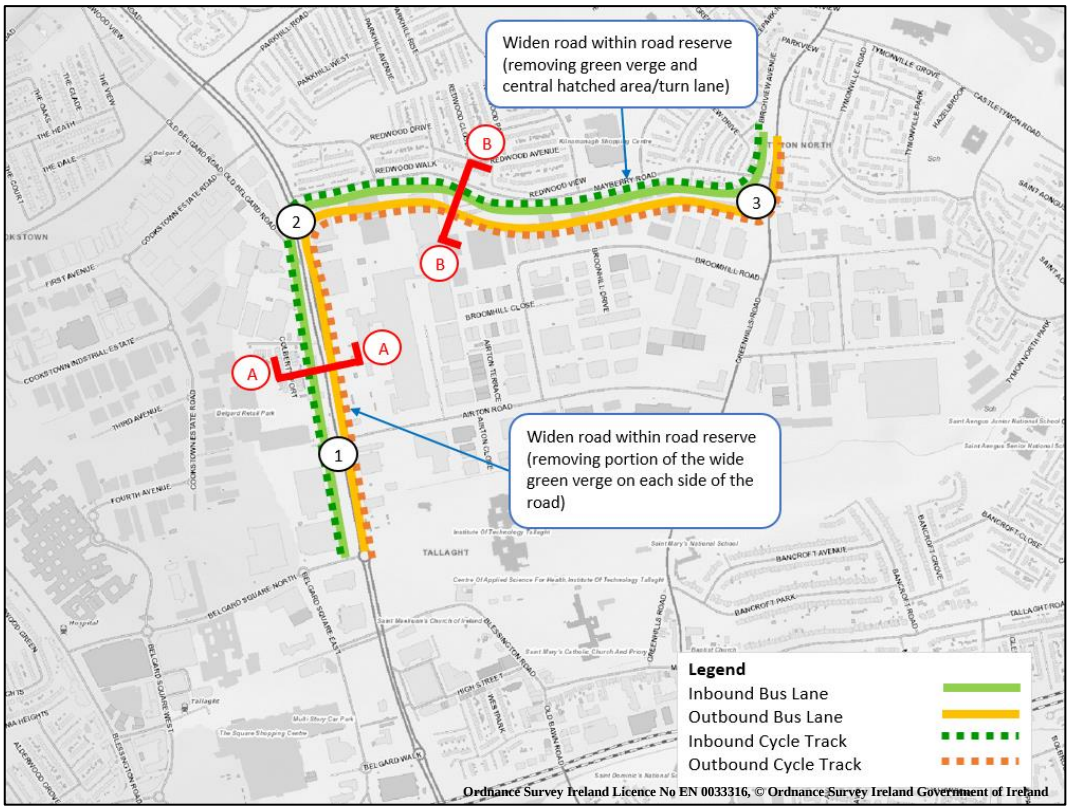


Figure 5.16: Route Option BG4 Indicative Scheme Design

Alternatively, one of the existing traffic lanes in each direction could be converted to bus lanes. Weekday peak hour volumes along Belgard Road on this section are observed to be up to 1,000 vehicles per hour in each direction. The removal of a lane would likely impact on the operation of Belgard Road, particularly during weekend peak periods when traffic volumes accessing The Square are highest. For the purposes of this assessment it is assumed that the verge is removed to accommodate the bus lanes and raised adjacent cycle lanes in each direction. A cross-section on Belgard Road is presented in **Figure 5.17**.

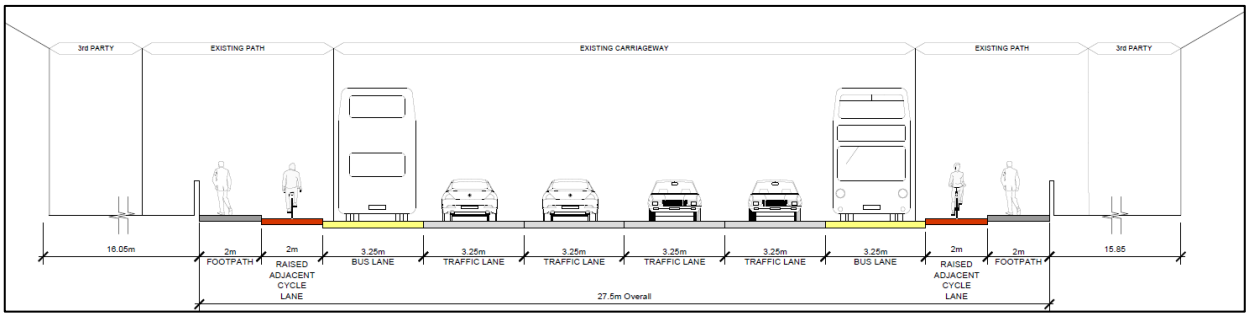


Figure 5.17: BG4 Cross-Section A-A: Belgard Road

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. Traffic could bypass waiting right turning vehicles by entering the bus lane for a short section. For the purposes of this assessment this upgrade is assumed. A cross-section on Mayberry Road is presented in **Figure 5.18**.

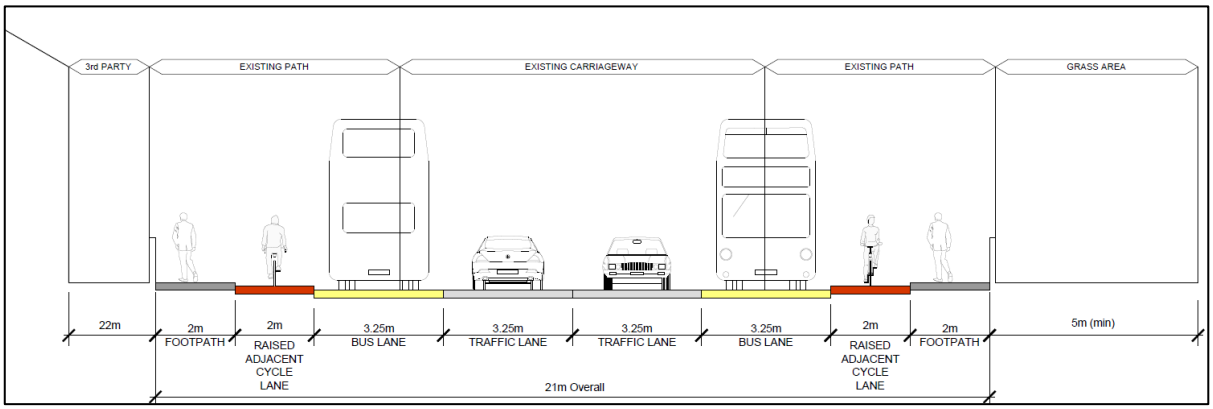


Figure 5.18: BG4 Cross-Section B-B: Mayberry Road

For the short section of Greenhills Road north of the Mayberry Road junction, it would be necessary to widen 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. For the purposes of this assessment this upgrade is assumed.

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Bus lanes and raised adjacent cycle lanes in each direction along Belgard Road;
- Bus lanes and raised adjacent cycle lanes in each direction along Mayberry Road; and
- Bus lanes and raised adjacent cycle lanes in each direction along Greenhills Road.

Junctions:

There are 3 signalised junctions along this route option, some of which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 5.16** and discussed below.

1. **Belgard Road/Airton Road:** Adjustments to the existing junction layout would be required to facilitate bus lanes on approach to the junction. There would also be a requirement to relocate/replace traffic signal equipment (e.g. signal heads etc.);
2. **Belgard Road/Mayberry Road:** Adjustments to the existing junction layout would be required to facilitate bus lanes on approach to the junction and to facilitate the right turn for buses onto Mayberry Road, perhaps through the use of a dedicated bus traffic signal. On the Mayberry Road approach it may be difficult to accommodate a bus lane to stop line due to the proximity of adjacent properties and as such the bus lane may need to share with left turning traffic; and
3. **Greenhills Road/Mayberry Road:** Adjustments to the existing junction layout would be required to facilitate bus lanes on approach to the junction. This may be difficult on Mayberry Road due to the proximity of adjacent properties and as such the bus lane may share with left turning traffic.

5.2.7 Route Options Assessment

Details of the Stage 2 route options assessment undertaken for the Study Area Section 1 (Belgard to Greenhills) are presented in **Appendix A1**.

The relative ranking of route options against the scheme assessment sub-criteria is summarised in **Table 5.2**.

Table 5.2: Tallaght Route Options Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	BG1	BG2	BG3	BG4
Economy	Capital Cost				
	Transport Reliability and Quality of Service				
Integration	Land Use Integration				
	Residential Population and Employment Catchments				
	Transport Network Integration				
	Cycling Integration				
	Key Trip Attractors				

Assessment Criteria	Assessment Sub-Criteria	BG1	BG2	BG3	BG4
Accessibility & Social Inclusion	Deprived Geographic Areas				
Safety	Road Safety				
Environment	Archaeology and Cultural Heritage				
	Architectural Heritage				
	Flora and Fauna				
	Soils and Geology				
	Hydrology				
	Landscape and Visual				
	Air Quality				
	Noise & Vibration				
	Land Use Character				

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 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 option 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 BG3 and BG4.

In terms of transport network integration, route 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', routes BG1 and BG4 serve slightly more key trip attractors along the route than BG2 and BG3. While route option BG3 does not serve as many attractors, it does directly serve a major attractor of bus users in IT Tallaght and as such route option BG1, BG2 and BG4 rank higher under this 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 comparatively more impact in terms of Flora and Fauna, Landscape and Visual and Air and Noise criteria. Route options BG1, BG2 and BG3 are considered to have relatively less impact on the environment.

A summary of the assessment and relative ranking of route options against the five main assessment criteria is presented in **Table 5.3**.

Table 5.3: Tallaght Route Options Assessment Summary (Main Criteria)

Assessment Criteria	BG1	BG2	BG3	BG4
Economy				
Integration				
Accessibility & Social Inclusion				
Safety				
Environment				

Based on the assessment undertaken, route option BG2 appears to offer more benefits over other options. Route option **BG2** is therefore preferred for the Tallaght area for the following reasons:

- It's 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 Institute of Technology Tallaght;
- It is the most direct route offering faster and reliable journey times (4 – 5 minutes); and
- It has comparatively lower potential to impact on the environment across most sub criteria (with the exception of Flora and Fauna).

The above route option is subject to reaching satisfactory agreement with ITT on the operational arrangements for routing buses through the campus. In the absence of such an agreement route option BG1 offers a viable alternative. Although this route option is more expensive than the next highest ranked option (BG3) it offers substantially better coverage in terms of both residential and employment populations and key trip attractors.

5.3 Stage 2: Parkview Route Options Assessment

In the vicinity of the existing Parkview residential estate, two route options passed the Stage 1 Assessment.

- PV1 - A route option via Greenhills Road;
- PV2 - A route option via a realigned Greenhills Road to the rear of Parkview residential estate.

These route options are discussed in the following sections.

5.3.1 Route Option PV1: Existing Greenhills Road Alignment

Route Option PV1 is presented in **Figure 5.19** and described in the following text.

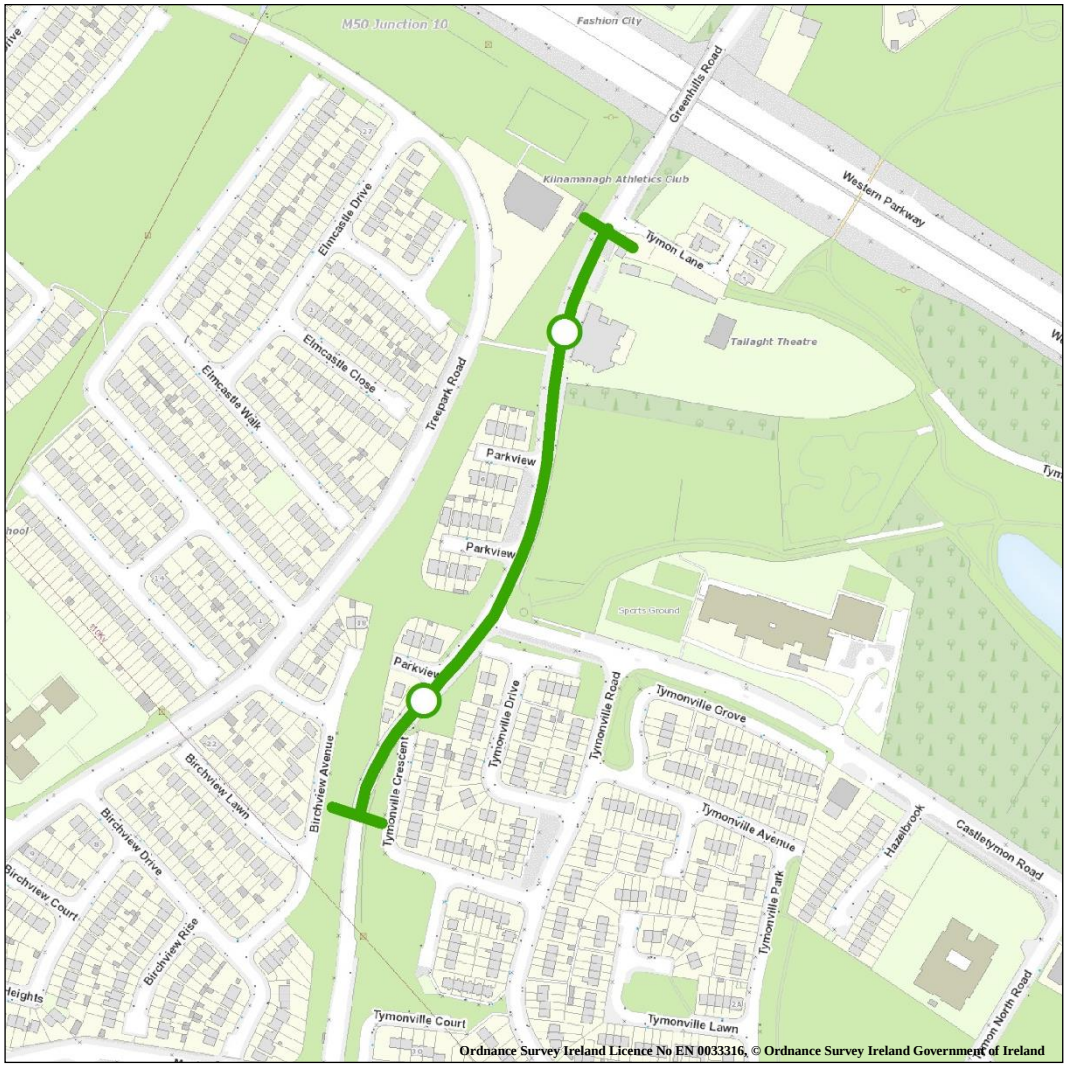


Figure 5.19: Route Option PV1

Inbound: Route option PV1 follows the existing Greenhills Road alignment from a point just south of Parkview to Tymon Lane.

Outbound: The outbound routing would follow the same route as the inbound routing.

Stops: A total of 2 stops would likely be provided along this route option.

5.3.1.1 Indicative Scheme Design

Route Sections:

Figure 5.20 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

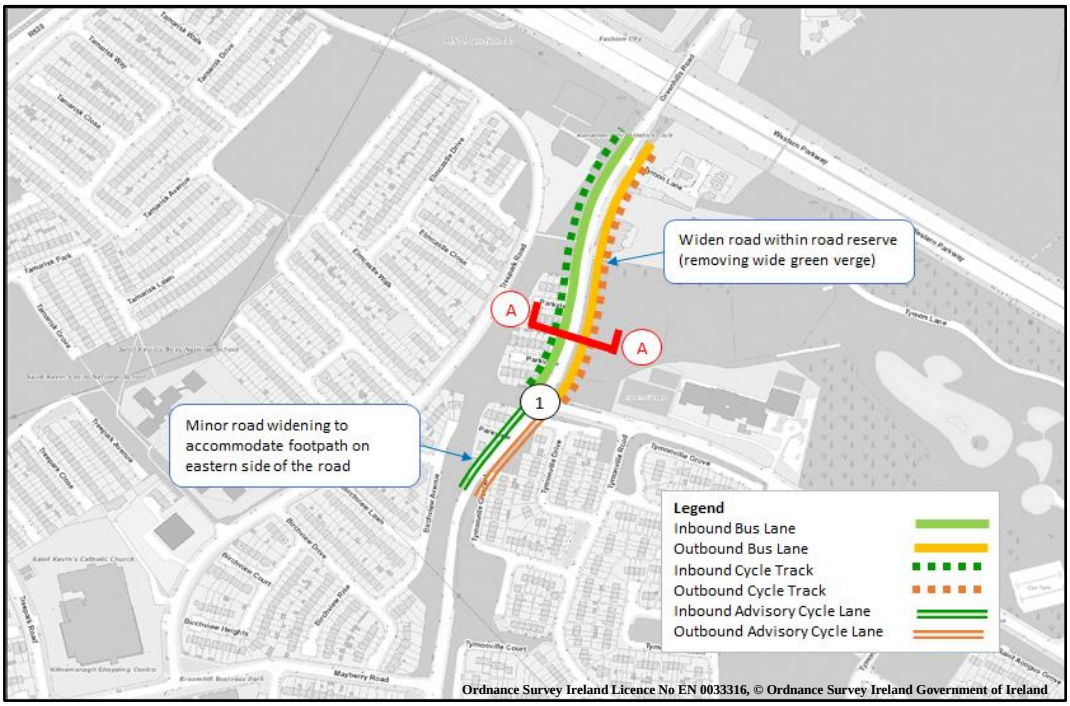


Figure 5.20: Route Option PV 1 Indicative Scheme Design

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 stopline), 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. A cross-section on Greenhills Road north of Castletymon Road is presented in **Figure 5.21**.

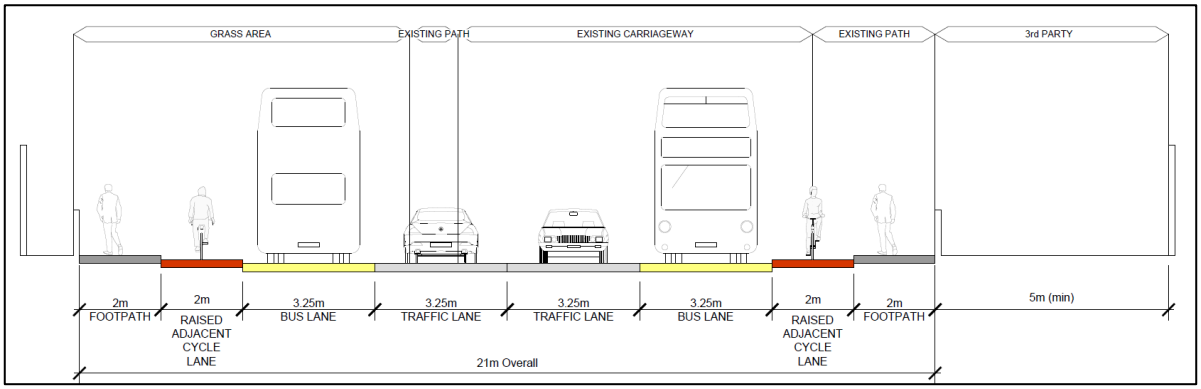


Figure 5.21: PV1 Cross-Section A-A: Greenhills Road

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Bus lanes and raised adjacent cycle lanes in each direction along Greenhills Road north of Castletymon Road (if deemed necessary for journey-time reliability); and
- No bus lanes but some provision for cyclists (e.g. on road advisory cycle lanes) south of Castletymon Road.

Junctions:

There is 1 signalised junction along this route option, which would require upgrading to facilitate bus priority. The location of this junction is presented in **Figure 5.20** and discussed below.

1. **Greenhills Road/Castletymon Road:** Adjustments to the existing junction layout would be required to facilitate bus lanes on the northern approach to the junction. There would also be a requirement to relocate/replace traffic signal equipment (e.g. signal heads etc.).

5.3.2 Route Option PV2: New Greenhills Road Alignment

Route Option PV2 is presented in **Figure 5.22** and described in the following text.

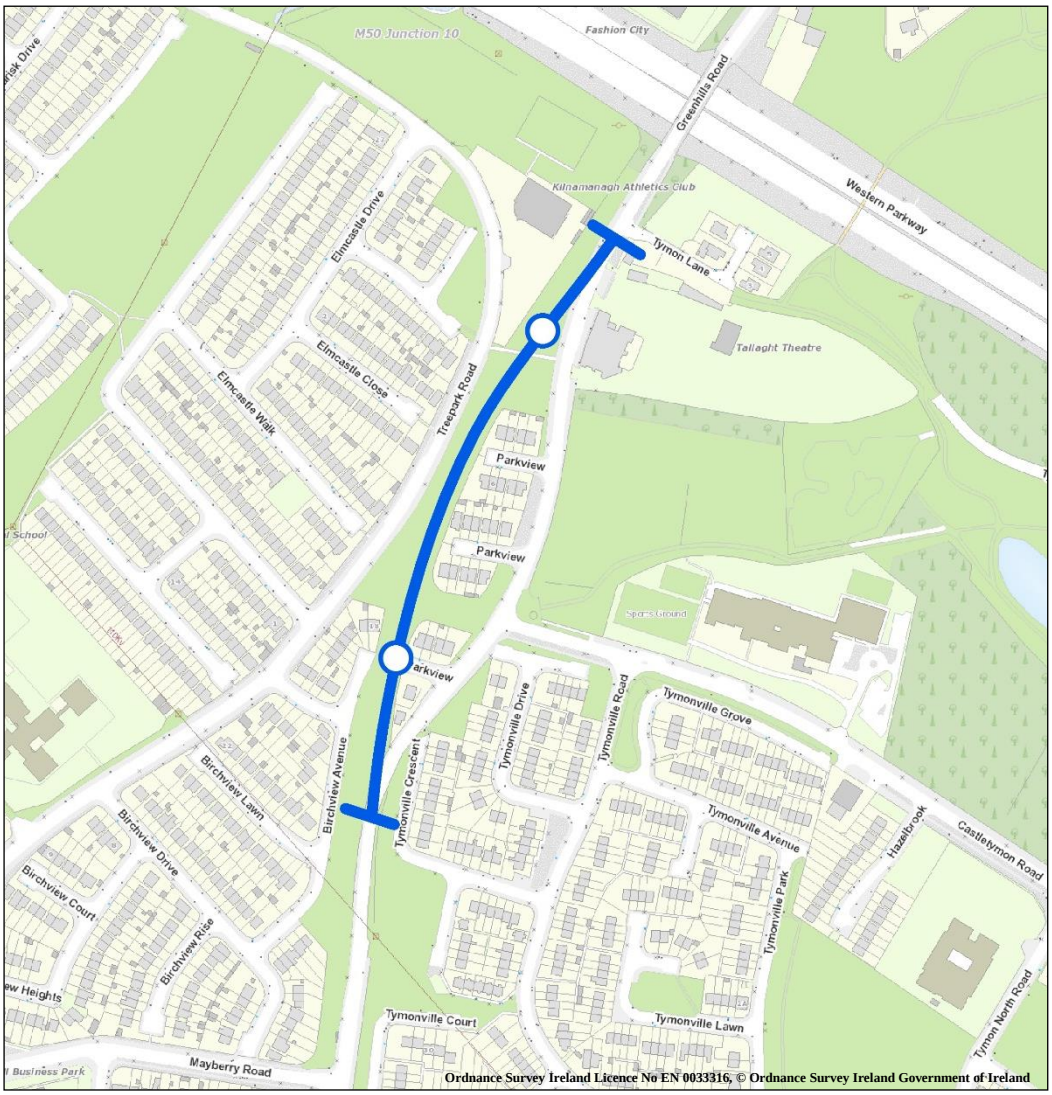


Figure 5.22: Route Option PV2

Inbound: Route option PV2 would run along a realigned section of Greenhills Road from a point just south of Parkview to Tymon Lane.

Outbound: The outbound routing would follow the same roads as the inbound routing.

Stops: A total of 2 stops would likely be provided along this route option.

5.3.2.1 Indicative Scheme Design

Route Sections:

Figure 5.23 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

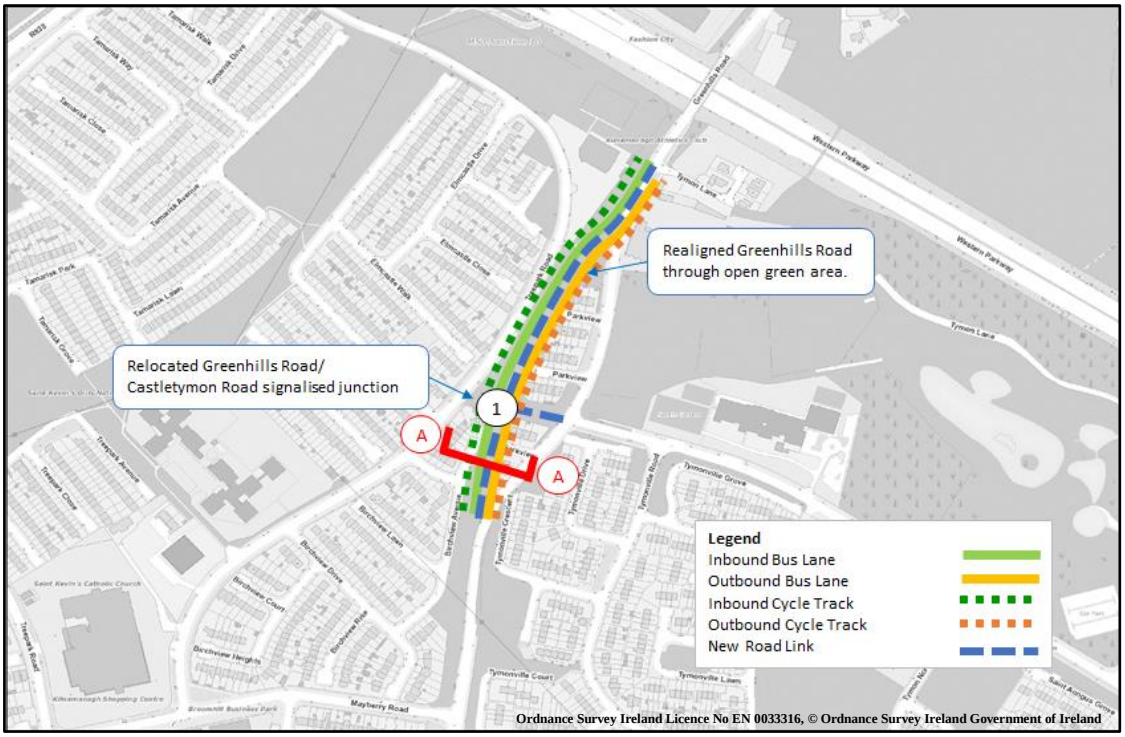


Figure 5.23: Route Option PV2 Indicative Scheme Design

This route option proposes realigning 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. A cross-section of the realigned Greenhills Road in this location is presented in **Figure 5.24**.

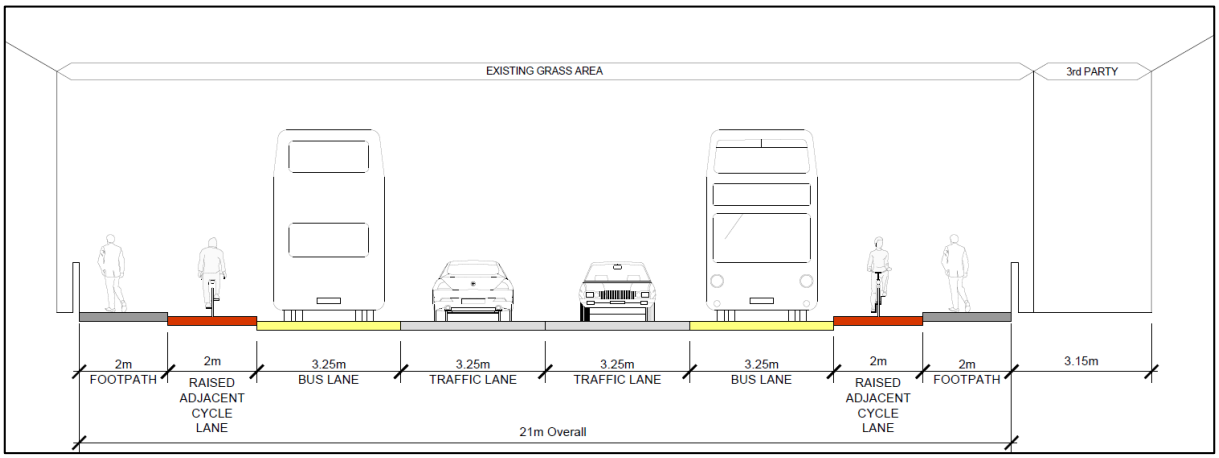


Figure 5.24: PV2 Cross-Section A-A: Greenhills Road

Under this proposal, the current junction of Castletymon Road and Greenhills Road would need to be relocated to the new Greenhills Road alignment. The existing 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 Greenhills Road/Castletymon Road junction to a priority controlled junction to facilitate access to Parkview.

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Bus lanes and raised adjacent cycle lanes in each direction along the length of the realigned Greenhills Road.

Junctions:

There is 1 signalised junction along this route option, which would require upgrading to facilitate bus priority. The location of this junction is presented in **Figure 5.23** and discussed below.

1. **Greenhills Road/Castletymon Road:** To facilitate this route option it is necessary to relocate this junction to the new road alignment. A completely new signalised junction and associated infrastructure is therefore required. The existing Greenhills Road/Castletymon Road junction would be downgraded to a priority controlled junction.

5.3.3 Route Options Assessment

Details of the Stage 2 route options assessment undertaken for the Parkview study area section are presented in **Appendix A2**.

The relative ranking of route options against the scheme assessment sub-criteria is summarised in **Table 5.4**.

Table 5.4: Parkview Route Options Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	PV1	PV2
Economy	Capital Cost		
	Transport Reliability and Quality of Service		
Integration	Land Use Integration		
	Residential Population and Employment Catchments		
	Transport Network Integration		
	Cycling Integration		
Accessibility & Social Inclusion	Key Trip Attractors		
	Deprived Geographic Areas		

Assessment Criteria	Assessment Sub-Criteria	PV1	PV2
Safety	Road Safety		
Environment	Archaeology and Cultural Heritage		
	Architectural Heritage		
	Flora and Fauna		
	Soils and Geology		
	Hydrology		
	Landscape and Visual		
	Air Quality		
	Noise & Vibration		
	Land Use Character		

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

In terms of Integration, 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, PV2 provides higher quality continuous raised adjacent cycle lanes and as such ranks higher under this 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 PV2. This is largely due to the fact that PV2 proposes a new road through and existing open green space. This has negative impacts in terms of land use character, air and noise, and landscape and visual.

A summary of the assessment and relative ranking of route options against the five main assessment criteria is presented in **Table 5.5**.

Table 5.5: Parkview Route Options Assessment Summary (Main Criteria)

Assessment Criteria	PV1	PV2
Economy		
Integration		
Accessibility & Social Inclusion		
Safety		
Environment		

Based on the assessment undertaken, route option PV2 appears to offer more benefits over other options. Route option **PV2** is therefore preferred 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
- Although it has the potential for relatively higher environmental impacts than PV1, the severity of these impacts are not considered to be significant at this stage of the assessment.

5.3.4 Fixed Route Section: Greenhills Road between Parkview and Ballymount Road Upper

5.3.4.1 Route Description

Following the Stage 1 sift only one route option was identified between Parkview and Ballymount Road Upper which is described below. This route is identified as route T30 in **Figure 5.2**

Inbound: This section of route would run along Greenhills Road between Parkview and Ballymount Road Upper.

Outbound: The outbound routing would follow the same roads as the inbound routing.

Stops: No stops would be provided along this short route section.

5.3.4.2 Concept Scheme Design

It is not considered practical to provide dedicated bus and cycle lanes across the existing 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 Greenhills Road to the east and west to facilitate bus and raised adjacent cycle lanes in each direction.

6 Study Area Section 2: Ballymount to Crumlin

6.1 Stage 1: Route Options Assessment

As there are a large number of potential end-to-end routes within the Section 2 study area, the roads available for CBC routing have been subdivided into shorter sections for the purposes of the Stage 1 route options sifting process. Following the route sifting process, remaining routes have been combined to form longer routes where possible.

Figure 6.1 presents the initial potential route options identified. A summary of the Stage 1 route options sifting process is presented in **Table 6.1**.

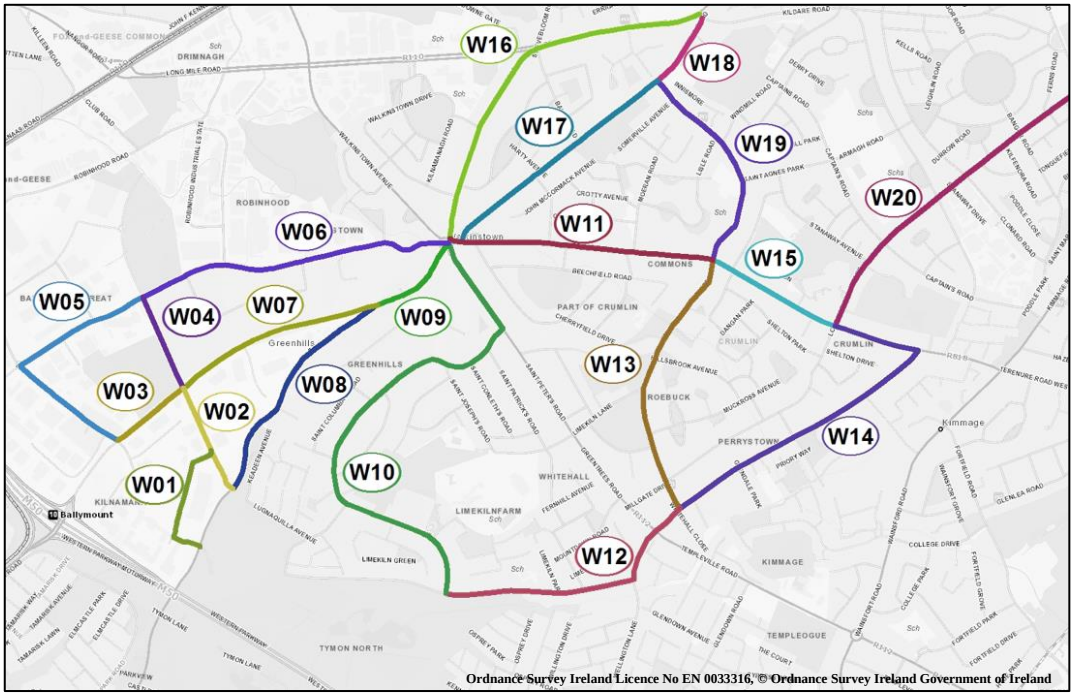


Figure 6.1: Section 2 Route Options – Ballymount to Crumlin

Table 6.1: Section 2 Route Option Sifting (Stage 1) Summary – Ballymount to Crumlin

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
W01	Ballymount Road Upper (Greenhills Road to Ballymount Avenue)	Secondary Route 8A	The section of Ballymount Road Upper between Greenhills Road and Fashion City Road is a single lane in each direction. A narrow footpath is provided on the northern side of the road while there is no verge or footpath on southern side of the road. To provide bus and cycle lanes in either or both directions on this section it would be necessary to take land from properties to the north and south of the road. In addition to the width restrictions, the road rises steeply from Fashion City Road to Greenhills Road, which would impact on bus passenger comfort particularly those standing. Bus and cycle lanes along the remaining section of this route could be provided with some land-take from adjacent properties. Given the vertical and horizontal constraints along the initial section of Ballymount Road Upper, and the presence of more suitable alternative, this route is not considered further.	Fail
W02	Ballymount Avenue including new link (Calmount Road to Greenhills Road)	Secondary Route 8A	This route option proposes extending Ballymount Avenue as far as Greenhills Road. The existing section of Ballymount Avenue could be widened to accommodate bus and cycle lanes in each direction.	Pass
W03	Calmount Road (Ballymount Road Upper to Ballymount Avenue)	Secondary Route 8A	Calmount Road is a wide road with a single traffic lane in each direction. Wide verges are present on both sides of the road which could be narrowed to accommodate bus and cycle lanes. However, following completion of the Section 1 Stage 1 Assessment, this route does not tie into any feasible route option to the south and is therefore not considered further.	Fail
W04	Ballymount Avenue (Calmount Road to Ballymount Road Lower)	Secondary Route 8A	Ballymount Avenue is a wide road with a single traffic lane and cycle lanes in each direction. There is potential to widen the road to accommodate bus and cycle lanes in each direction. However, this route option does not connect to any feasible route option to the north and is therefore not considered further.	Fail
W05	Ballymount Road Upper/ Ballymount Road Lower (Calmount to Ballymount Avenue)	Secondary Route 7E	Ballymount Road Upper is the main entry point to Ballymount Industrial Estate. Both Ballymount Road Upper and Lower are wide roads with a single traffic lane in each direction. Wide verges are present on both sides of the road which could be narrowed to accommodate bus and cycle lanes. However, this route does not tie into any feasible route option to the south and is therefore not considered further.	Fail
W06	Ballymount Road Lower (Ballymount Avenue to	Secondary Route 7E	Ballymount Road Lower is a busy distributor road providing access to the wider Ballymount Industrial Estate. There is little scope to widen the road to provide bus and cycle lanes in each direction although it may be possible to provide a bus lane in	Fail

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
	Walkinstown Roundabout)		one direction for short sections of the route. However, this route does not tie into any feasible route option to the west and is therefore not considered any further.	
W07	Calmount Road including new link road (Ballymount Avenue to Greenhills Road)	Secondary Route 8A	Calmount Road east of Ballymount Avenue is a wide road with a single traffic lane in each direction. There is potential to widen the road to accommodate bus and cycle lanes in each direction. The road is currently a cul-de-sac but is constructed to a point approximately 150m from Greenhills Road. This option proposes connecting Calmount Road to Greenhills Road.	Pass
W08	Greenhills Road (Northern edge of Tymon Park to location of potential new Calmount Road Extension)	Feeder Route	Greenhills Road east of Ballymount Avenue is a wide road which carries a single lane of traffic in each direction. There is potential to provide bus and cycle lanes in both directions immediately south of the M50 overpass. North of the overpass bus lanes may be possible, with private land acquisition as far as a point just south of Kilakee Drive. Beyond this point, widening becomes more difficult as the level drops off on each side of the road. To achieve bus lanes in each direction through this section, earthworks and/or retaining structures would be required (with private land acquisition). It is likely that it would not be possible to widen the northern 300m of this route option due to the proximity of existing buildings to the road and as such no bus lanes could be provided through this section. Notwithstanding this, there is an option which diverts through traffic to Calmount Road (W02/W07) which would allow this route option to operate as a bus only link (with access to adjacent properties), which would be protected by a bus gate where the route connects with the realigned Calmount Road/Greenhills Road, and as such this route is progressed to the next stage.	Pass
W09	Greenhills Road (Potential new Calmount Road extension to Walkinstown Roundabout)	Secondary Route 8A	Greenhills Road in this location carries a single lane of traffic in each direction. Road widening along this option would require land acquisition and extensive retaining structures. However, no more suitable alternative exists and as such this option is progressed to the next stage.	Pass
W10	Limekiln Avenue/St. James Road/St. Peters Road (Limekiln Road to Walkinstown Roundabout).	Feeder Route	St. James' Road and Limekiln Avenue are residential roads with direct access from individual properties onto the road. Most properties along the route have private driveways although some do not. Extensive on-street car parking is available along the route. Bus lanes could be provided by removing on-street car parking. However, this route does not tie into any feasible route option to the south and is therefore not considered further.	Fail

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
W11	Cromwell's Fort Road (Walkinstown Roundabout to Whitehall Road)	Secondary Route S03	Cromwell's Fort Road is a busy road which provides direct access to several residential properties along its length as well as providing access to other adjacent residential neighbourhoods. It may be possible to widen the road but to provide bus and cycle lanes in both directions would require land acquisition. However, this route does not tie into any feasible route option to the south and is therefore not considered any further.	Fail
W12	Limekiln Road/Wellington Road (Limekiln Avenue to Whitehall Road West)	Secondary Route 9C/9D	Limekiln Road is a busy road which provides direct access to several residential properties along its length as well as providing access to other adjacent residential neighbourhoods. There is a wide verge present on both sides of the road for much of its length which could be narrowed to provide bus and cycle lanes. However, this route does not tie into any feasible route option to the south and is therefore not considered any further.	Fail
W13	Whitehall Road West (Cromwell's Fort Road to Whitehall Road)	Primary Route 8B	Whitehall Road West is a busy road which provides direct access to several residential properties along its length as well as providing access to other adjacent residential neighbourhoods. It may be possible to widen the road to provide bus and cycle lanes on some sections of the route. However, this route does not tie into any feasible route option to the south and is therefore not considered any further.	Fail
W14	Whitehall Road/Kimmage Road West (Whitehall Road West to Lorcan O'Toole Park)	Secondary Route 9D	Whitehall Road is a busy road which provides direct access to several residential properties along its length as well as providing to other adjacent residential neighbourhoods. It may be possible to widen the road but to provide bus and cycle lanes in both directions would require land acquisition. However, this route does not tie into any feasible route option to the south and is therefore not considered any further.	Fail
W15	Kimmage Road West (Lorcan O'Toole Park to Whitehall Road)	Secondary Route S03	Kimmage Road West is a busy road which provides direct access to several residential properties along its length as well as providing access to other adjacent residential neighbourhoods. It may be possible to widen the road but to provide bus and cycle lanes in both directions would require land acquisition. However, this route does not tie into any feasible route option to the south and is therefore not considered any further.	Fail
W16	Walkinstown Road/Drimnagh Road (Walkinstown Roundabout to Kildare Road)	Drimnagh Road is part of Secondary Route 8C	Walkinstown Road is a busy road which provides direct access to several residential properties along its length as well as a number of retail units. A short section of bus lane is provided in the southbound direction on approach to Walkinstown Roundabout (approximately 60m). At the northern end of Walkinstown Road, approximately 150m of bus lane is provided on approach to Drimnagh Road. Bus lanes could be provided in each direction by acquiring land from adjacent properties.	Pass

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
			This section of Drimnagh Road consists of a bus lane and traffic lane in each direction and could be widened to accommodate cycle lanes in each direction with some land acquisition and removal of on-street car parking.	
W17	Bunting Road (Cromwell's Fort Road to St. Agnes Road)	Secondary Route 8A	Bunting Road is a tree lined residential road with which provides direct access to several residential properties along its length. There is potential to provide a bus and cycle lane in one or both directions by narrowing the verge, removal of trees, removal of unofficial parking on footpath and some land acquisition. However, Bunting Road joins Cromwell's Fort Road approximately 25m from the Walkinstown Roundabout. Turning movements into and out of Bunting Road are limited to left- in/left-out. A dedicated bus traffic signal could be provided at this junction to allow buses to turn right from Bunting Road towards Walkinstown Roundabout.	Pass
W18	Bunting Road (St. Agnes Road to Drimnagh Road)	Secondary Route 8A	Bunting Road is a residential road which provides direct access to several residential properties along its length. There is potential to provide bus and cycle lanes in both directions by narrowing the verge, removal of unofficial parking on footpath and some land acquisition.	Pass
W19	St. Agnes Road (Cromwell's Fort Road to Bunting Road)	Primary Route 8B	St. Agnes Road is a residential road which provides direct access to several residential properties along its length. This road also passes through Crumlin Village. Continuous bus and cycle lanes would require land acquisition. However, this route option does not connect to any feasible route option to the south and is therefore not considered any further.	Fail
W20	Stannaway Road (Kimmage Road West to Sundrive Road)	Secondary Route 9C	Stannaway Road is a residential road which provides direct access to several residential properties. Road widening to provide bus and cycle lanes would require land acquisition. However, this route option does not connect to any feasible route option to the south and is therefore not considered any further.	Fail

Following the Stage 1 sift, 7 of the 20 route options assessed passed the initial sifting stage and were progressed to the next assessment stage. These route options are presented in **Figure 6.2**.

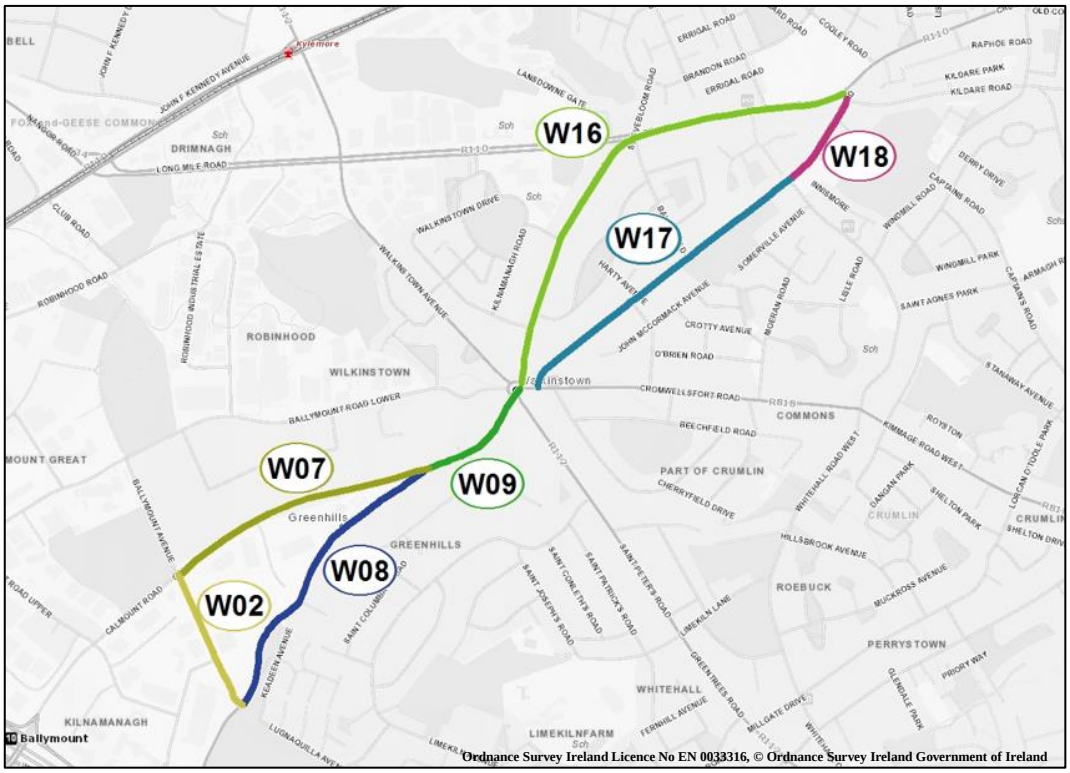


Figure 6.2: Section 2 Route Options Remaining After Stage 1 Assessment

6.2 Stage 2: Ballymount to Walkinstown Route Options Assessment

Following the Stage 1 sift for the Ballymount to Crumlin study area, the remaining route options were combined to form 3 cohesive route options between Ballymount and Walkinstown.

- BW1 - A route option via Greenhills Road;
- BW2- A route option via Ballymount Avenue and Calmount Road;
- BW3 - A route option via Greenhills Road, with general traffic rerouted to the BW2 routing.

These route options are discussed in the following sections.

6.2.1 Route Option BW1: Greenhills Road

Route Option BW1 is presented in **Figure 6.3** and described in the following text.

Figure 6.3: Route Option BW1

Inbound: Route option BW1 would run along Greenhills Road as far as Walkinstown Roundabout.

Outbound: The outbound routing would follow the same route as the inbound routing.

Stops: A total of 4 stops would likely be provided along this route option.

6.2.1.1 Indicative Scheme Design

Route Sections:

Figure 6.4 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

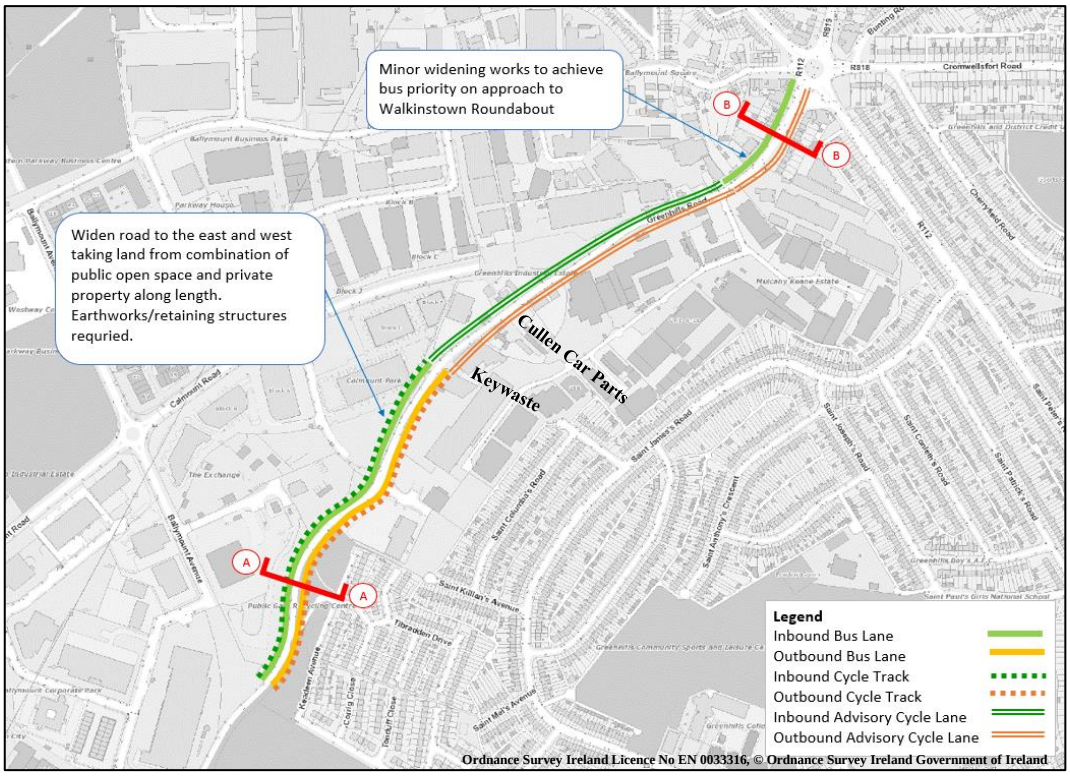


Figure 6.4: Route Option BW1 Indicative Scheme Design

This route option would stay along the existing Greenhills Road alignment. In this area, secondary cycle route 8A follows Greenhills Road between Calmount Road and Walkinstown Roundabout. Beyond this it follows Calmount Road, Ballymount Avenue and the associated planned links to/from Greenhills Road (included as a development objective in the South Dublin County Council Development Plan 2016 - 2022). Greenhills Road south of Calmount Road is classified as a feeder route. As such, for this route option, high quality cycle facilities are only necessary between Calmount Road and Walkinstown Roundabout.

Notwithstanding this, the GDA Cycle Network Plan in this area appears to have been determined based on the planned future road network as described above. However, if the core bus corridor was to be proposed along Greenhills Road in this area, this would only be likely on the basis that the planned road link is not being progressed as this would make any infrastructure works on Greenhills Road to provide bus and raised adjacent cycle lanes redundant when the new road is built and opened. As such, for this route option, cycle facilities would be required along the length of this route to accommodate the rerouted secondary cycle route 8A.

This option assumes that 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 a land-take from adjacent properties. As Greenhills Road effectively runs along a ridge, earthworks/retaining structures would be required to facilitate the road widening. A cross-section on Greenhills Road is presented in **Figure 6.5**.

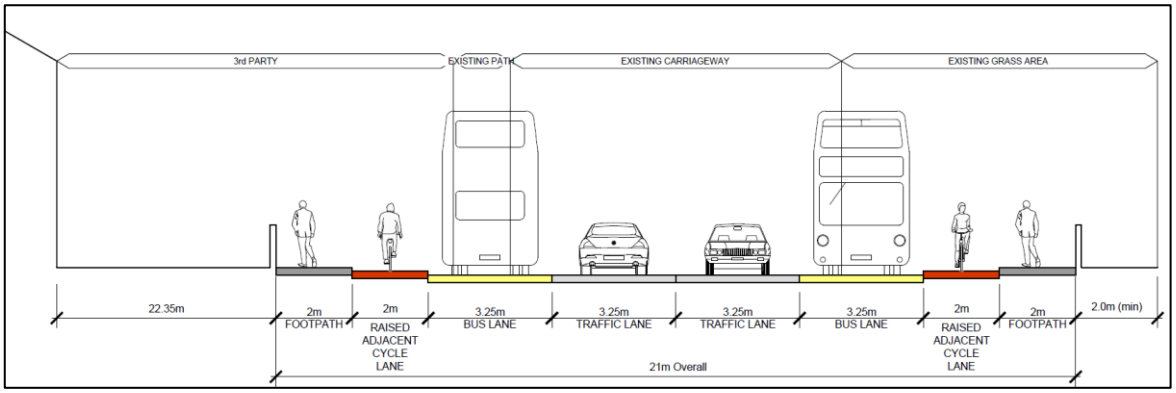


Figure 6.5: BW1 Cross-Section A-A: Greenhills Road

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). A cross-section on Greenhills Road on approach to Walkinstown Roundabout is presented in **Figure 6.6**.

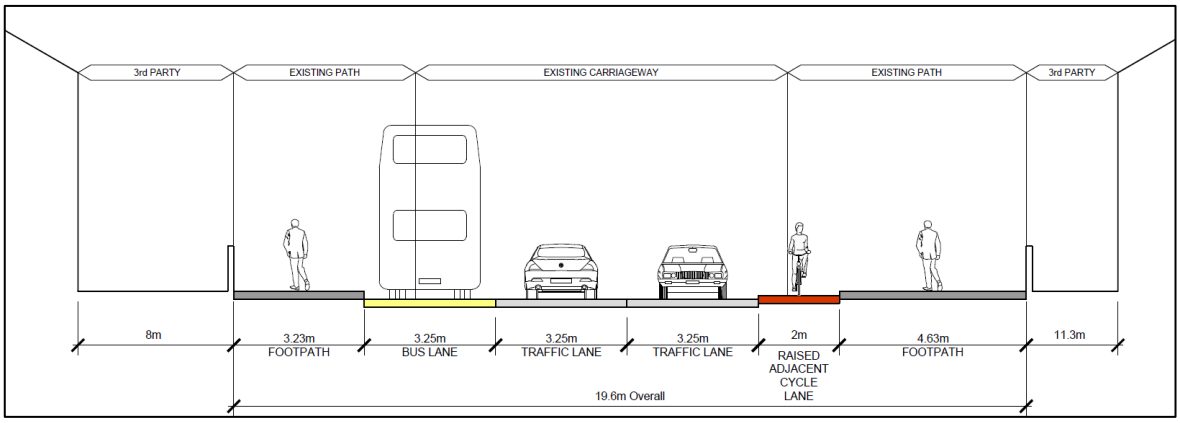


Figure 6.6: BW1 Cross-Section B-B: Greenhills Road (on approach to Walkinstown Roundabout)

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Bus lanes and raised adjacent cycle lanes in each direction along Greenhills Road between the start of the route and the Keywaste facility; and
- Inbound bus lane (shared with cyclists) for 200m on approach to Walkinstown Roundabout.

Junctions:

There are no junctions along this route option which would require upgrading to facilitate the proposed works.

6.2.2 Route Option BW2: Ballymount Avenue and Calmount Road (Buses and General Traffic Rerouted)

Route Option BW2 is presented in **Figure 6.7** and described in the following text.

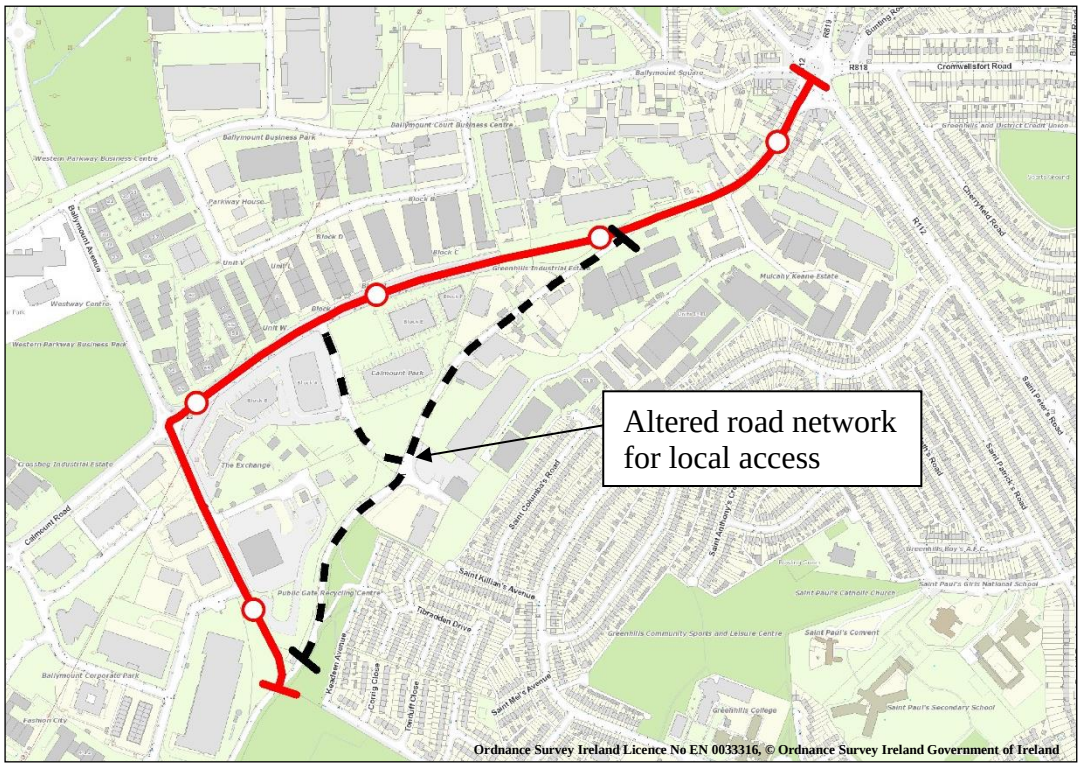


Figure 6.7: Route Option BW2

Inbound: Route option BW2 would turn from 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 Greenhills Road allowing the route to continue as far as Walkinstown Roundabout. The existing Greenhills Road would be closed to through traffic.

Outbound: The outbound routing would follow the same route as the inbound routing.

Stops: A total of 5 stops would likely be provided along this route option.

Route Sections:

Figure 6.8 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

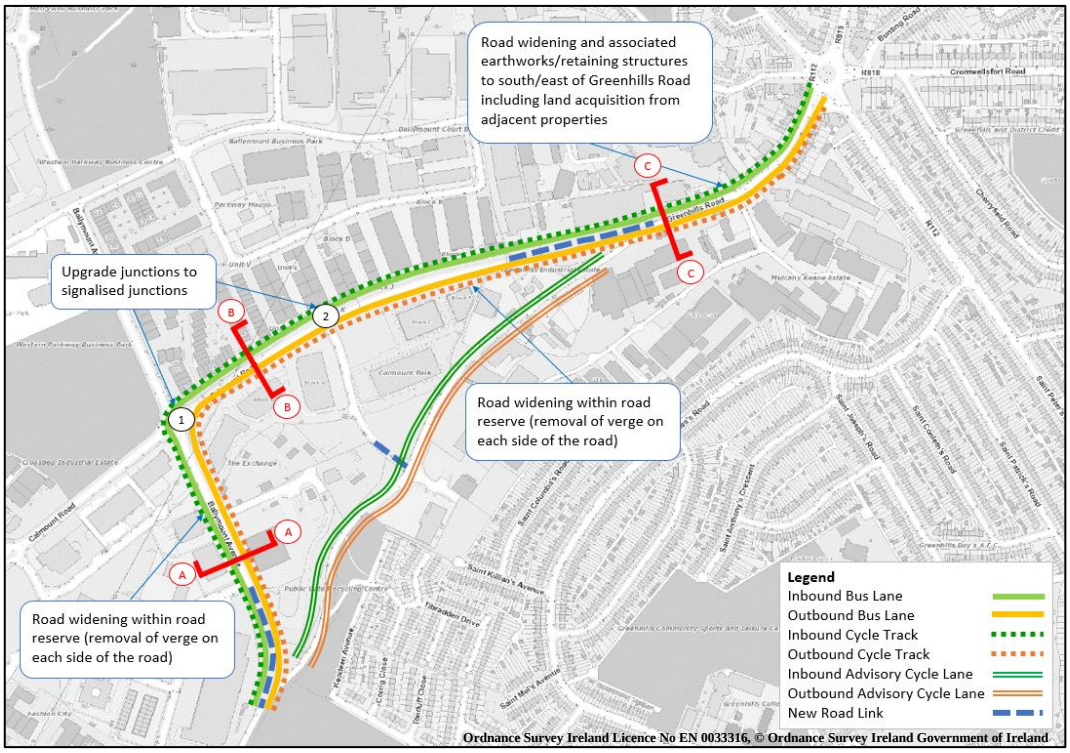


Figure 6.8: Route Option BW2 Indicative Scheme Design

This route option proposes rerouting all Greenhills Road traffic, including buses, through Ballymount Industrial Estate. To facilitate this, a new section of road between Greenhills Road and Ballymount Avenue is required. A new section of road is also required to connect Calmount Road to Greenhills Road. This route option provides a bus lane and raised adjacent cycle lane in each direction by widening within the existing road reserve. A cross-section on Ballymount Avenue and Calmount Road are presented in **Figure 6.9** and **Figure 6.10**.

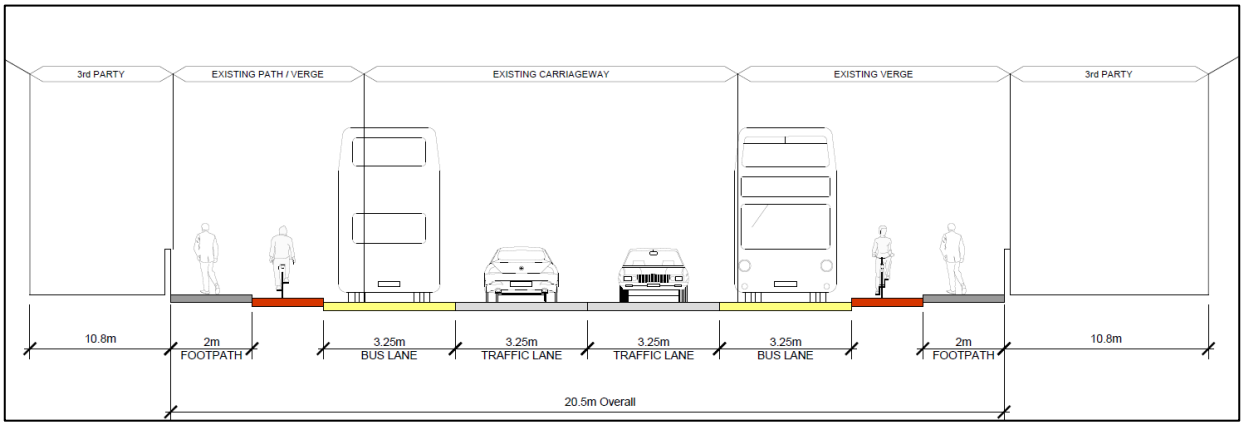


Figure 6.9: BW2 Cross-Section A-A: Ballymount Avenue

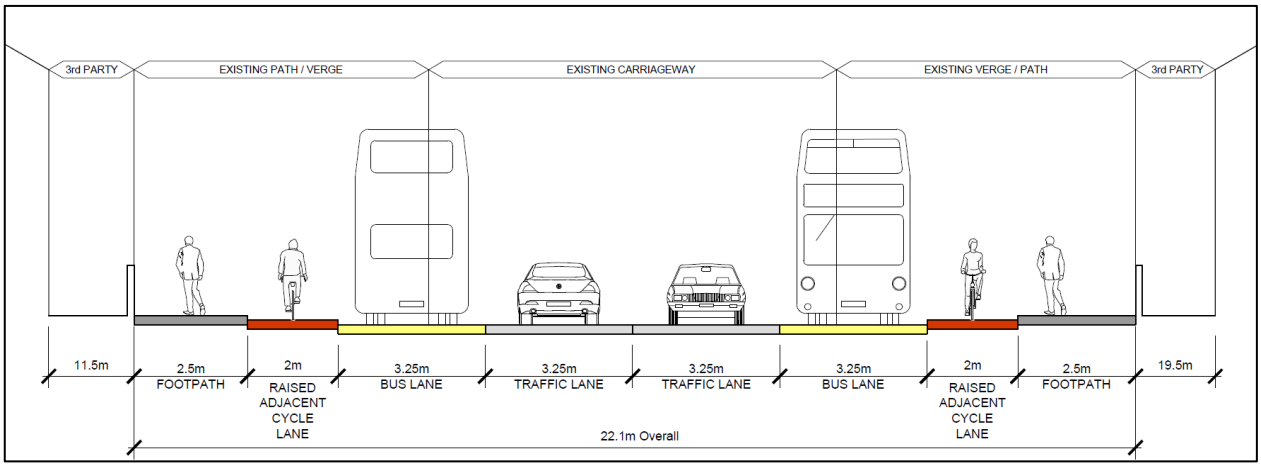


Figure 6.10: BW2 Cross-Section B-B: Calmount Road

On approach to Walkinstown Roundabout, the road would be widened to the south/east of 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. The exact engineering works required would be subject to further examination in subsequent designs stages. A cross-section on Greenhills Road is presented in **Figure 6.11**.

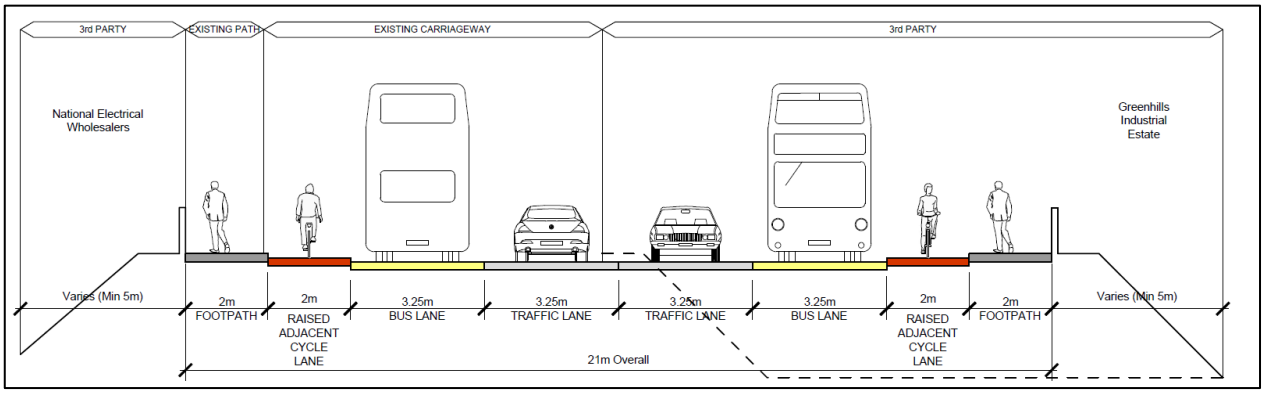


Figure 6.11: BW2 Cross-Section C-C: Greenhills Road

Under this option it is proposed to close Greenhills Road to through traffic at either end with access provided via a new junction off Calmount Road.

In summary, this route option would, subject to confirmation at the scheme design stage, result in bus lanes and raised adjacent cycle lanes in each direction along its length:

Junctions:

There are 2 junctions along this route option, which would require upgrading to traffic signals to facilitate bus priority. The location of these junctions are presented in **Figure 6.8** and discussed below.

1. **Ballymount Avenue/Calmount Road:** It would be necessary to upgrade this roundabout to a four-arm signalised junction to facilitate bus priority and accommodate the anticipated additional traffic volumes;

2. **Calmount Road/Calmount Avenue:** It would be necessary to upgrade this junction to traffic signals to facilitate access to the section of Greenhills Road closed under this proposal.

6.2.3 Route Option BW3: Retention of Greenhills Road for buses with general traffic rerouted via Ballymount Avenue and Calmount Road

Route Option BW3 is presented in **Figure 6.12** and described in the following text.

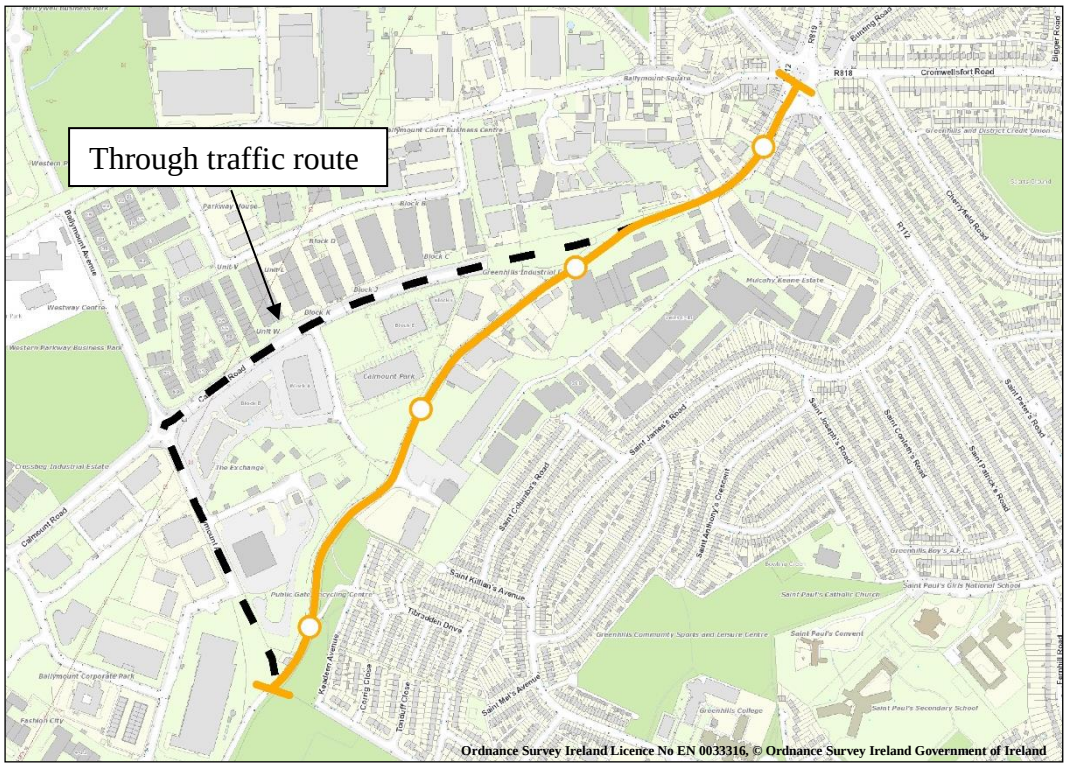


Figure 6.12: Route Option BW3

Inbound: This route option would run along Greenhills Road which would be restricted to bus and local access only.

General traffic would turn from 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 Greenhills Road allowing the general traffic to continue as far as Walkinstown Roundabout.

Outbound: The outbound routing would follow the same route as the inbound routing.

Stops: A total of 4 stops would likely be provided along this route option.

Route Sections:

Figure 6.13 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

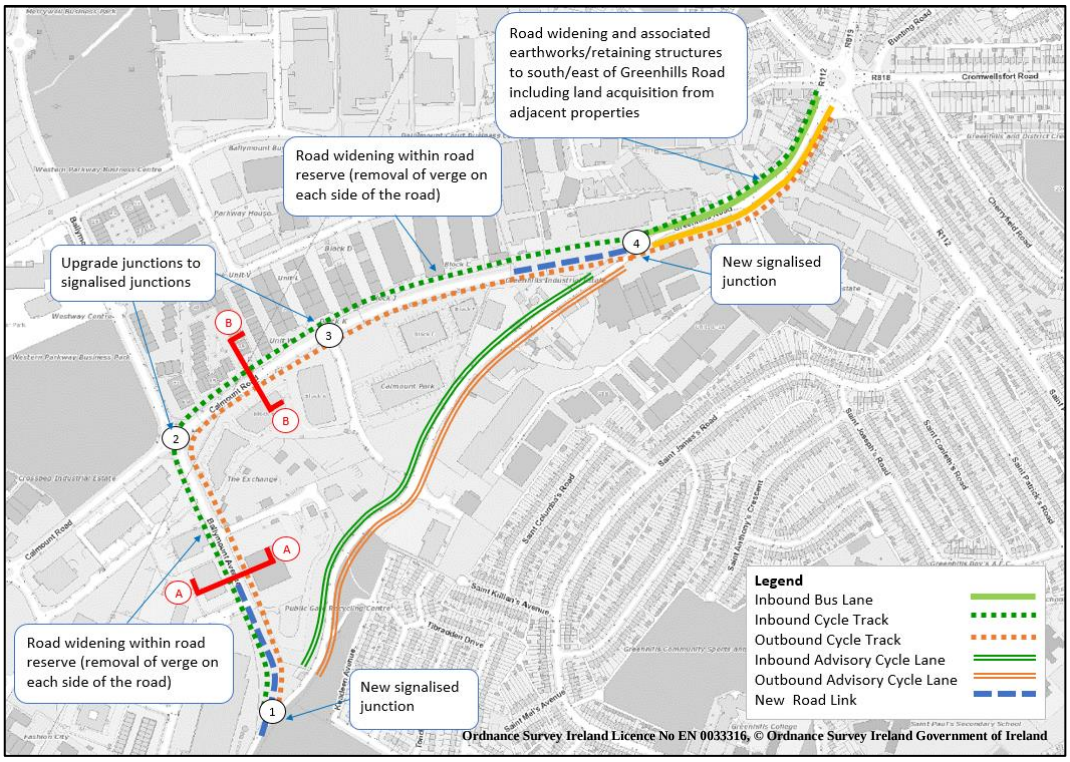


Figure 6.13: Route Option BW3 Indicative Scheme Design

This route option proposes that buses would run along Greenhills Road. Along 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 Greenhills Road/Calmount Road junction to allow buses to enter/exit Greenhills Road.

It is also proposed to reroute through traffic from Greenhills Road through Ballymount Industrial Estate (i.e. no buses). To facilitate this, a new section of road between Greenhills Road and Ballymount Avenue would be required. A new section of road would also be required to connect Calmount Road to Greenhills Road. A raised adjacent cycle lane would be provided in each direction by widening within the existing road reserve slightly. A cross-section on Ballymount Avenue and Calmount Road are presented in **Figure 6.29** and **Figure 6.30**.

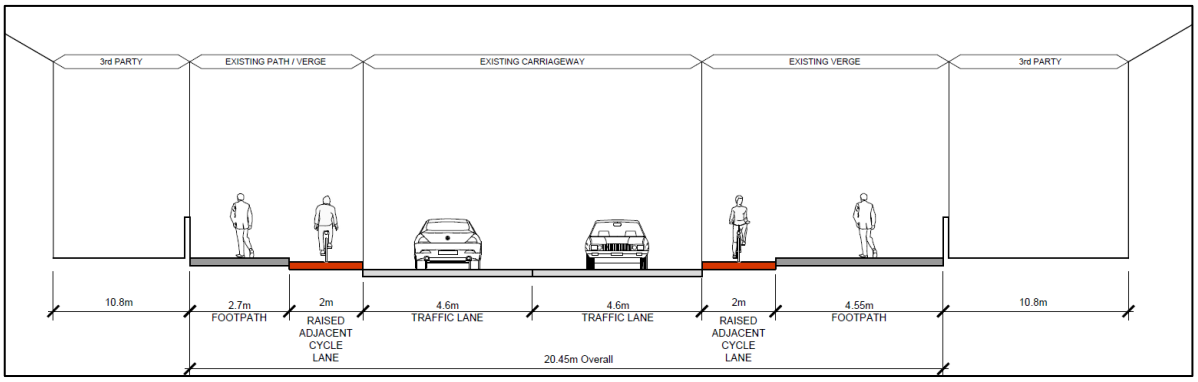


Figure 6.14: BW3 Cross-Section A-A: Ballymount Avenue

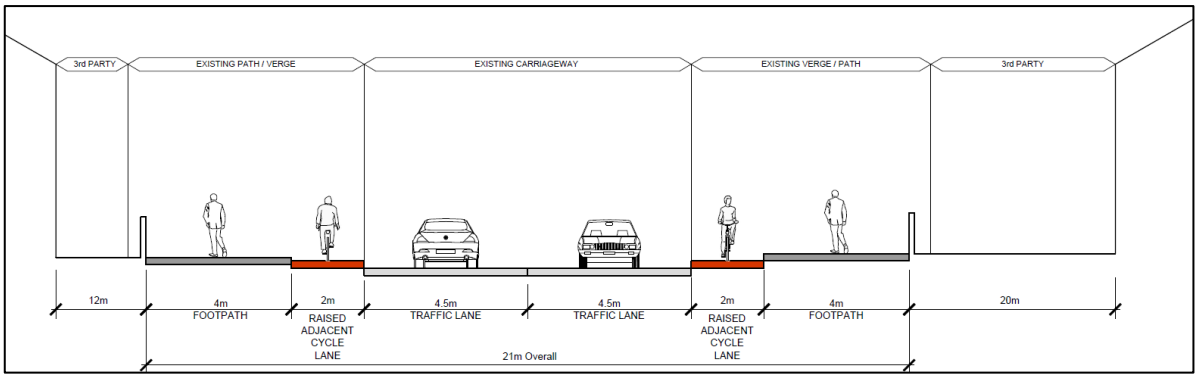


Figure 6.15: BW3 Cross-Section B-B: Calmount Road

On approach to Walkinstown Roundabout, the road would be widened to the south/east of 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. The exact engineering works required would be subject to further examination in subsequent designs stages. A cross-section on Greenhills Road is presented in **Figure 6.11**.

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Bus and local traffic access only along Greenhills Road with bus gate at Calmount Road/Greenhills Road junction (no dedicated bus lanes);
- New road link connecting Greenhills Road to Ballymount Avenue and Calmount Road to Greenhills Road to accommodate cars and cyclists;
- Bus and raised adjacent cycle lanes in each direction would be provided between Calmount Road and Walkinstown Roundabout.

Junctions:

There are 2 junctions along this route option, which require upgrading to traffic signals to facilitate bus priority. In addition, 2 new junctions are required. The location of these junctions are presented in **Figure 6.13** and discussed below.

1. **Ballymount Avenue/Greenhills Road:** To facilitate access to and egress from the old Greenhills Road alignment it would be necessary to signalise the

Ballymount Avenue/Greenhills Road junction (with old Greenhills Road being the minor arm at the junction);

2. **Ballymount Avenue/Calmount Road:** It would be necessary to upgrade this roundabout to a four-arm signalised junction to accommodate the anticipated additional traffic volumes as a result of rerouting Greenhills Road through this junction;
3. **Calmount Road/Calmount Avenue:** It would be necessary to upgrade this junction to traffic signals to facilitate safe to parts of the Ballymount Industrial Estate.
4. **Calmount Road/Greenhills Road:** To facilitate a bus gate to and from the Greenhills Road at this location, it would be necessary to signalise this junction. This would also allow queues to be managed on the approach to the Walkinstown Roundabout. Entry and exit to the Greenhills Road at this location would be restricted to buses only.

6.2.4 Route Options Assessment

Details of the Stage 2 route options assessment undertaken for the Ballymount to Walkinstown study area section are presented in **Appendix A3**.

The relative ranking of route options against the scheme assessment sub-criteria is summarised in **Table 6.2**.

Table 6.2: Ballymount Route Options Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	BW1	BW2	BW3
Economy	Capital Cost			
	Transport Reliability and Quality of Service			
Integration	Land Use Integration			
	Residential Population and Employment Catchments			
	Transport Network Integration			
	Cycling Integration			
Accessibility & Social Inclusion	Key Trip Attractors			
	Deprived Geographic Areas			
Safety	Road Safety			
	Archaeology and Cultural Heritage			

Assessment Criteria	Assessment Sub-Criteria	BW1	BW2	BW3
Environment	Architectural Heritage			
	Flora and Fauna			
	Soils and Geology			
	Hydrology			
	Landscape and Visual			
	Air Quality			
	Noise & Vibration			
	Land Use Character			

In terms of economy, route option BW1 represents the cheapest 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 options of BW2 and BW3.

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

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

A summary of the assessment and relative ranking of route options against the five main assessment criteria is presented in **Table 6.3**.

Table 6.3: Ballymount Route Options Assessment Summary (Main Criteria)

Assessment Criteria	BW1	BW2	BW3
Economy			
Integration			
Accessibility & Social Inclusion			
Safety			
Environment			

Based on the assessment undertaken, route options BW2 and BW3 appear to offer similar benefits over 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 Greenhills Road. Cycle access to Greenhills Road, which is identified as a feeder route, could also be maintained in this option;
- Compared to option BW3, this option removes the need for additional signalised junctions associated with bus access to and from the current 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 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.

6.3 Walkinstown Roundabout Options Assessment

6.3.1 Introduction

This section of the assessment process specifically looks at options for upgrading Walkinstown Roundabout and the roads leading to the roundabout to prioritise the movement of buses up to and through the junction.

A number of traffic management and junction arrangement options are presented with feasible options assessed under a set of criteria put forward.

The assessment builds on some preliminary junction upgrade assessment work undertaken by Arup on behalf of South Dublin County Council and the NTA in 2013.

This assessment identified that on balance, the preferred design option for the junction was to reduce the number of entry lanes and circulation lanes to two with pedestrian/cyclist crossings across each approach to the junction.

6.3.2 Baseline Assessment

6.3.2.1 Public Transport

Bus Services

There are a number of public transport services that operate in the immediate vicinity of the Walkinstown Roundabout. These are listed in **Table 6.4** and their routes shown in **Figure 6.16**.

Table 6.4: Public Transport Services at Walkinstown Roundabout

Route no.	Colour	Route	Average Headway (min)	Peak Headway (min)		Total Flows per Day
56a		Tallaght - Ringsend	75	70	Both Directions	30
27		Jobstown - Clare Hall	12	12	Both Directions	144
77a		Citywest - Ringsend	20	15	Both Directions	110
77x		Citywest – UCD Belfield	N/A	N/A	Inbound only	1
9		Limelkin Ave - Charlestown	15	10	Both Directions	129

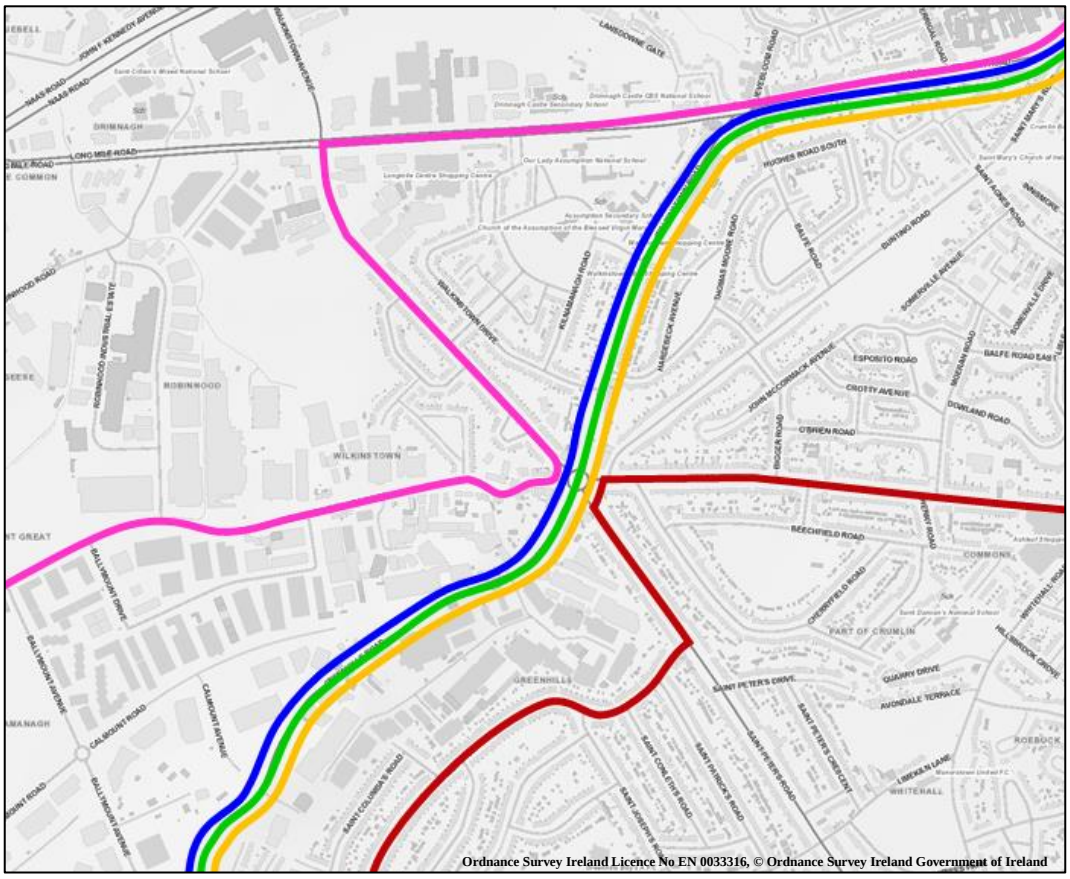


Figure 6.16: Bus Routes in the Vicinity of Walkinstown Roundabout

Table 6.5 summarises the bus route services running through the roundabout during the AM peak hour.

Table 6.5: AM Peak Hour Bus Services through Walkinstown Roundabout

Junction Entry	Peak Flow per hour
Walkinstown Avenue	4
Ballymount Road Lower	4
Greenhills Road	12
St.Peters Road	6
Cromwellsfort Road	6
Walkinstown Road	12

As can be seen in **Table 6.5**, Greenhills Road and Walkinstown Road carry the most peak hour bus services.

Automatic Vehicle Location Data

Automatic Vehicle Location (AVL) data for bus route 27 has been used to identify existing delays to buses at, and on approach to the roundabout.

Figure 6.17 and **Figure 6.18** summarises the average speed of buses between relevant bus stops along the 27 route in the vicinity of the roundabout, for inbound and outbound journeys respectively.

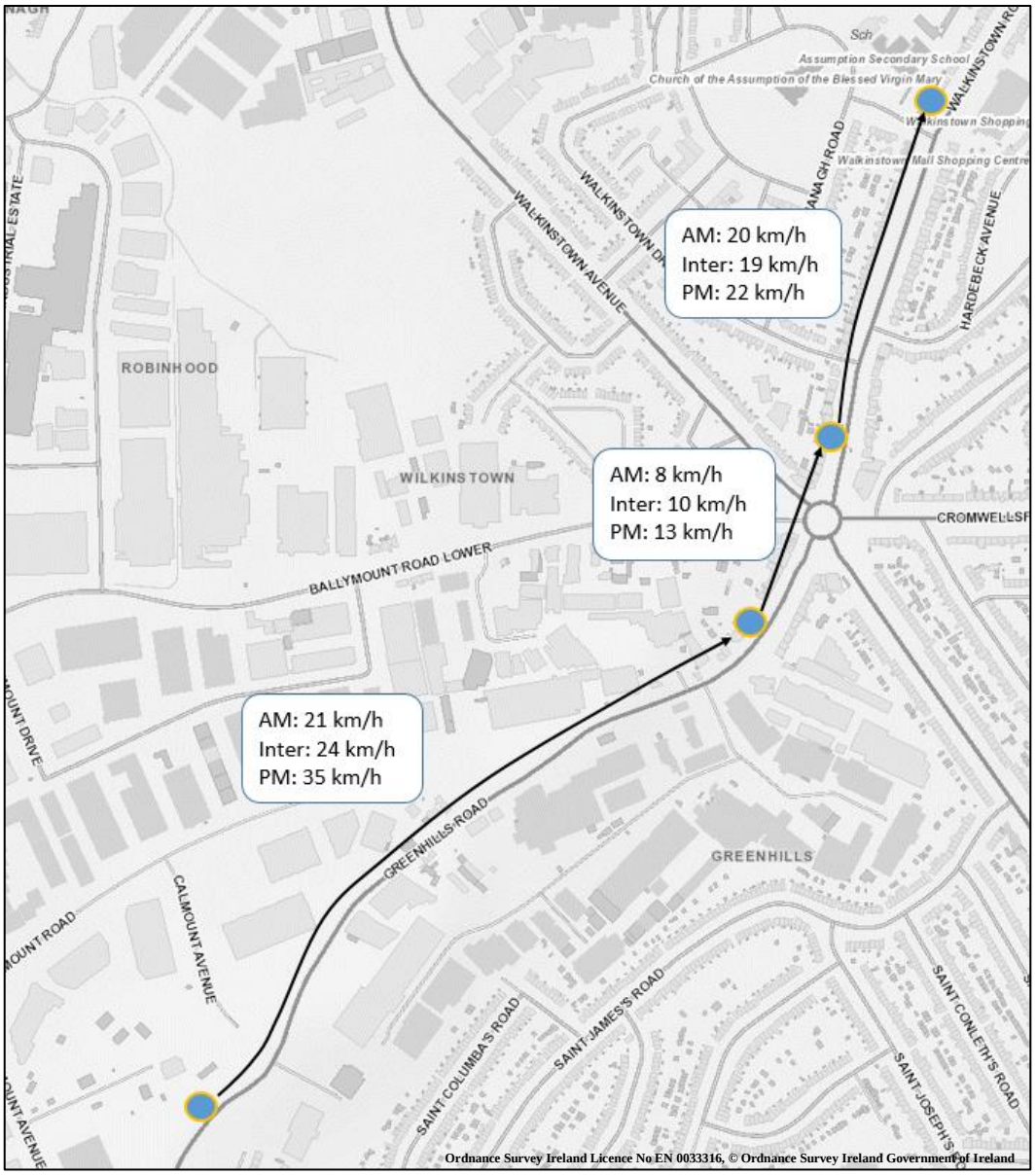


Figure 6.17: Inbound Average Speeds through Walkinstown Roundabout

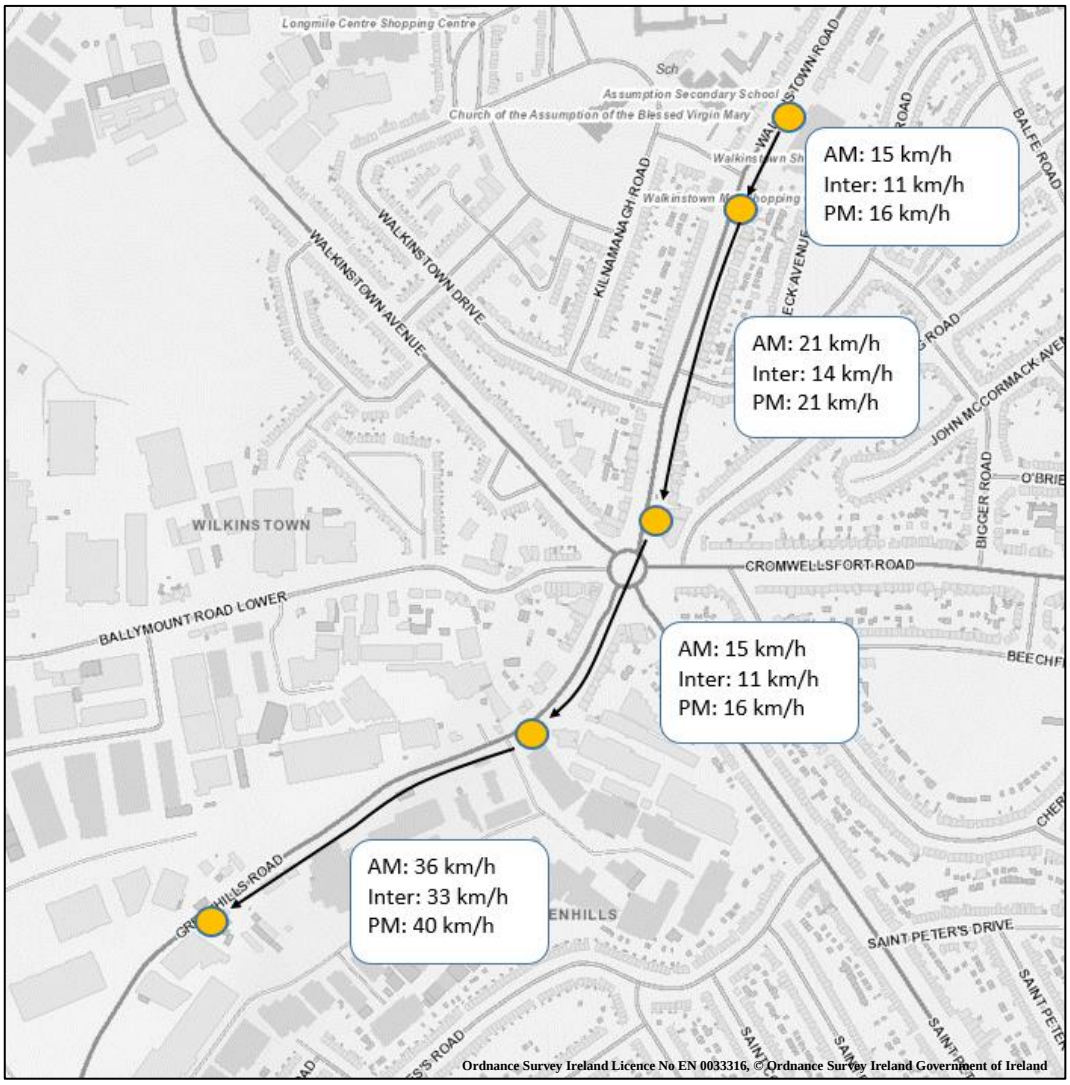


Figure 6.18: Outbound Average Speeds through Walkinstown Roundabout

As can be seen in **Figure 6.17** and **Figure 6.18**, the average speeds on approach to, and departure from, Walkinstown Roundabout are generally within acceptable ranges (i.e. greater than 20km/h). However, there are currently delays to buses on both the Greenhills Road and Walkinstown Road approaches through the junction during each peak hour. The delays are particularly noticeable inbound in the morning peak hour where average speeds are reduced to 8km/h which is well below the desirable 20km/h for a CBC.

Additionally, the Dublin Bus Traffic Analysis Tallaght Outbound (Route 27) Report from March 2015 details unscheduled stops for buses along the 27 route. This shows that almost 30% of outbound buses are delayed at the junction for an average of 68 seconds in the 3 hour evening peak period. The report notes that this is largely due to the requirement for buses to navigate from the nearside lane to the central lane to navigate the roundabout.

This existing bus journey time data highlights the issues with the existing junction arrangement and the delays it causes to buses running through the junction.

6.3.2.2 Traffic Volumes

As part of the Greenhills to City Centre Core Bus Corridor Study, traffic counts were carried out at the Walkinstown Roundabout on Thursday 10th March 2016. The AM peak hour was found to be 08:15 – 09:15, and the PM peak hour was found to be 16:15 – 17:15. The recorded traffic counts for the roundabout are presented in **Figure 6.19** and **Figure 6.20** for the AM and PM peak hour periods respectively.

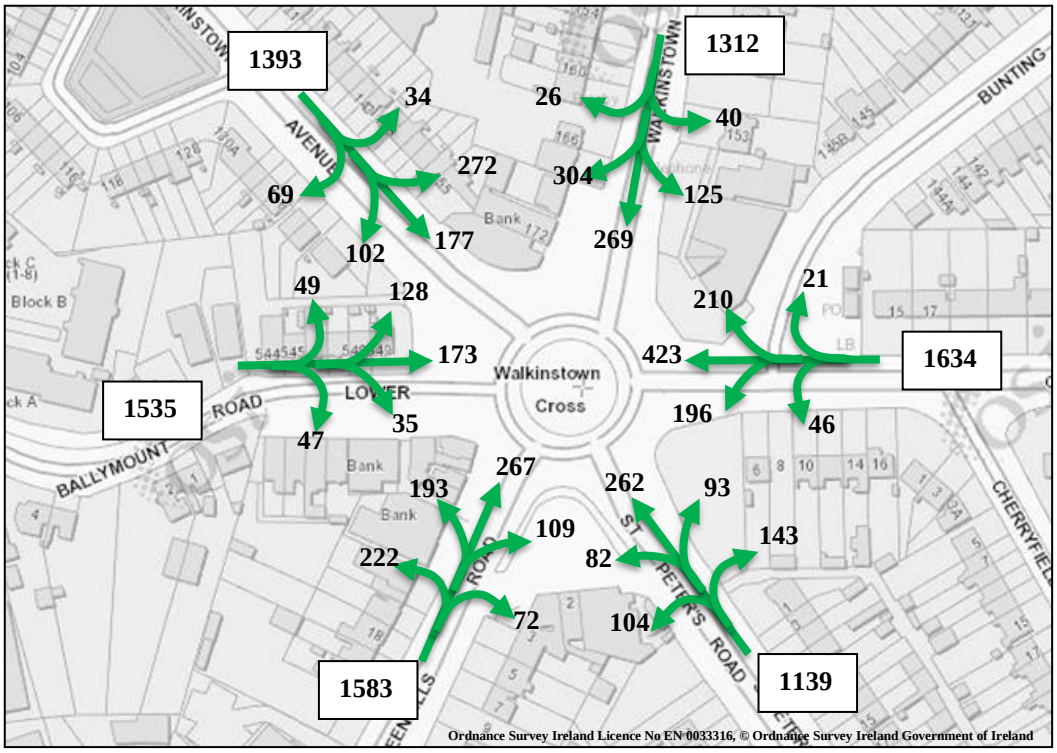


Figure 6.19: Recorded Traffic Counts – AM Peak Hour

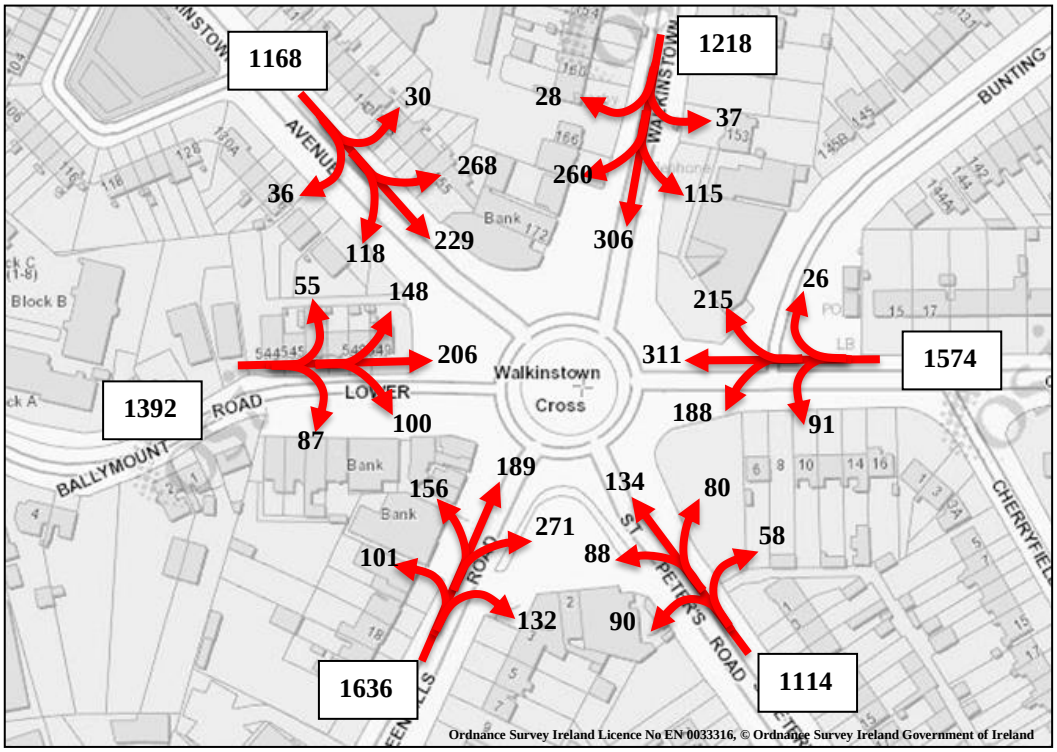


Figure 6.20: Recorded Traffic Counts – PM Peak Hour

It can be seen in **Figure 6.19** and **Figure 6.20** that there are no particular dominant movements at the junction although it is noted that both the Greenhills Road, Cromwellsfort Road and Ballymount Road Lower approaches carry more traffic than other approaches.

6.3.3 Methodology

6.3.3.1 General

A two stage assessment has also been carried out for the Walkinstown Roundabout Options Assessment considering both traffic management options and junction arrangement options, as summarised below:

- An initial Stage 1 high-level options assessment or 'sifting' process which appraised options in terms of ability to achieve scheme objectives and whether they could be practically delivered.
- Options which passed this initial stage were taken forward to a more detailed Stage 2 assessment.

6.3.3.2 Option Development

The primary purpose of this assessment is to develop options which will prioritise the movement of buses up to and through the junction while also improving the environment for pedestrians and cyclists. Options considered comprise the following:

- Junction Arrangement Options: Upgrades to the junction layout are considered under this heading.
- Traffic Management Options: In addition to the physical junction arrangements, a number of traffic management options are also considered at this stage.

Following the stage 1 assessment, junction arrangement and traffic management options are combined to form scheme options. These scheme options are then progressed to a multi-criteria assessment.

6.3.3.3 Assessment Criteria

The criteria against which the options are assessed have been selected to have commonality with the Route Options Assessment methodology where appropriate. **Table 6.6** presents a summary of the resulting assessment criteria and sub criteria used as part of the Stage 2 detailed route options assessment process.

Table 6.6: Walkinstown Roundabout Assessment Criteria

Assessment Criteria	Assessment Sub-Criteria	Assessment metric
1. Economy	1.a. Capital Cost	Order of magnitude indicative cost estimate (infrastructure and land-take)
	1.b. Transport Reliability and Quality of Service	Benefits to bus journey times and reliability through the junction
2. Integration	2.a. Transport Network Integration	Impact on traffic movement
	2.b. Cycle Network Integration	Impact on cyclists
3. Safety	4.a. Road User Safety	Impact on safety for all road users
4. Environment	5.a. Landscape and Visual	Impact on appearance of the junction
	5.b. Land Use Character	Impact on land use at, or surrounding the junction

The colour coded scoring system used in the Route Options Assessment has been applied to this MCA.

6.3.4 Stage 1 Assessment

6.3.4.1 Traffic Management Options

A number of traffic management measures which would either reduce the volume of traffic or the number of arms at the junction have been considered. A summary of the Stage 1 traffic management options sifting process is presented in **Table 6.7**.

Table 6.7: Traffic Management Options at Walkinstown Roundabout Stage 1 Sift

Option Description	Comments	Pass/Fail
Traffic Management Option 1: Close the Ballymount Road Lower approach to the junction to through traffic allowing local access only. This traffic would divert to other entrance/exits to the Ballymount Industrial Estate including existing and potential new access on Greenhills Road.	By reducing the number of approaches to the junction there is potential to improve the operation of the junction and therefore reduce delays to buses passing through the junction. Similarly, a reduction in the number of arms would allow various junction arrangements to be explored. This improvement could benefit a number of different junction arrangements and is therefore passed to the next assessment stage.	Pass
Traffic Management Option 2: Close access to and egress from the Walkinstown Road approach to the junction for general traffic while maintaining it for buses. Traffic would be rerouted to Walkinstown Avenue under this proposal.	Restricting access to Walkinstown Road would reduce the volume of traffic with which buses would have to contend with on Walkinstown Road. However, this option does not meet the objectives in terms of prioritising the bus through the junction. Rerouting general traffic to Walkinstown Avenue inbound, would increase the amount of left turning traffic from Greenhills Road. This is traffic which would need to cross the path of a bus coming from Greenhills Road to get to Walkinstown Avenue, for example as a left turn at a signalised junction. Alternatively, if the junction arrangement allowed the	Fail

Option Description	Comments	Pass/Fail
	priority movement to be reassigned (i.e. Greenhills – Walkinstown being the main route), buses would be forced to cross this busy stream of traffic to turn right onto Walkinstown Road. Similarly, outbound, buses coming from Walkinstown Road would be opposed by more traffic from Walkinstown Avenue due to rerouting of traffic which would likely result in delays to buses in a roundabout junction arrangement, and offer little or no benefit over a signalised junction arrangement without this traffic management measure. It is also worth noting that such a change to access to Walkinstown Road, which serves several businesses (including a SuperValu store) and residential areas, would likely be met with opposition. For the reasons outlined above this option as not been passed to the next assessment stage.	
Traffic Management Option 3: Close exit from the junction to Walkinstown Road to general traffic with inbound traffic rerouting to Walkinstown Avenue. Only buses would be allowed to exit the junction onto Walkinstown Road. Outbound, both general traffic and buses could arrive from Walkinstown Road.	Restricting access to Walkinstown Road would reduce the volume of traffic with which buses would have to contend with on Walkinstown Road. However, this option does not meet the objectives in terms of prioritising buses through the junction. Rerouting general traffic to Walkinstown Avenue inbound, would increase the amount of left turning traffic from Greenhills Road. This is traffic which would need to cross the path of buses coming from Greenhills Road to get to Walkinstown Avenue, for example as a left turn at a signalised junction. Alternatively, if the junction arrangement allowed the priority movement to be reassigned (i.e. Greenhills – Walkinstown being the main route), buses would be forced to cross this busy stream of traffic to turn right onto Walkinstown Road. As with Option 2, such a change in access arrangements to Walkinstown Road, which serves several businesses (including a SuperValu store) and residential areas, would likely be met with opposition. For the reasons outlined above, this option as not been passed to the next assessment stage.	Fail
Traffic Management Option 4: Close access from the Greenhills Road approach to the junction for general traffic while maintaining access for buses only. Inbound traffic would likely reroute to Ballymount Road Lower under this option.	Restricting access to Greenhills Road would reduce the volume of traffic with which inbound buses would have to contend with on Greenhills Road, noting that bus lanes in each direction may not be practical for sections of Greenhills Road. There are limited options for traffic to reroute in the area and therefore a large portion of existing inbound traffic would reroute locally to Ballymount Road Lower either via	Fail

Option Description	Comments	Pass/Fail
	a new connection off Greenhills Road or diversions at a more strategic level. This would likely have a significant impact on the capacity of the Ballymount Road Lower approach to the junction. Furthermore this would be a significant diversion for vehicles arriving from Greenhills Road would be required to undertake. The diversion is particularly notable for vehicles travelling from the businesses located directly off Greenhills Road including a Lidl store. While the increase in traffic on Ballymount Road Lower as a result of this traffic management measure would reduce traffic on the Greenhills Road approach and improve the bus priority through the junction if maintained as a roundabout, this would offer little benefit in a signalised junction arrangement. For the reasons outlined above, this option has not been passed to the next assessment stage.	
Traffic Management Option 5: Close access to Greenhills Road from the junction for general traffic while maintaining it for buses. Inbound traffic would likely reroute to Ballymount Road Lower under this proposal.	Restricting access to Greenhills Road would reduce the volume of traffic with which outbound buses would have to contend with on Greenhills Road. However, this option does not meet the objectives in terms of prioritising the bus through the junction. This option would increase the amount of traffic which would conflict with traffic exiting Greenhills Road (e.g. increased traffic moving from Walkinstown Road to Ballymount Road Lower) and would therefore result in additional delays to buses if maintained as a roundabout. While this could be controlled in a signalised junction arrangement to afford buses priority, it would not offer any benefits over the signalised option without any traffic management measures. For the reasons outlined above this option has not been passed to the next assessment stage.	Fail
Traffic Management Option 6: Tie Cromwellsfort Road into St. Peters Road in advance of the junction and restrict movements to left-in left out.	This option is specifically linked to a junction arrangement which ties Cromwellsfort Road into St Peters Road in advance of the main junction. This traffic management measure would allow the number of approaches to the junction to be reduced and allow a more efficient signalised junction arrangement to be developed. This traffic management measure would mean that traffic arriving at the junction from Cromwellsfort Road with a destination other than St. Peters Road, would have to reroute. This traffic would most likely reroute to St. Peters Road either turning from Kimmage Road West onto either Whitehall Road or Whitehall Road West. There are also	Pass

Option Description	Comments	Pass/Fail
	other options to reroute in Templeogue for traffic arriving from further afield. This option would allow the two main regional routes at the junction to form the main roads at the junction (i.e. the R819 Greenhills Road –Walkinstown Road and the R112 St. Peters Road – Walkinstown Avenue). In combination with traffic management Option 1, this could allow for a more typical 4-arm signalised junction to be developed. While this option is likely to result in large increases in traffic on St. Peters Road, there are a number of potential benefits to this as outlined above. As such this traffic management option is considered at the next assessment stage.	

6.3.4.2 Junction Options

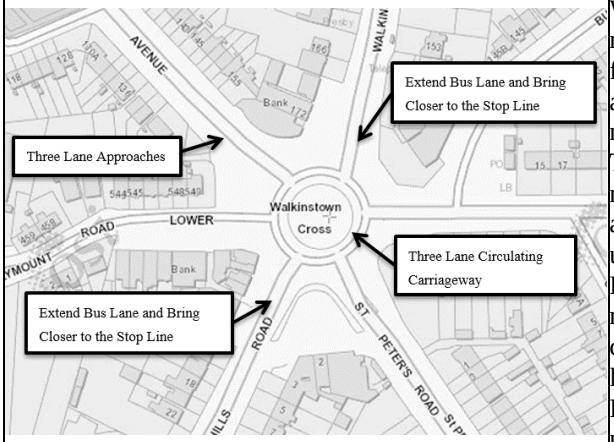
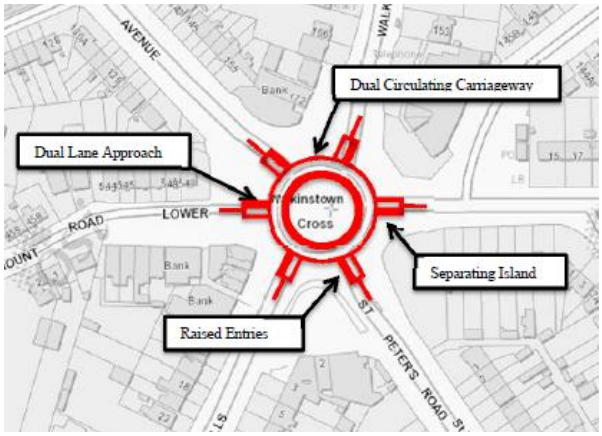
A number of potential junction arrangements have been considered as part of this assessment.

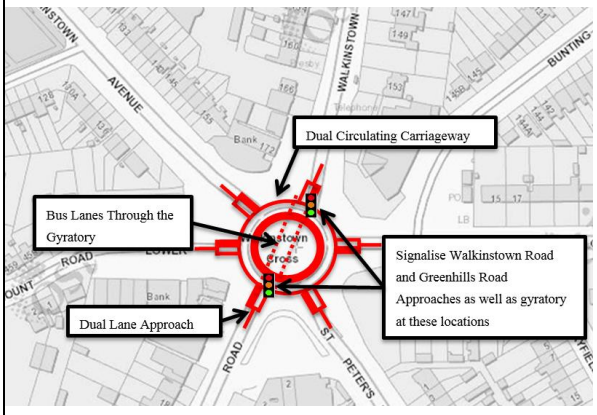
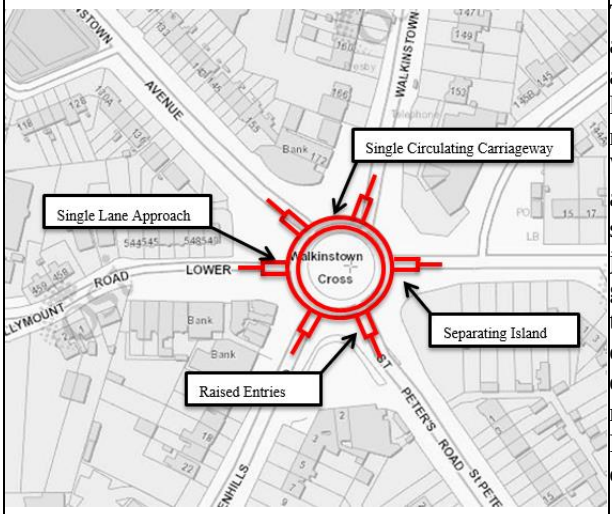
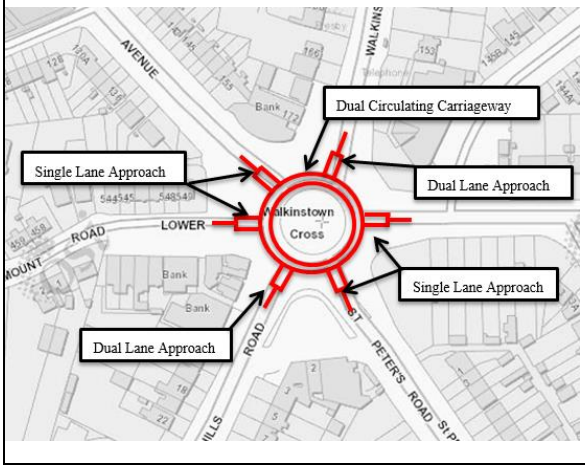
Junction arrangement options considered as part of the Walkinstown Roundabout Upgrade Study have been re-considered in the context of achieving the best practical CBC.

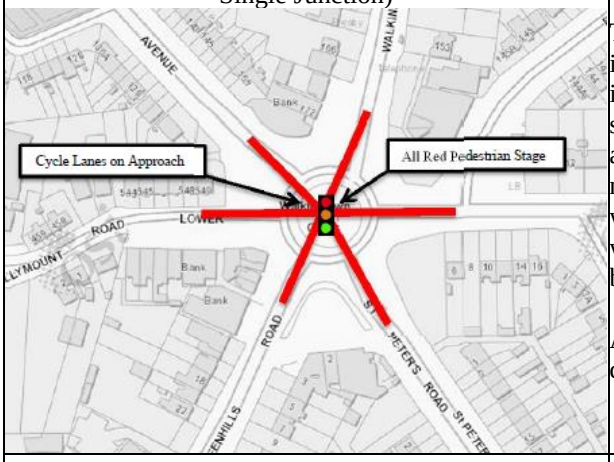
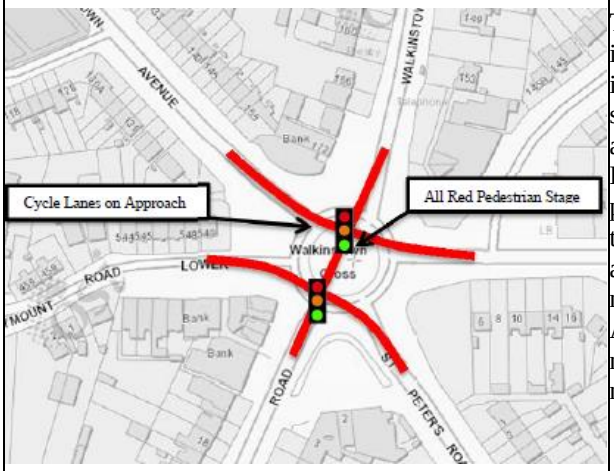
Junction arrangement options are also considered in the context of the potential benefits to be gained in conjunction with the traffic management measures considered in Section 6.3.5.1.

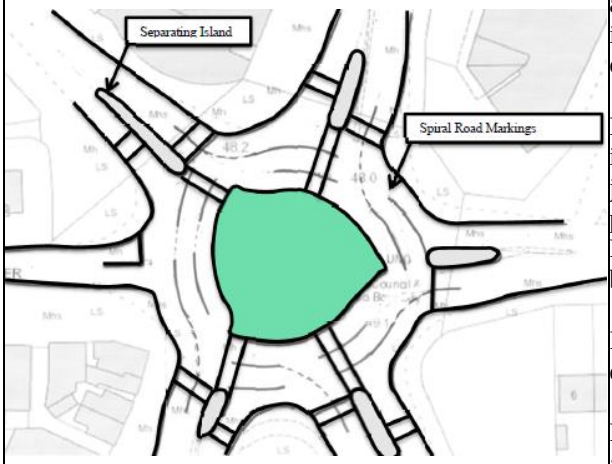
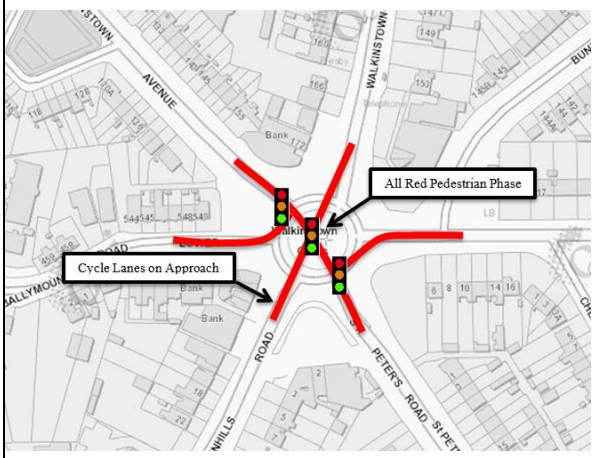
Table 6.8 presents the junction options considered in order to achieve the best practical journey time reliability for the CBC route.

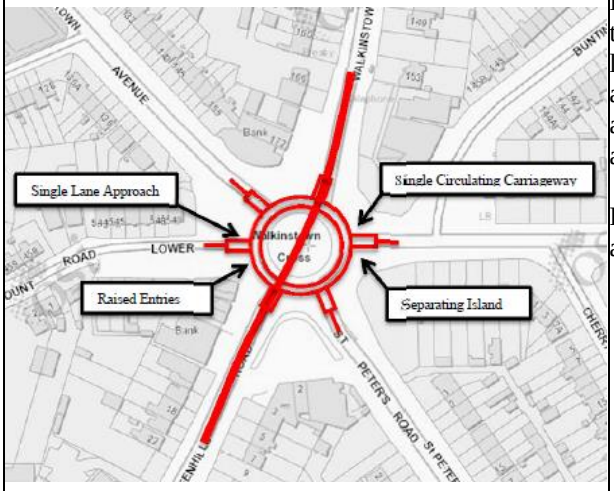
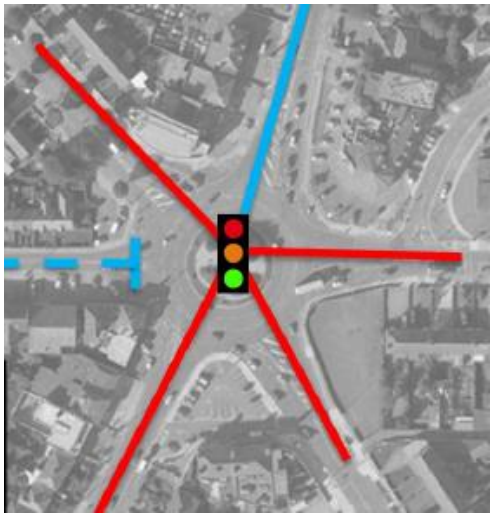
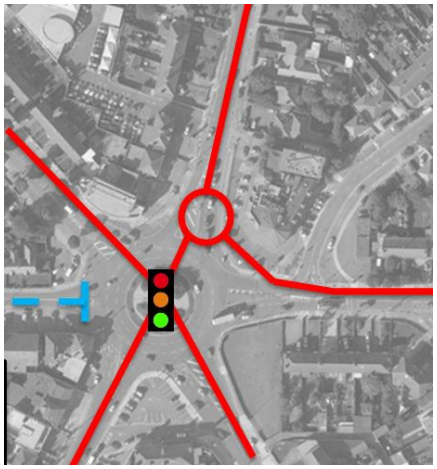
Table 6.8: Junction Arrangement Options Stage 1 Sift

Option	Comments	Pass/Fail
Junction Arrangement Option A: Existing Roundabout with Improved Bus Priority on Approach to the Yield Line 	This option effectively maintains the existing roundabout arrangement, with extended bus lanes on approach to the roundabout and the bus lane brought closer to the yield line. While bus priority on approach to the roundabout is improved, the existing issues for buses generally still exist for this option as buses would be required to move into the middle lane to pass through the roundabout. These would be signal controlled to improve reliability but there is potential for delay associated with both the signalised and unsignalised options. Furthermore, this option is poor for other road users in particular cyclists who would continue to have to manoeuvre through the 3-lane gyratory. For the reasons outlined above, this option is not considered to offer any advantages in relation to bus priority and is therefore not carried forward to the next assessment stage.	Fail
Junction Arrangement Option B: Modified Roundabout (Dual lane) 	This option reduces the gyratory and approaches to two lanes. A bus lane would be provided on approach to the roundabout shared with left turners for the final 35m. While the lane reductions would reduce traffic capacity at the junction, buses would no longer have to merge into the adjacent lane to pass through the junction (a source of delay identified by Dublin Bus) and would be able to pass through the junction from the nearside lane. For the above reasons this option is passed to the next assessment stage.	Pass
Junction Arrangement Option C: Modified Roundabout with Bus Lanes Through the Middle of Gyratory	This option would see bus lanes running through the middle of the roundabout. This would require the Walkinstown Road and Greenhills Road approaches to be upgraded to traffic signals. The gyratory at this location would also need to be signalised. The provision of isolated traffic signals at an otherwise priority controlled junction has the potential to surprise unfamiliar drivers and would compromise the safety of the junction. Buses would need to move to a central lane in advance of the junction in order to pass through the junction. This would also likely be signalised.	Fail

Option	Comments	Pass/Fail
	Given the large number of approaches to the junction, any queuing on the gyratory as a bus is passing through the junction would interfere with traffic moving through the junction from signalised approaches. This option would therefore have a significant impact on traffic. Given the complexity of the existing junction, and that this proposal would further complicate the arrangement and compromise the safety of road users through the provision of isolated traffic signals, this option is not considered to be appropriate.	
Junction Arrangement Option D: Modified Roundabout (Single Lane) 	This option would propose reducing the approaches to the roundabout to a single lane as well as reducing the gyratory to a single lane. To facilitate bus priority, queue relocation system would be in place on the Walkinstown Road and Greenhills Road approaches through the introduction of a signalised bus jump in advance of the junction. This would ensure that buses would get to the stop line uncontended. However, this option would have a significant impact on traffic. Furthermore, it may be more difficult for buses to find a gap owing to the reduced capacity on the roundabout gyratory. For these reasons this option is not considered any further.	Fail
Junction Arrangement Option E: Modified Roundabout (Single Lane Approaches except on CBC, Dual Lane Circulating Carriageway) 	This option would propose reducing the approaches to the roundabout to a single lane on all approaches except the Greenhills Road and Walkinstown Road approaches. This option would maintain a dual lane gyratory. This option would have a significant impact on traffic. However, restricting access to the roundabout but providing two lanes in the gyratory would make it easier for buses to enter into the gyratory. For this reason, this option is progressed to the next assessment stage.	Pass

Option	Comments	Pass/Fail
Junction Arrangement Option F: Traffic Signals (6-arm Single Junction) 	This option is likely to have a substantial impact on traffic as each arm would require its own signal stage resulting in a seven stage signal plan (6 traffic stages servicing each arm and 1 pedestrian stage). Given the large number of stages, buses would likely have to wait longer for a green signal and there would therefore result in greater delays to buses. As such, this junction arrangement is not considered further.	Fail
Junction Arrangement Option G: Traffic Signals (Double Junction) 	This option is likely to have a substantial impact on traffic as each arm would require its own signal stage resulting in a five stage signal plan (4 traffic stages servicing each arm and 1 pedestrian stage). However, this option is considered to be potentially feasible, in conjunction with other traffic management measures which would allow more green time to be allocated to bus movements. A number of double junction arrangements may be possible, depending on traffic management measures which are applied.	Pass
Junction Arrangement Option H: Traffic Signals (Single Junction with Circulating Loop) 	This option introduces a complicated junction arrangement with convoluted routes for cyclists and pedestrians. Limited stacking capacity on the roundabout is likely to result in congestion within the junction that would potentially impede the progress of buses through the junction. It is considered that this option has little obvious benefit over other signalised options for buses. As such this junction arrangement is not considered any further.	Fail

Option	Comments	Pass/Fail
Junction Arrangement Option I: Signalised Turbo Roundabout 	This option introduces a unique junction arrangement (there are no turbo roundabouts in Ireland) which may lead to driver confusion. Limited stacking capacity on the roundabout is likely to result in congestion within the junction that would potentially impede the progress of buses through the junction. Furthermore, the junction layout is poor for both pedestrians and cyclists. It is considered that this option has little obvious benefit over other options for buses. For the reasons outlined above this junction arrangement is not considered further.	Fail
Junction Arrangement Option J: Traffic Signal (Treble Signalised Junction) 	This option, would create 3 signalised junctions in close proximity limiting the stacking capacity between each set of signals. As such the three junctions will be required to work in combination with each other, effectively as a single large junction with a small amount of stacking space in between. This arrangement is unlikely to improve the flow of buses through the junction without significantly impacting on general traffic. For the reasons outlined above this junction arrangement is not considered further. However, variations of this arrangement may be considered in combination with traffic management measures to provide a single or double signalised junction with other approaches unsignalised e.g. restricting access to Cromwellsfort Road to left in/left out.	Fail
Junction Arrangement Option K: Grade Separated Junction between Greenhills Road and Walkinstown Road	While this option would provide unimpeded priority for buses through the junction, this option would involve significant works at high cost. However, as the flyover would only remove approximately 15% of traffic from the roundabout, there would be little benefit to other users at the junction.	Fail

Option	Comments	Pass/Fail
	Furthermore, the required ramps on approach to and departure from the junction would likely extend up to 100m beyond the junction and result in impacts on local residents such as access to their properties and visual impact among others. For the reasons outlined above this junction arrangement is not considered further.	
Junction Arrangement Option L: Traffic Signal Controlled 5-arm Junction 	This option is likely to have a substantial impact on traffic even if traffic management measures are implemented as each arm would require its own signal stage. Furthermore this option is poor for pedestrians and cyclists. For the reasons outlined above this junction arrangement is not considered further.	Fail
Junction Arrangement Option M: Traffic Signal Controlled 4-arm Junction with mini-roundabout 	This option includes a roundabout which has the potential to introduce inconsistent delays to buses through the junction. Furthermore, the pedestrian and cycle activity in the area is impacted by the mini-roundabout. For the reasons outlined above this junction arrangement is not considered further.	Fail

As can be seen in **Table 6.8** following the Stage 1 sift, two junction arrangements are passed to the next stage for consideration. These are developed further in the next section in conjunction with the traffic management measures identified earlier in section 6.3.4.1.

6.3.5 Stage 2 Assessment

Combined scheme options arising from the traffic management (Section 6.3.4.1) and junction arrangements (section 6.3.4.2) are presented in the following sections.

6.3.5.1 Scheme Option 1: Modified Roundabout Dual Lane (Preferred Option from Previous Study)

Walkinstown Roundabout Scheme Option 1 is presented in **Figure 6.21** and described in the following text.

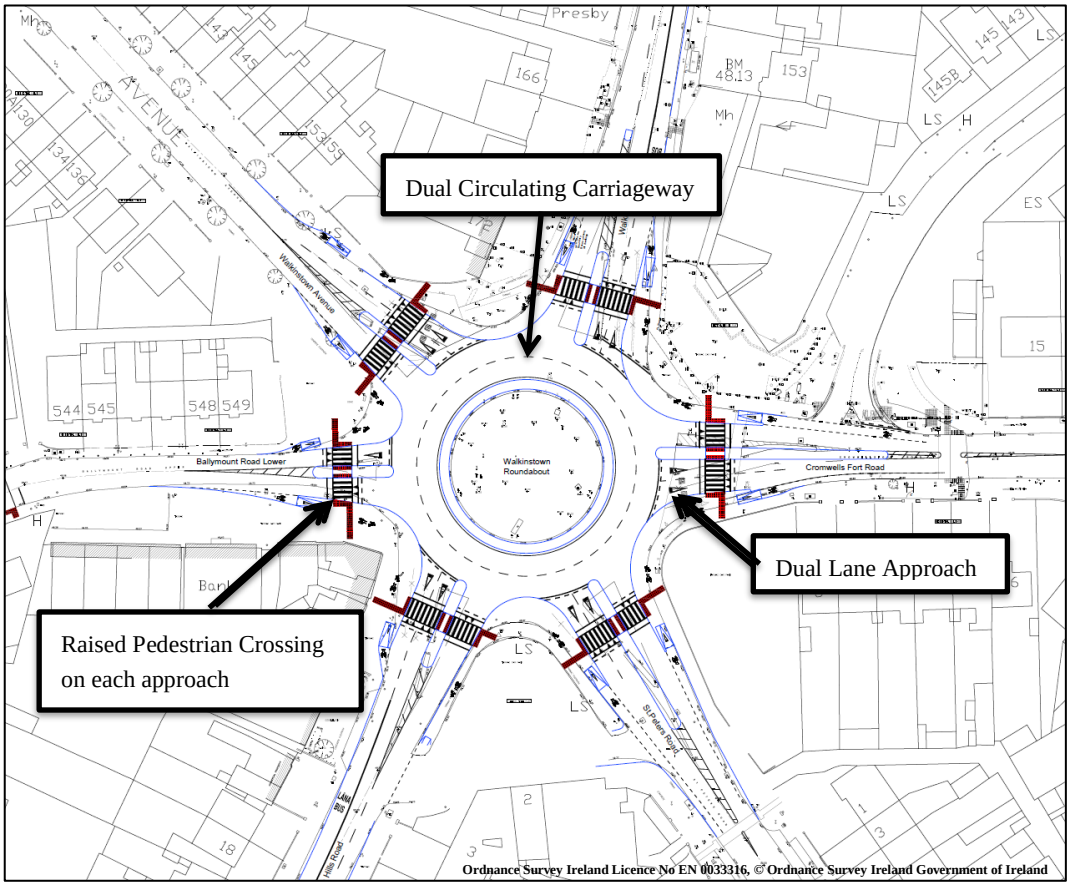


Figure 6.21: Walkinstown Roundabout Scheme Option 1

Option 1 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 two lanes on each approach to the roundabout;
- 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 Walkinstown Road and Greenhills Road to approximately 35m in advance of the stop line.

6.3.5.2 Scheme Option 2: Modified Roundabout Dual Lane, Ballymount Road Local Access Only

Walkinstown Roundabout Scheme Option 2 is presented in **Figure 6.22** and described in the following text.

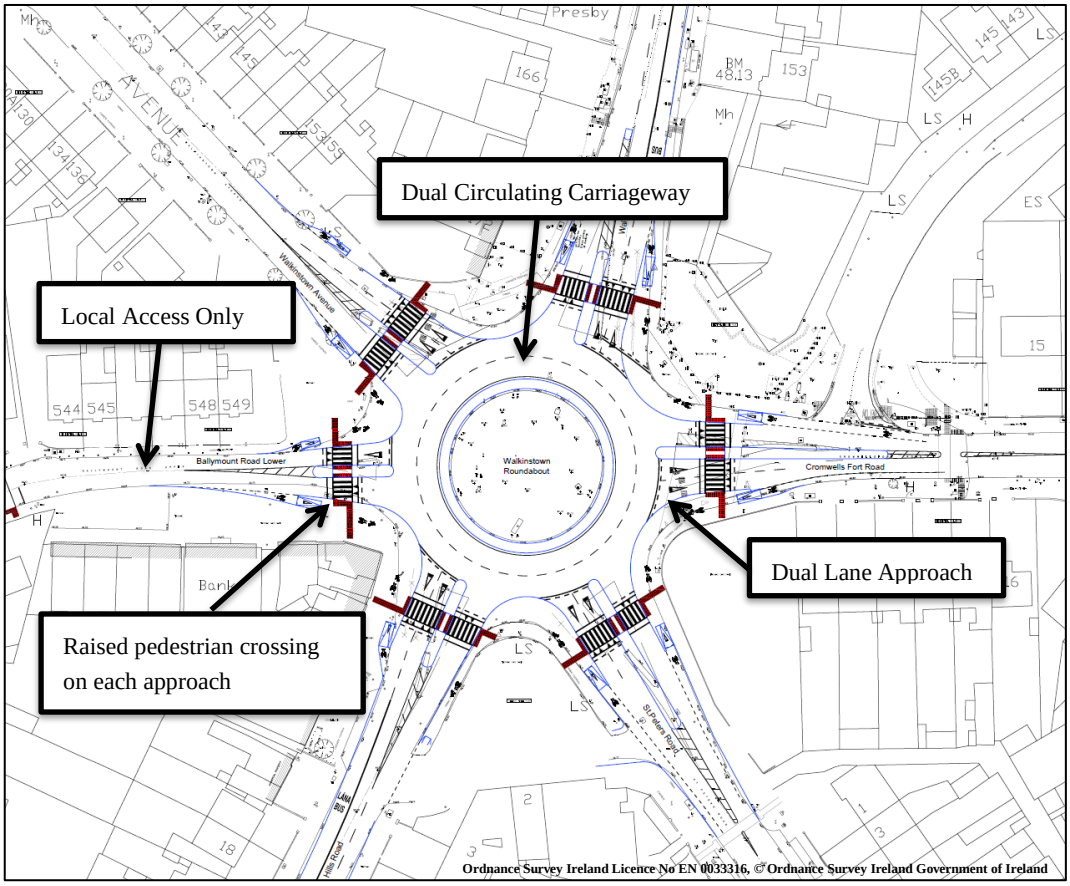


Figure 6.22: Walkinstown Roundabout Scheme Option 2

Option 2 would require each of the same changes noted to facilitate Option 1. In addition Option 2 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.

6.3.5.3 Scheme Option 3: Modified Roundabout Single Lane (except Greenhills Road and Walkinstown Road), Dual Lane Gyratory

Walkinstown Roundabout Scheme Option 3 is presented in **Figure 6.23** and described in the following text.

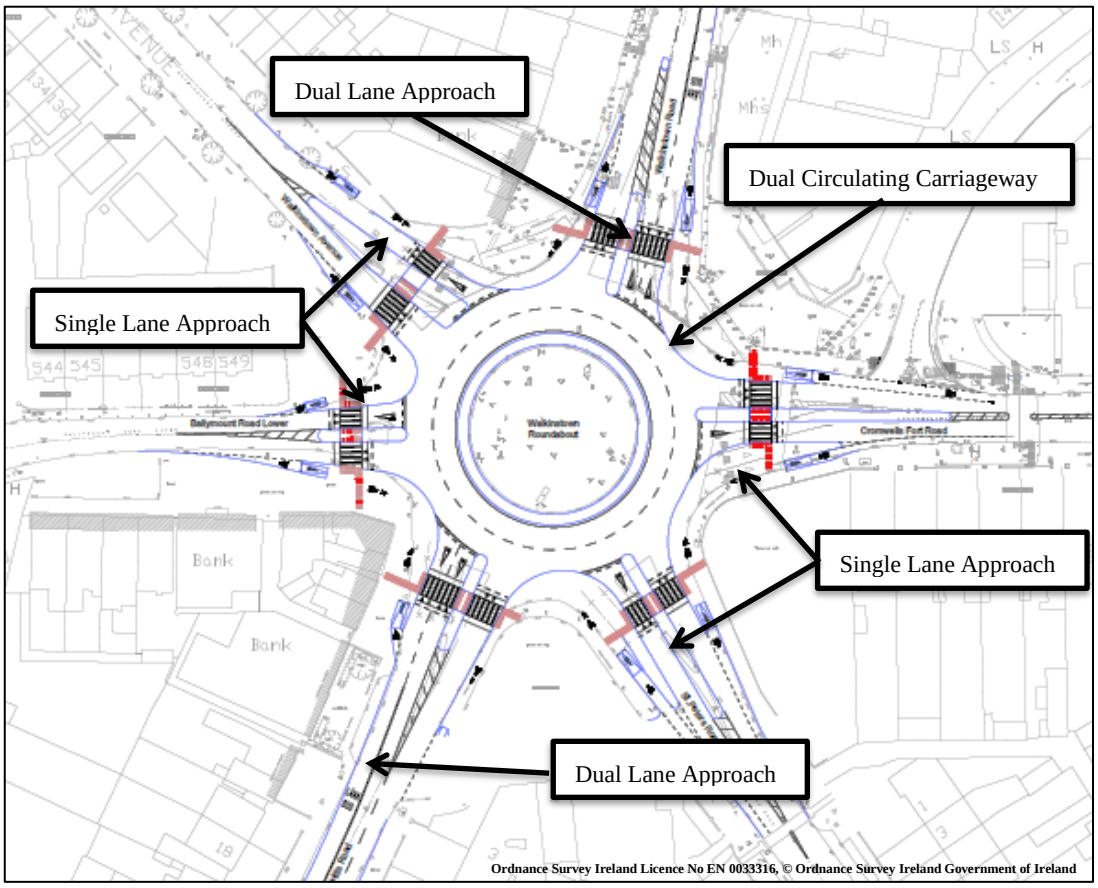


Figure 6.23: Walkinstown Roundabout Scheme Option 3

Option 3 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 Greenhills Road and 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 Walkinstown Road and Greenhills Road to approximately 35m in advance of the stop line.

6.3.5.4 Scheme Option 4: 4-arm Signalised Junction, Ballymount Local Access Only, Cromwellsfort Road LILO

Walkinstown Roundabout Scheme Option 4 is presented in **Figure 6.24** and described in the following text.

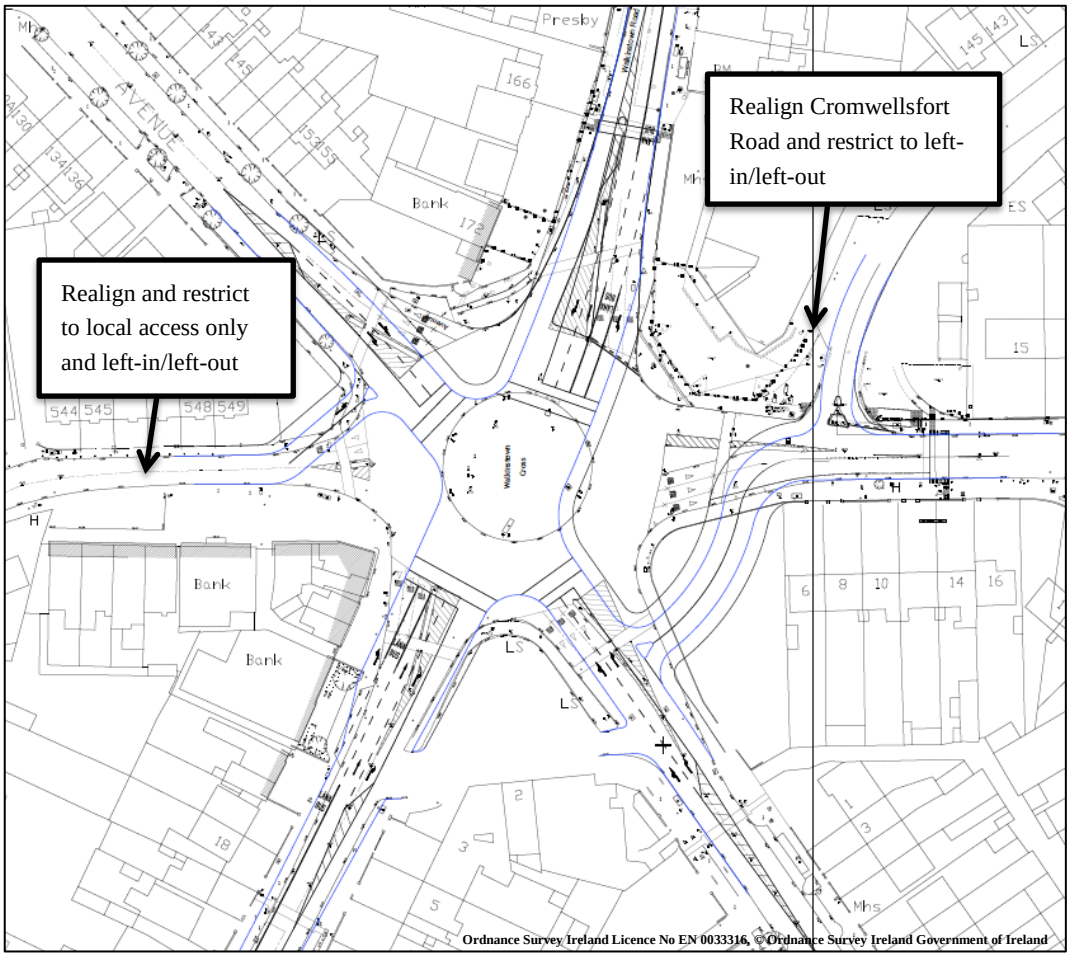


Figure 6.24: Walkinstown Roundabout Scheme Option 4

Option 4 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 5 stage plan (4 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 Walkinstown Road and 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.

6.3.5.5 Scheme Option 5: Double Signalised Junction North/South with Ballymount Road Local Access Only

Walkinstown Roundabout Scheme Option 5 is presented in **Figure 6.25** and described in the following text.

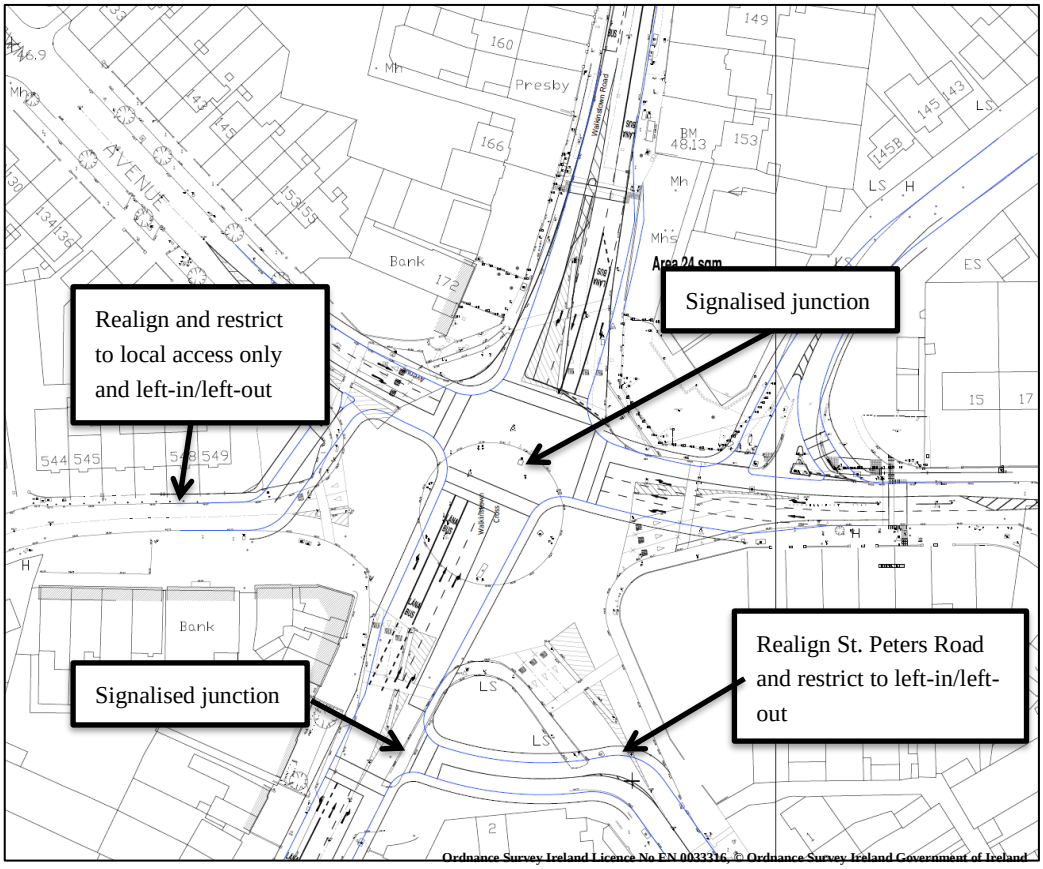


Figure 6.25: Walkinstown Roundabout Scheme Option 5

Option 5 would propose the creation of 2 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 5 stage plan (4 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 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; and
- The realignment of St. Peter's Road to join Greenhills Road.

6.3.5.6 Scheme Option 6: Double Signalised Junction East/West

Walkinstown Roundabout Scheme Option 6 is presented in **Figure 6.26** and described in the following text.

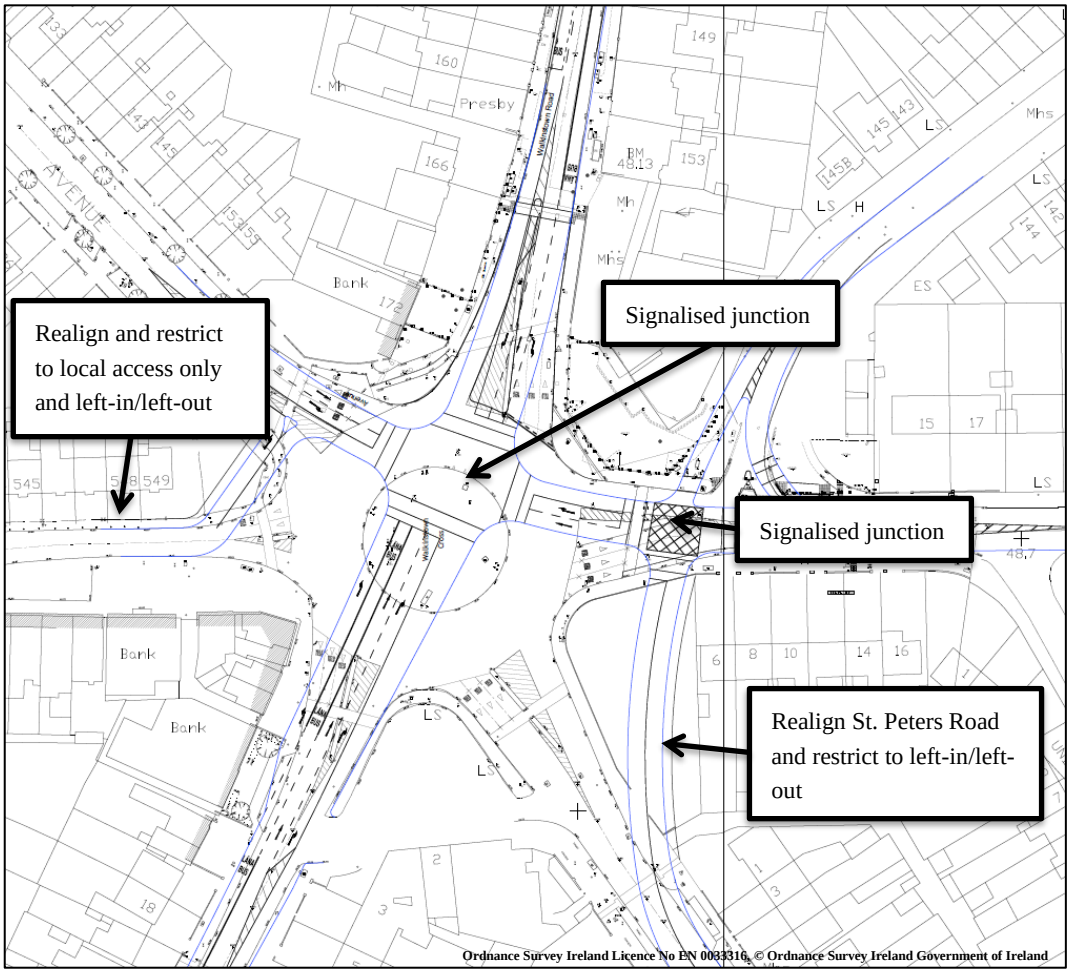


Figure 6.26: Walkinstown Roundabout Scheme Option 6

Option 6 would propose the creation of 2 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 5 stage plan (4 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 Walkinstown Road and 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; and
- The realignment of St. Peter's Road to join Cromwellsfort Road.

6.3.6 Multi Criteria Assessment

Details of the Stage 2 options assessment undertaken for the Walkinstown Roundabout are presented in **Appendix A4 and A5**.

The relative ranking of route options against the scheme assessment sub-criteria is summarised in **Table 6.9** and **Table 6.10**.

Table 6.9: Walkinstown Roundabout Options Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Economy	Capital Cost						
	Transport Reliability and Quality of Service						
Integration	Transport Network Integration						
	Cycling Integration						
Safety	Road Safety						
Environment	Landscape and Visual						
	Land Use Character						

In terms of Economy, options 1, 2 and 3 are significantly cheaper than options 4, 5 and 6, largely because they do not require any land-take. However, Options 4, 5 and 6 offer the potential for better journey time reliability and as such rank higher.

In terms of Integration, Option 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. Option 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, Options 1, 2 and 3 have less impact on existing land use compared to the signalised junction arrangements, which require land take to facilitate the required layouts.

A summary of the assessment and relative ranking of route options against the four main assessment criteria is presented in **Table 6.10**.

Table 6.10: Walkinstown Roundabout Options Assessment Summary (Main Criteria)

Assessment Criteria	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Economy						
Integration						
Safety						
Environment						

As can be seen in **Table 6.9** and **Table 6.10**, there is relatively little to distinguish between the junction arrangement options explored. While the signalised junction arrangement options appear to have a greater impact, particularly on traffic movements, further assessment is required at the next design stage to fully understand the impact of traffic diversions and signalisation, as these changes would likely offer better reliability for buses passing through the junction.

However, on the basis of this assessment, **Option 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 3 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.

However, as noted earlier, signalisation has potential to improve bus priority and journey time reliability through the junction but would require additional assessment at the next design stage to confirm whether the impact of diverting traffic away from the junction would be manageable. Of the signalised junction arrangements, **Option 5** (Double Signalised Junction North-South) is considered to offer the most benefits for the following reasons:

- It has potential to provide good journey time reliability for buses;
- It provides good separation between the two signalised junctions to allow the junctions to work together to maximise capacity for all users (would provide most capacity of all signalised options explored);
- It provides safe signal controlled crossing points for pedestrians; and
- It would facilitate safe movement of cyclists through the junction.

6.4 Stage 2: Walkinstown to Crumlin Route Options Assessment

North of Walkinstown Roundabout, two core route options in this area were taken forward from the Stage 1 sift. In addition to these, a route option which utilised both core route options (one for inbound and one for outbound) was considered:

- WC1- A route option via Walkinstown Road and Drimnagh Road;
- WC2 - A route option via Bunting Road;
- WC3 - Inbound routing via Walkinstown Road and Drimnagh Road and outbound via Bunting Road.

A fourth option which would utilise Walkinstown Road and Drimnagh Road outbound and Bunting Road inbound 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 loop 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 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. shared with bus lane, cycle facilities rerouted 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 etc.).

It is important to note that in some instances, the final scheme option will be a combination of some or all of the above based on the multi-criteria assessment undertaken.

6.4.1 Route Option WC1: Walkinstown Road and Drimnagh Road

Route Option WC1 is presented in **Figure 6.27** and described in the following text.

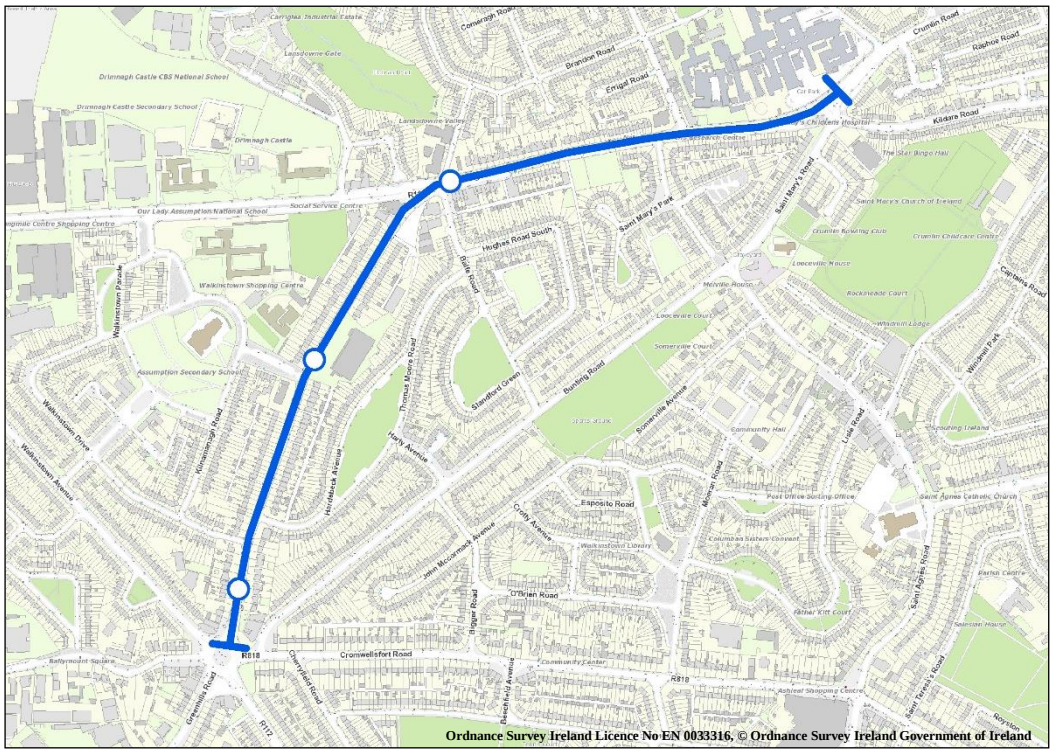


Figure 6.27: Route Option WC1

Inbound: Route option WC1 would run along Walkinstown Road between Walkinstown Roundabout and Drimnagh Road. The route would then turn onto Drimnagh Road. This route option ends at the Drimnagh Road/Kildare Road junction.

Outbound: The outbound routing would follow the same route as the inbound routing.

Stops: A total of 3 stops would likely be provided along this route option.

6.4.1.1 Indicative Scheme Designs

WC1a – Bus Lanes and Raised Adjacent Cycle Lanes in Each Direction

Route Sections:

The indicative scheme design for this option is presented in **Figure 6.28**. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

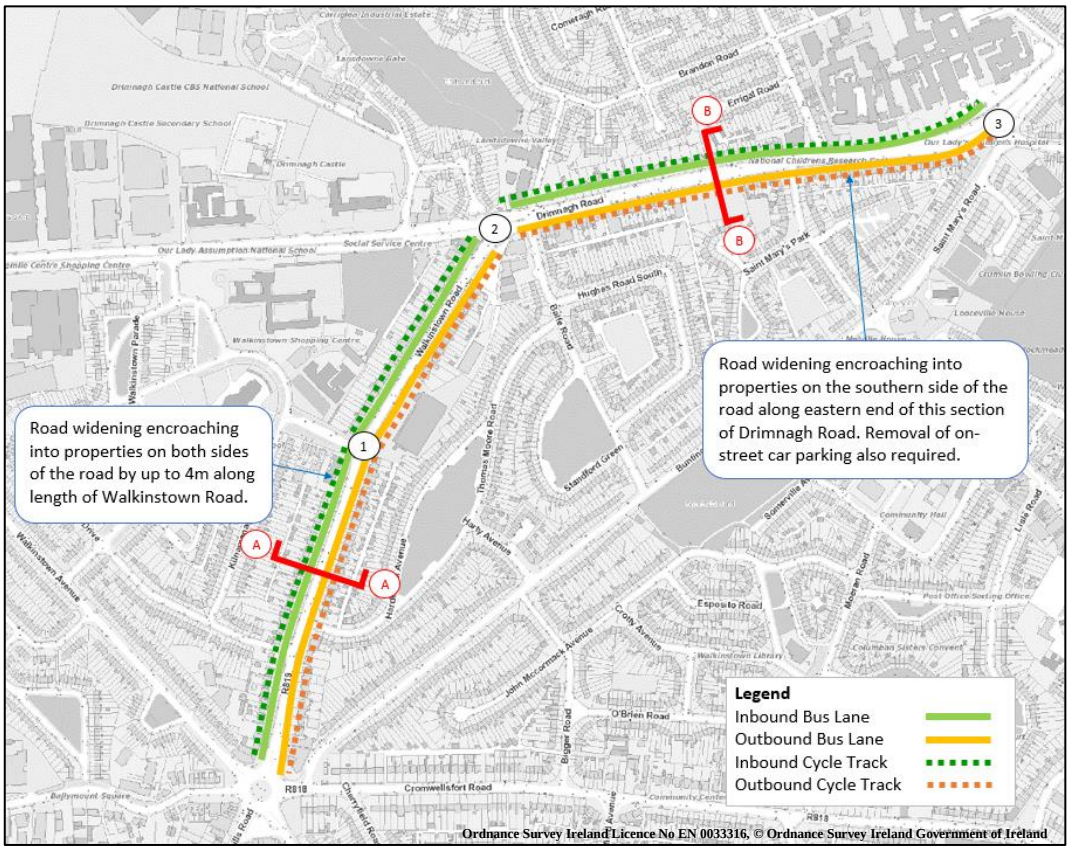


Figure 6.28: WC1a Indicative Scheme Design

Walkinstown Road currently caters for a single lane of traffic in each direction for the majority of its length and is fronted by predominantly residential properties. There is currently a 170m section of inbound bus lane on approach to the Walkinstown Road/Drimnagh Road junction. On the approach to Walkinstown Roundabout there is a 60m section of outbound bus lane.

Option WC1a would see widening along the length of 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's worth noting that approximately 20 car parking spaces associated with Supervalu would be removed to facilitate this option. A cross-section on Walkinstown Road is illustrated in **Figure 6.29**.

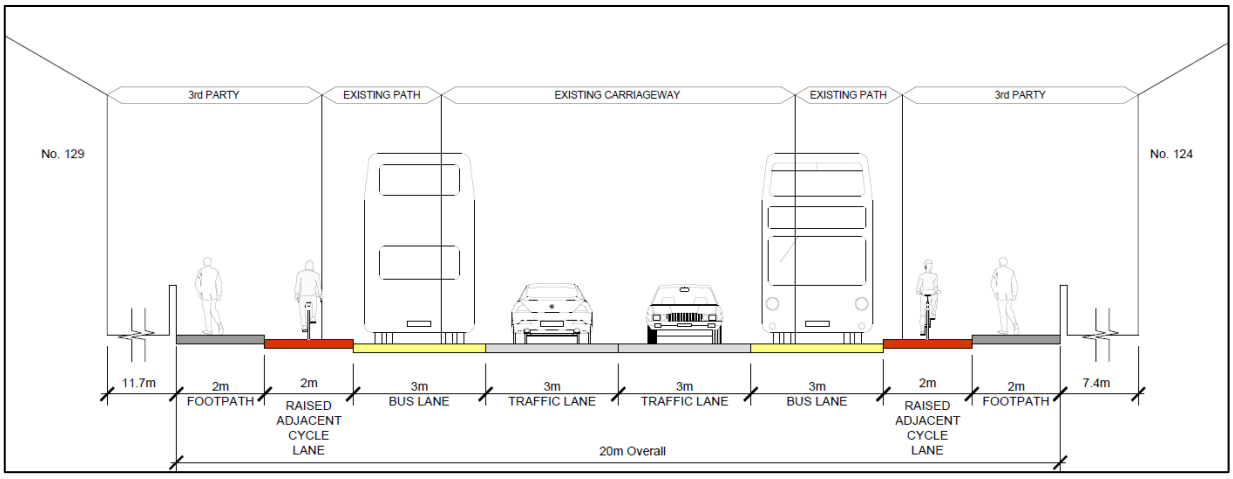


Figure 6.29: WC1a Cross-Section A-A: Walkinstown Road

Along Drimnagh Road, there are currently bus lanes in each direction and these would be maintained under this proposal. To provide dedicated cycle lanes along 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. A cross-section on Drimnagh Road for this proposal is illustrated in **Figure 6.30**.

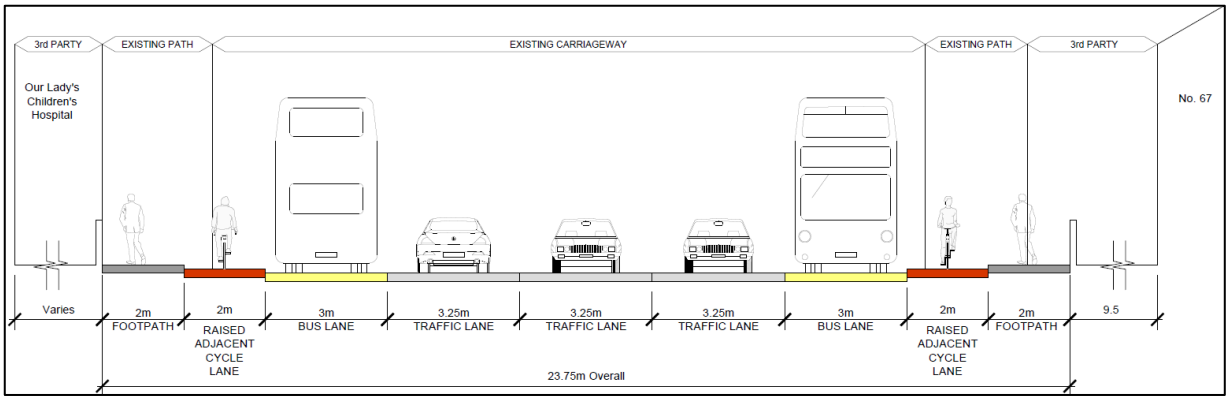


Figure 6.30: WC1a Cross-Section B-B: Drimnagh Road

Junctions:

There are 3 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 6.28** and discussed below.

1. **Walkinstown Road/Kilnamanagh Road:** This junction would need to be upgraded to accommodate bus lanes and cycle lanes through the junction. There is also a requirement to relocate/provide new signal equipment.

2. **Walkinstown Road/Drimnagh Road:** This junction currently has bus lanes on the Walkinstown Road and Drimnagh Road approaches to the junction.

Junction would need to be upgraded to accommodate cyclists through the junction; and

3. **Drimnagh Road/Kildare Road**: There are currently bus lanes on both the eastern and western approaches to the junction. Junction would need to be upgraded to accommodate cyclists through the junction.

WC1b – Bus Lanes in Each Direction

Route Sections

The indicative scheme design for this option is presented in **Figure 6.31**. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

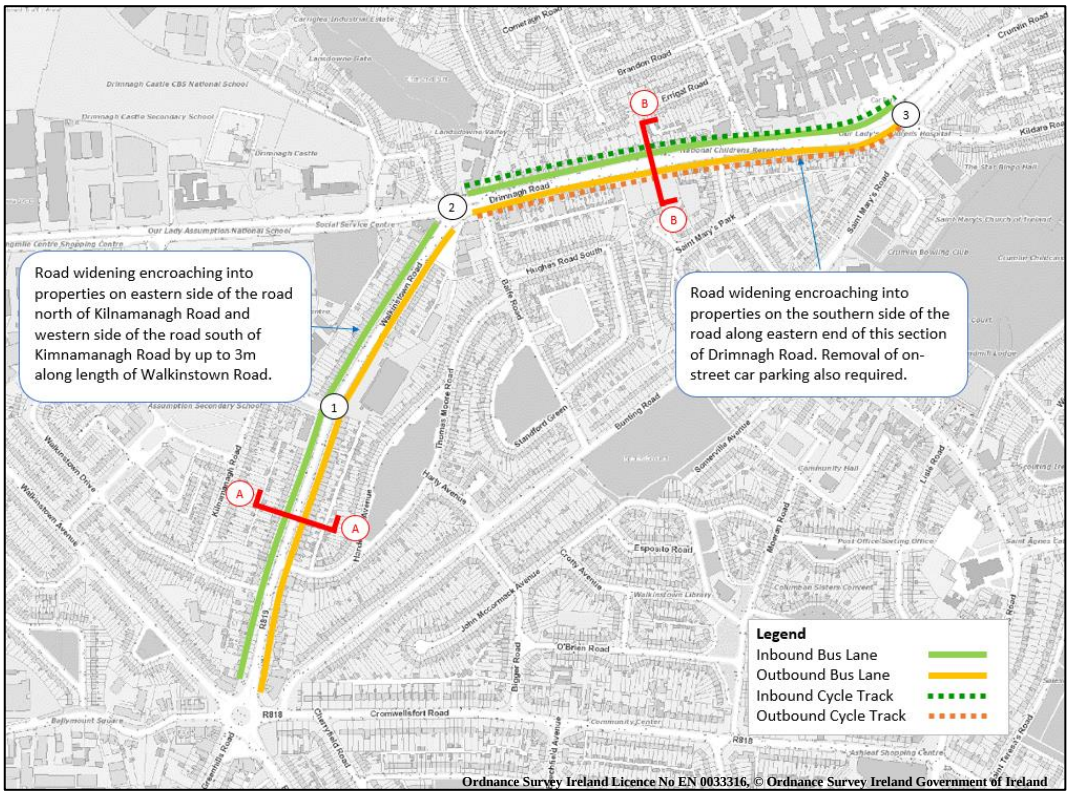


Figure 6.31: WC1b Indicative Scheme Design

Option WC1b proposes widening 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's worth noting that approximately 20 car parking spaces associated with Supervalu would be removed to facilitate this option.

A cross-section on Walkinstown Road is illustrated in **Figure 6.32**.

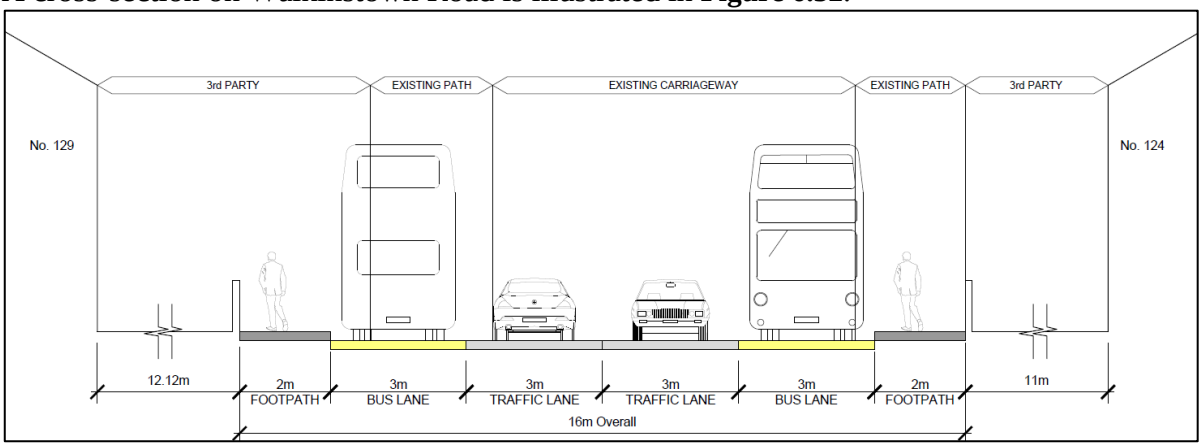


Figure 6.32: WC1b Cross-Section A-A: Walkinstown Road

Along 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 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. A cross-section on Drimnagh Road for this proposal is illustrated in **Figure 6.30**.

For this option, cyclists along Walkinstown Road (which is not identified as a cycle route in the GDA Cycle Network Plan) would share the bus lane with other traffic.

Junctions:

There are 3 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 6.31** and discussed below.

1. **Walkinstown Road/Kilnamanagh Road:** This junction would need to be upgraded to accommodate bus lanes through the junction. There would also be a requirement to relocate/provide new signal equipment;

2. **Walkinstown Road/Drimnagh Road:** This junction currently has bus lanes on the Walkinstown Road and Drimnagh Road approaches to the junction. There is limited potential to improve the junction layout, and as such only minor improvements are likely; and

3. **Drimnagh Road/Kildare Road**: There are currently bus lanes on both the eastern and western approaches to the junction, and as such only minor changes to this junction are likely.

WC1c – Partial Bus Lanes in Each Direction

Route Sections:

Figure 6.33 illustrates the indicative scheme design for this route option.

The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

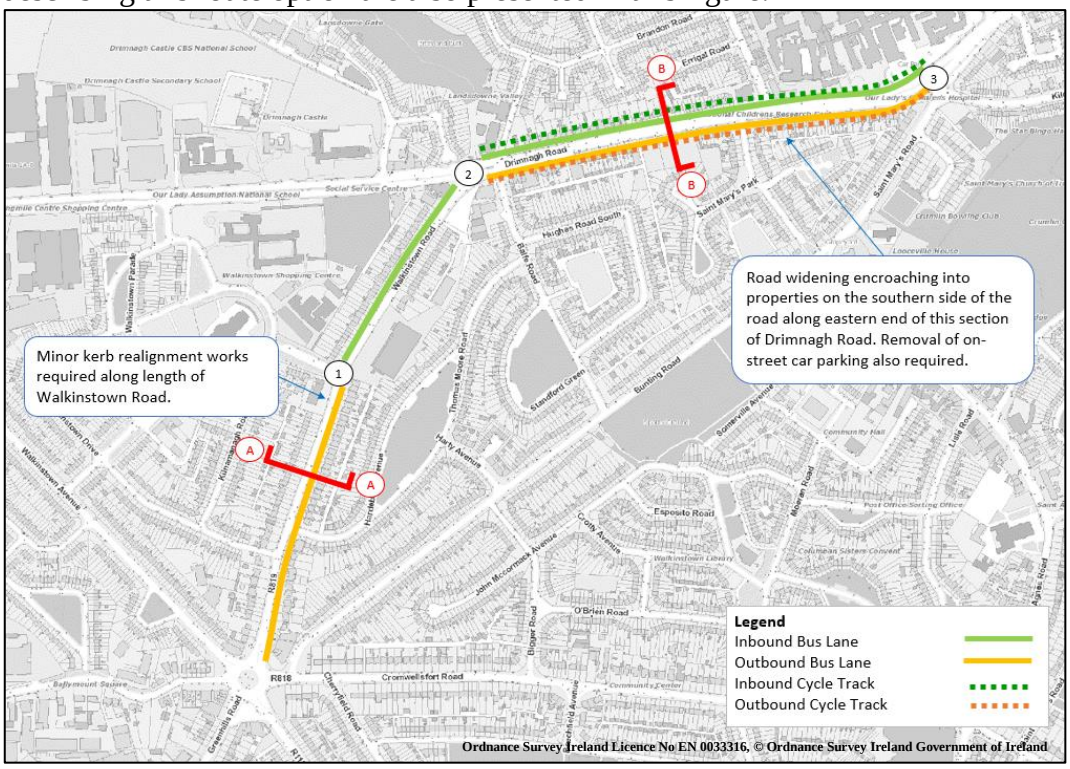


Figure 6.33: WC1c Indicative Scheme Design

It is possible to provide one additional lane along this section of 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 lane 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 Kilnamanagh 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.

A cross-section for Walkinstown Road for this option is illustrated in **Figure 6.34**.

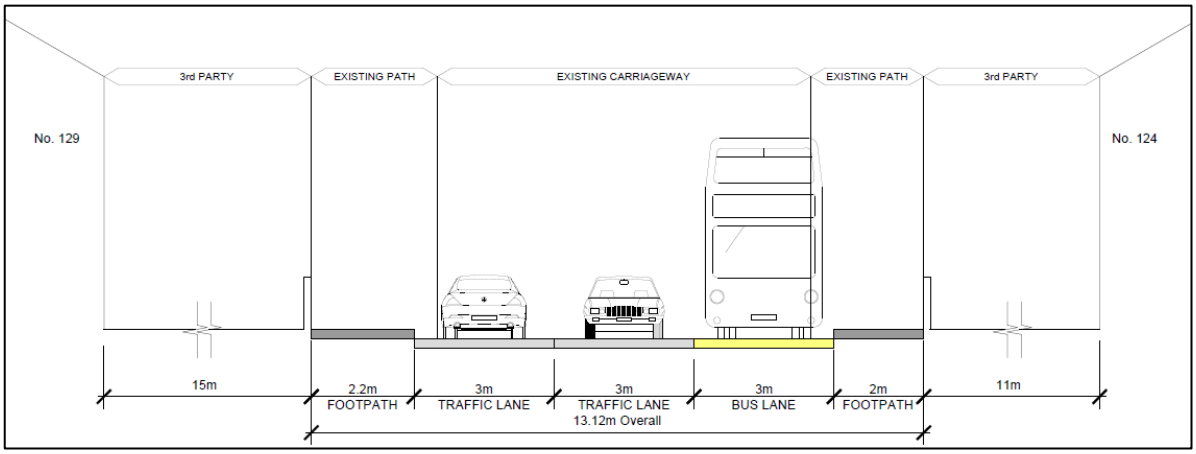


Figure 6.34: WC1c Cross-Section A-A: Walkinstown Road

Along 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 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. A cross-section on Drimnagh Road for this proposal is illustrated in **Figure 6.30**.

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Inbound bus lane along Walkinstown Road between Kilnamanagh Road and Drimnagh Road;
- Outbound bus lane along Walkinstown Road between Kilnamanagh Road and Walkinstown Roundabout;
- Inbound and outbound bus lanes and raised adjacent cycle lanes along Drimnagh Road; and
- Inbound and outbound advisory cycle lanes along Bunting Road.

There are 3 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 6.33** and discussed below.

1. **Walkinstown Road/Kilnamanagh Road:** This junction would need to be upgraded to accommodate bus lanes on approach to the junction. There is also a possible requirement to relocate/provide new signal equipment.
2. **Walkinstown Road/Drimnagh Road:** This junction currently has bus lanes on the Walkinstown Road and Drimnagh Road approaches to the junction. There is limited potential to improve the junction layout and as such only minor improvements are likely; and
3. **Walkinstown Road/Kildare Road**: There are currently bus lanes on both the eastern and western approaches to the junction and as such only minor changes to this junction are likely.

WC1d - Partial Bus Lanes in Each Direction (alternative)

Route Sections:

Figure 6.35 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

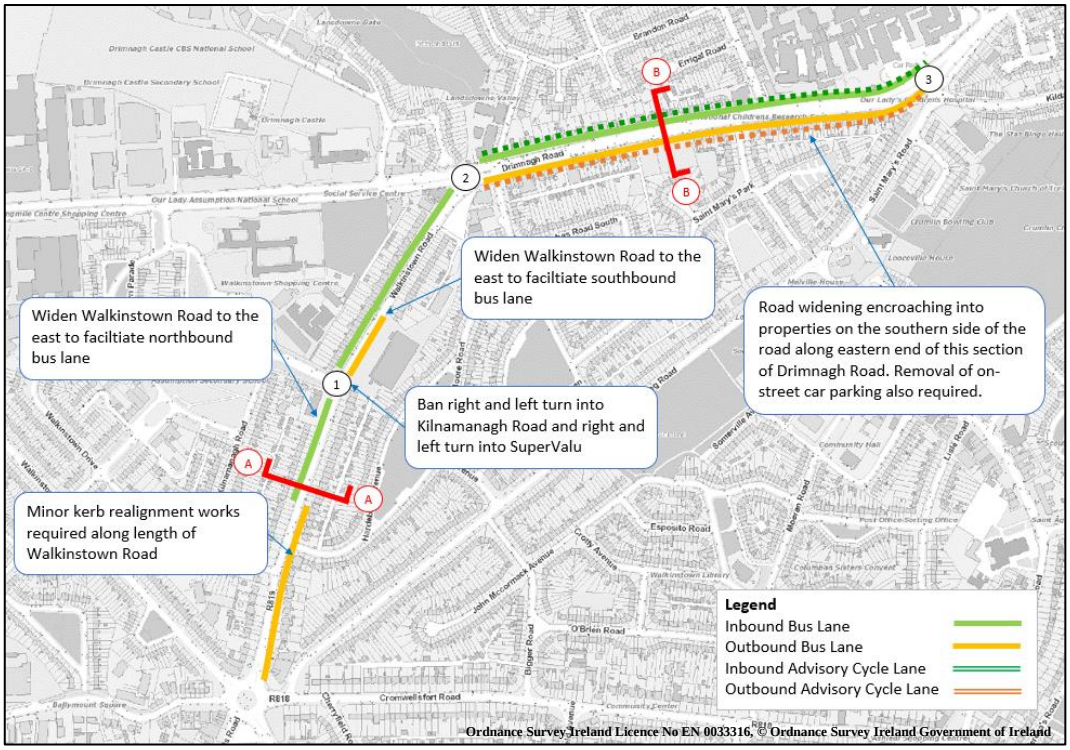


Figure 6.35: WC1d Indicative Scheme Design

This option offers a slight variation to option 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/Kilnamanagh Road junction and the Walkinstown Road/Drimnagh Road junction. This option would therefore mitigate against queues which form at the Walkinstown Road/Kilnamanagh Road junction and improve journey time reliability through this junction. To facilitate bus lanes through the Kilnamanagh Road junction it would be necessary to take some land from a number of properties along the eastern side of 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 Kilnamanagh Road and SuperValu would be banned thereby facilitating bus lanes to the stopline. Traffic currently turning left into Kilnamanagh 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 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 Walkinstown Road.

Along 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 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. A cross-section on Drimnagh Road for this proposal is illustrated in **Figure 6.30**.

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Inbound bus lane along Walkinstown Road from approximately 150m south of the Kilnamanagh Road junction to the Drimnagh Road junction;
- Outbound bus lane along Walkinstown Road on approach to Walkinstown Roundabout (approximately 270m);
- Outbound bus lane along Walkinstown Road on approach to the Walkinstown Road/Kilnamanagh Road junction (approximately 150m);
- Inbound and outbound bus lanes and raised adjacent cycle lanes along Drimnagh Road; and
- Inbound and outbound advisory cycle lanes along Bunting Road.

There are 3 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 6.35** and discussed below.

1. **Walkinstown Road/Kilnamanagh Road:** This junction would need to be upgraded to accommodate bus lanes on approach to the junction. There is also a possible requirement to relocate/provide new signal equipment.

2. **Walkinstown Road/Drimnagh Road:** This junction currently has bus lanes on the Walkinstown Road and Drimnagh Road approaches to the junction. There is limited potential to improve the junction layout, and as such only minor improvements are likely; and

3. **Walkinstown Road/Kildare Road**: There are currently bus lanes on both the eastern and western approaches to the junction, and as such only minor changes to this junction are likely.

6.4.2 Route Option WC2: Bunting Road/St. Mary's Road

Route Option WC2 is presented in **Figure 6.36** and described in the following text.

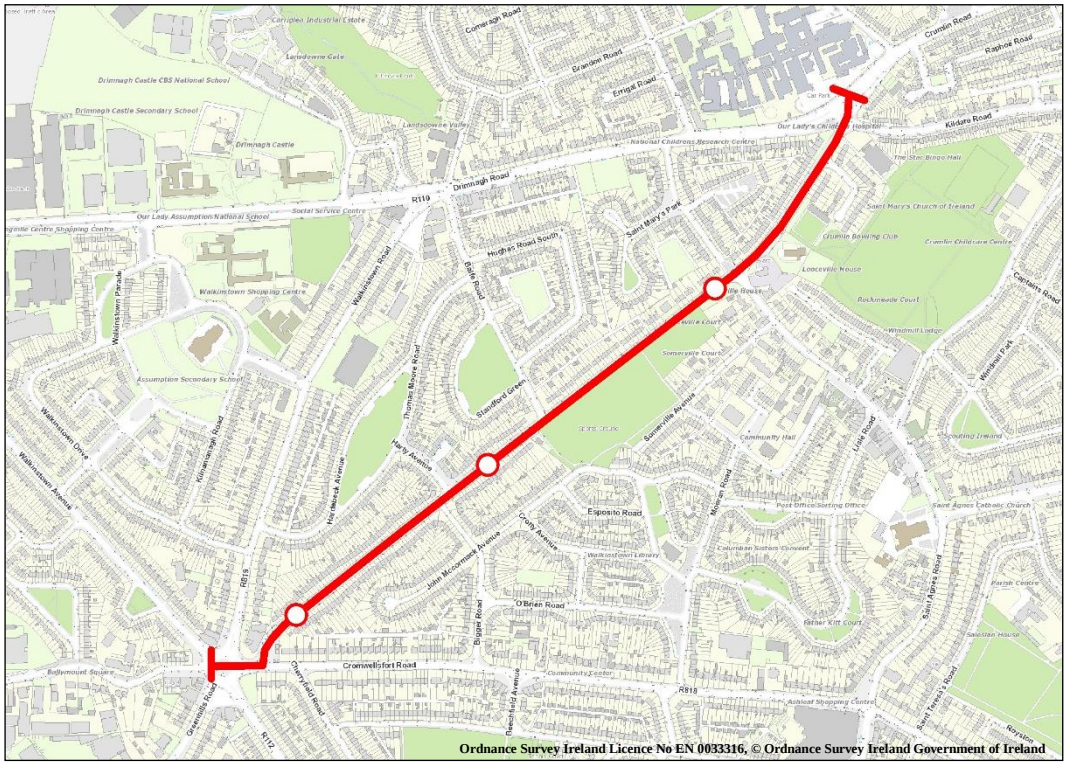


Figure 6.36: Route Option WC2

Inbound: 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 Drimnagh Road/Kildare Road junction

Outbound: The outbound routing would follow the same route as the inbound routing.

Stops: A total of 3 stops would likely be provided along this route option.

6.4.2.1 Indicative Scheme Designs

WC2a – Bus Lanes and Raised Adjacent Cycle Lanes in Each Direction

Figure 6.37 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

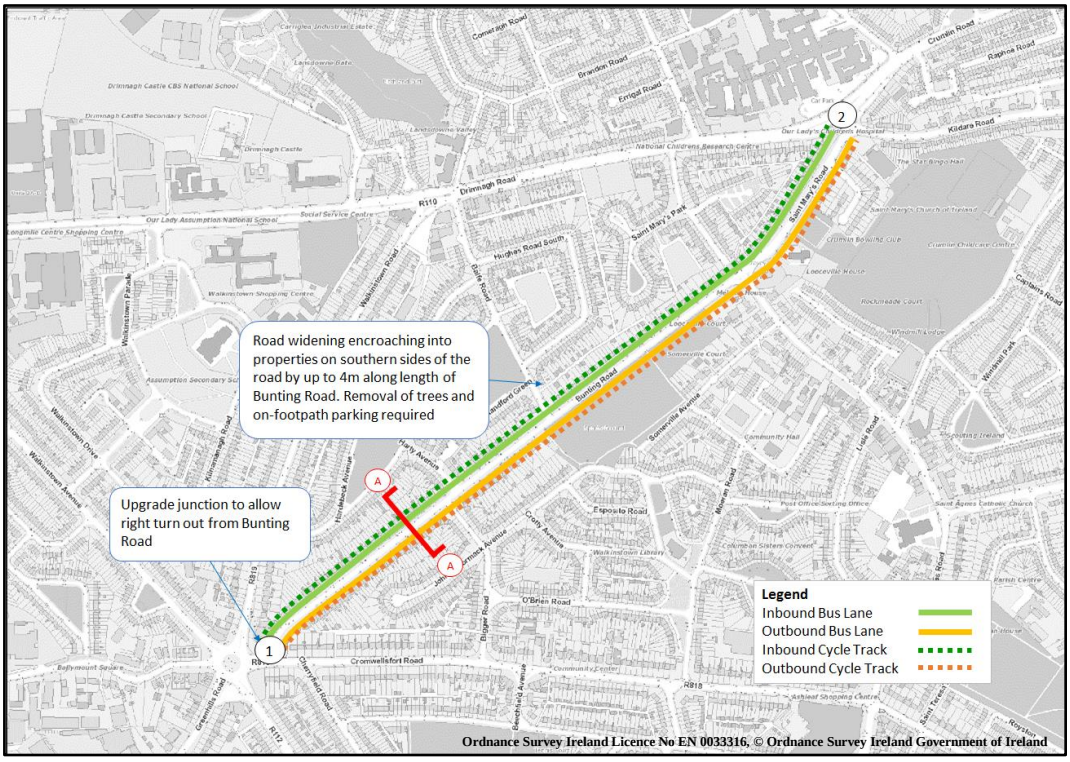


Figure 6.37: WC2a Indicative Scheme Design

Bunting Road/St. Mary's Road currently accommodates a single lane of traffic and an on road advisory cycle lane in each direction for most of its length and typically consists of a 7-8m carriageway with a wide footpath on each side of the road. The wide footpath is observed to be used for car parking by local residents. Additionally, the road is lined by mature trees on each side of the road for much of its length.

Option WC2a 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. A cross-section on Bunting Road for this option is illustrated in **Figure 6.38**.

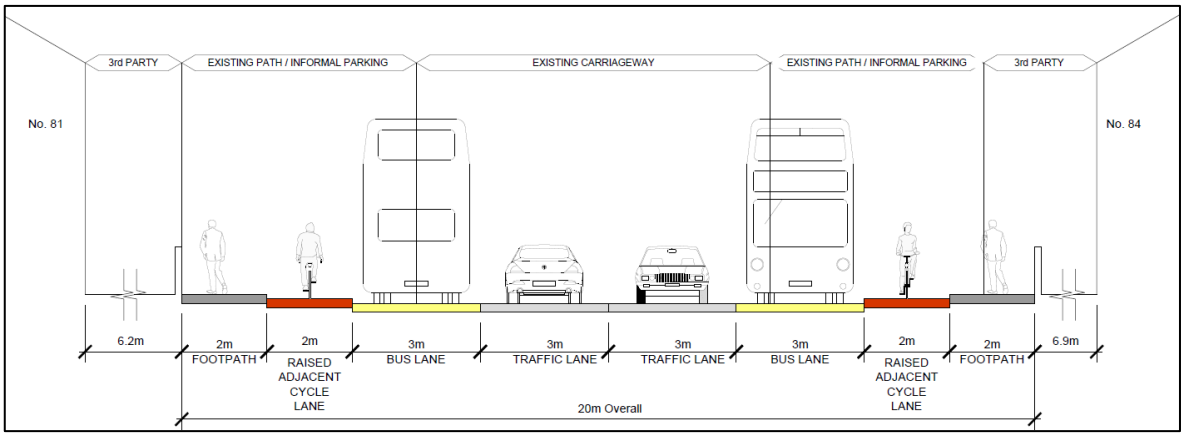


Figure 6.38: WC2a Cross-Section A-A: Bunting Road

Junctions:

There are 2 junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 6.37** and discussed below.

1. **Cromwell's Fort Road/Bunting Road:** This junction is currently a left-in/left-out junction. To facilitate right turning buses from Bunting Road, it is necessary to upgrade this junction to traffic signals, with right turn movements from Bunting Road allowed for buses only; and
2. **St. Marys Road/Drimnagh Road:** It would be necessary to widen the St. Marys Road approach to the junction to provide a bus lane. It will also be necessary to relocate traffic signal equipment on this approach. A bus lane is currently provided on the Crumlin Road approach, and as such only minor adjustments would be required.

WC2b - Bus Lanes in Each Direction, Raised Adjacent Cycle Lanes on Walkinstown Road and Drimnagh Road

Figure 6.39 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced to in subsequent sections describing this route option are also presented in this figure.

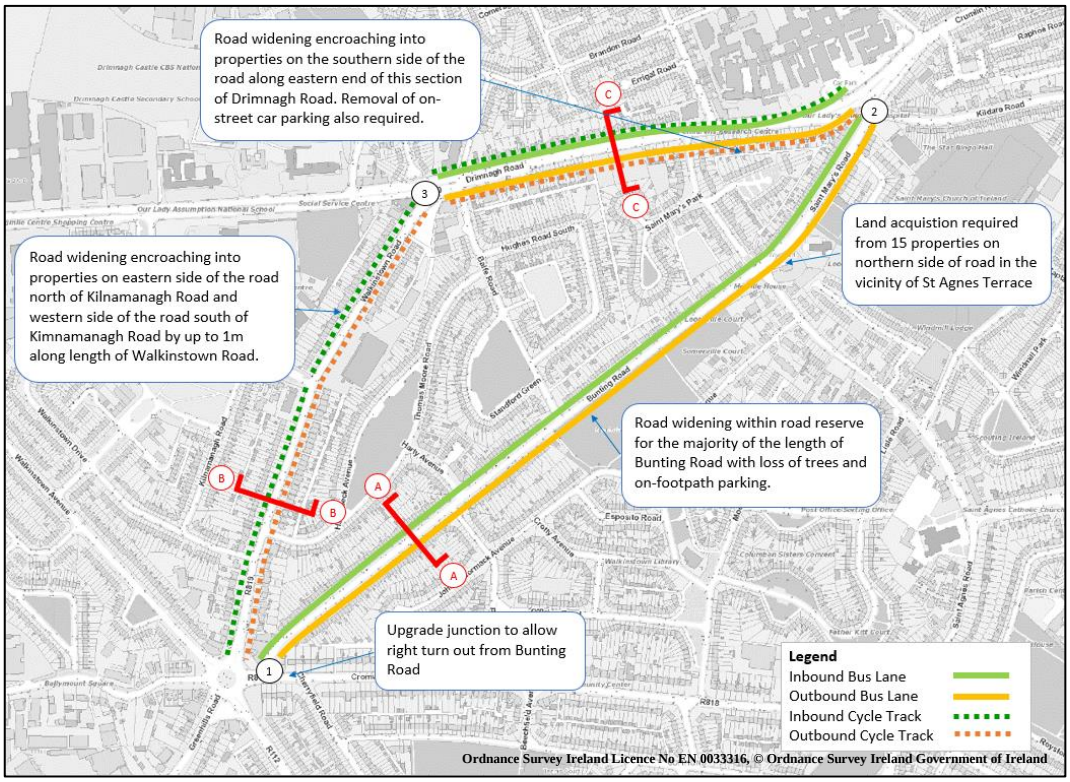


Figure 6.39: WC2b Indicative Scheme Design

Option WC2b 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. A cross-section on Bunting Road for this option is illustrated in **Figure 6.40**.

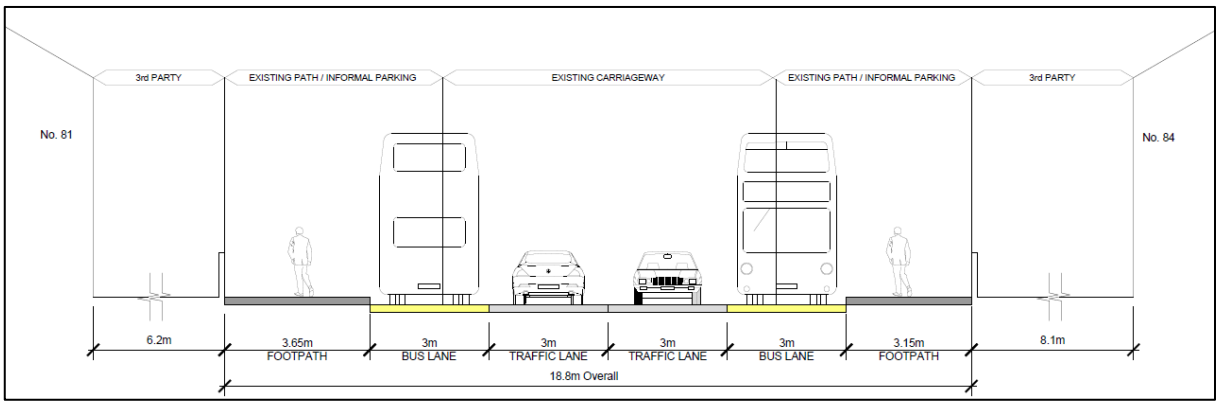


Figure 6.40: WC2b Cross-Section A-A: Bunting Road

This option proposes rerouting Secondary Cycle Route 8A from Bunting Road onto Walkinstown Road and Drimnagh Road. To facilitate the raised adjacent cycle lanes it would be necessary to widen 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.

A cross-section on Walkinstown Road for this option is illustrated in **Figure 6.41**.

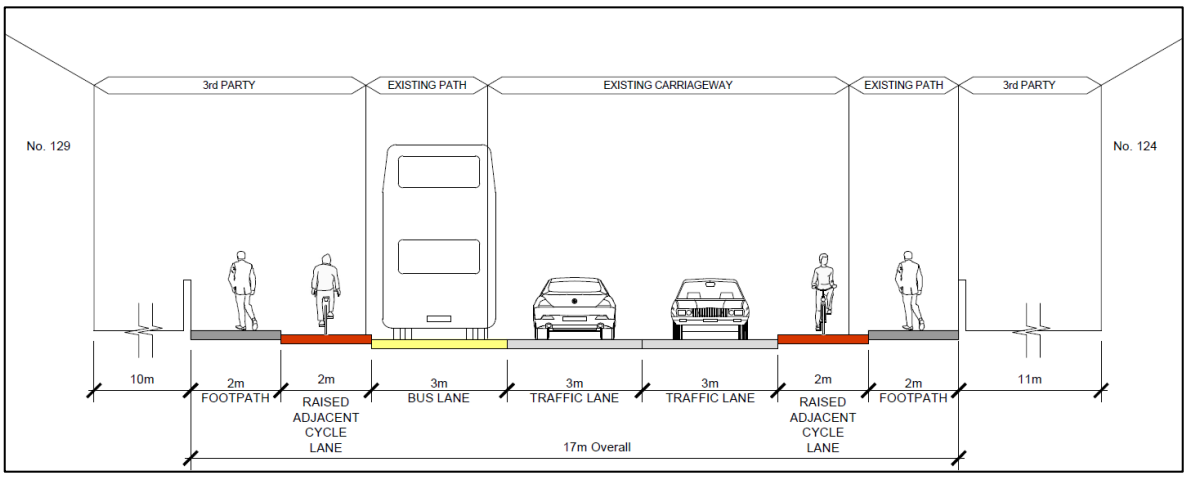


Figure 6.41: WC2b Cross-Section B-B: Walkinstown Road

Along 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 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. A cross-section on Drimnagh Road for this proposal is illustrated in **Figure 6.30**

Junctions:

There are 3 junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 6.39** and discussed below.

1. **Cromwell's Fort Road/Bunting Road:** This junction is currently a left-in/left-out junction. To facilitate right turning buses from Bunting Road, it is necessary to upgrade this junction to traffic signals, with right turn movements from Bunting Road allowed for buses only;
2. **St. Marys Road/Drimnagh Road:** It would be necessary to widen the St. Marys Road approach to the junction to provide a bus lane. It will also be necessary to relocate traffic signal equipment on this approach. A bus lane is currently provided on the Crumlin Road approach and as such only minor adjustments would be required; and
3. **Walkinstown Road/Drimnagh Road:** This junction would need to be widened to accommodate cycle lanes on approach to the junction.

WC2c –No Bus Lanes, Raised Adjacent Cycle Lanes on Bunting Road and Drimnagh Road

Route Sections:

The location of these junctions are presented in **Figure 6.42** and discussed below. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

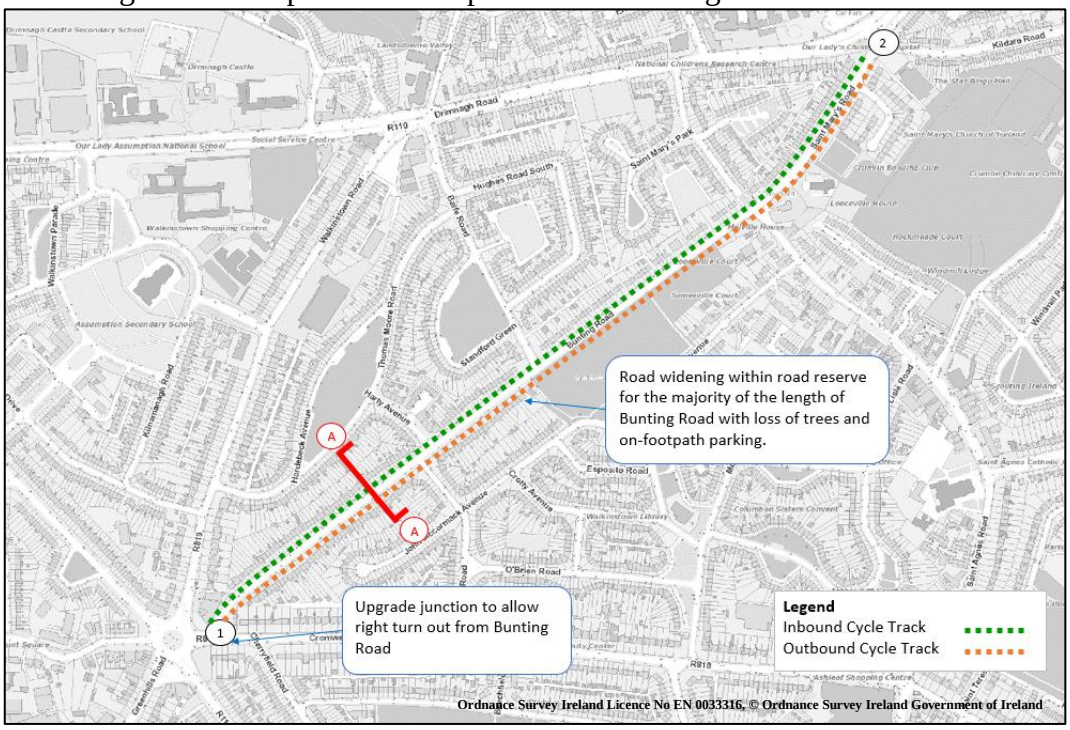


Figure 6.42: WC2c Indicative Scheme Design

Access to Bunting Road is currently restricted to and from Cromwell's Fort Road with two-way traffic volumes in the peak hours of less than 200 vehicles at the Cromwell's Fort Road end of Bunting Road. The vast majority of traffic on the road at this point are travelling inbound, and as such there are only around 70 vehicles (in the PM peak hour) for which outbound buses would need to contend with at this junction. Full bus priority is therefore not considered to be necessary at this junction in normal operation.

Inbound, the only place where bus lanes would be currently necessary to avoid delays is on the St. Mary's Road on approach to the Drimnagh Road junction where traffic volumes are higher during peak hours (up to 250 vehicles inbound). However, there is no potential to widen the road within the existing road reserve at this location to facilitate this provision.

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. A cross section on Bunting Road is presented in **Figure 6.43**.

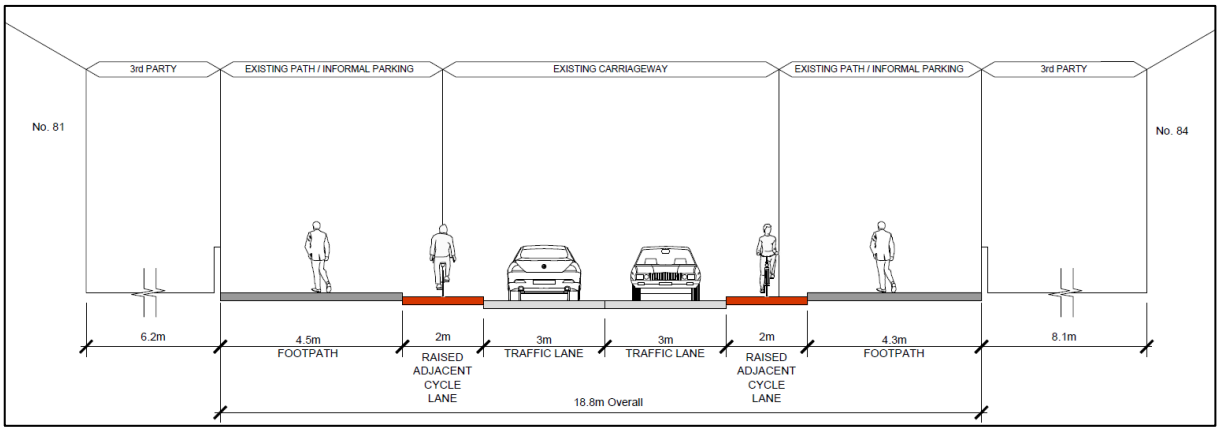


Figure 6.43: WC2c Cross-Section A-A: Bunting Road

Junctions:

There are 2 junctions along this route option, which would require upgrading to facilitate bus priority.

1. **Cromwell's Fort Road/Bunting Road:** This junction is currently a left-in/left-out junction. To facilitate right turning buses from Bunting Road it is necessary to upgrade this junction to traffic signals with right turn movements from Bunting Road allowed for buses only; and

2. **St. Marys Road/Drimnagh Road:** It is not possible to provide a bus lane on the St. Marys Road approach. A bus lane is currently provided on the Crumlin Road approach. As such only minor improvements would be likely at this junction.

6.4.3 Route Option WC3: Bunting Road/Walkinstown Road

Route Option WC3 is effectively a combination of route options WC1 and WC2 discussed earlier, with route option WC1 catering for inbound buses and WC2 catering for outbound route options.

The routing for WC3 is illustrated in **Figure 6.44** and described in the following text.

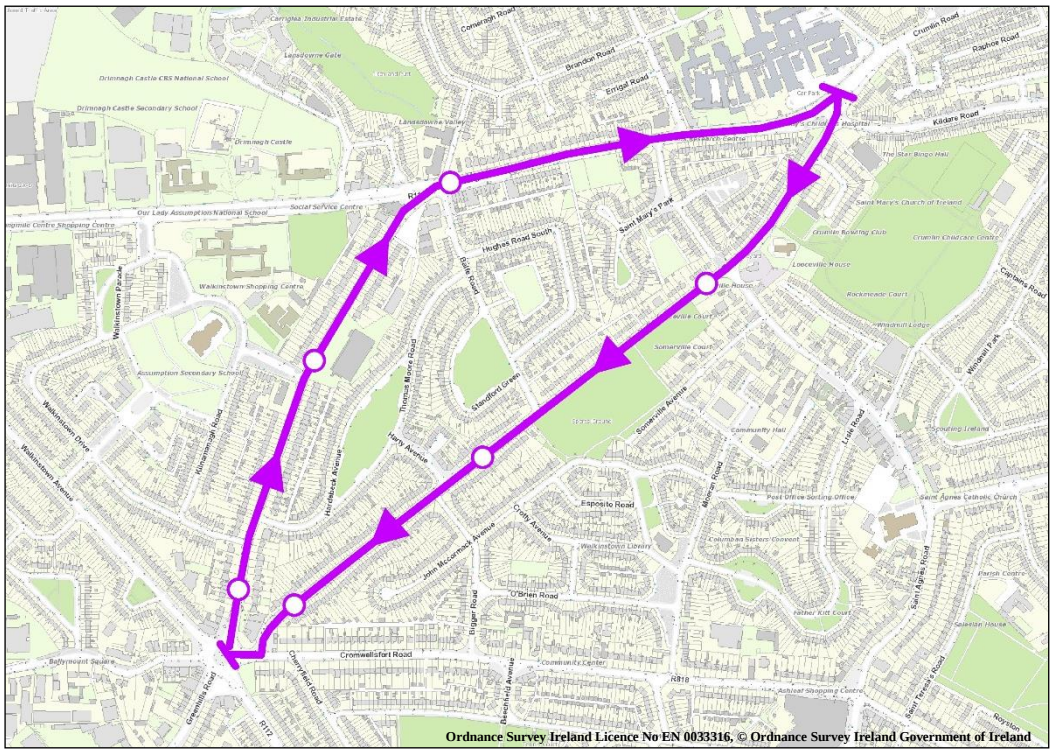


Figure 6.44: Route Option WC3

Inbound: This route option would run along Walkinstown Road between Walkinstown Roundabout and Drimnagh Road. The route would then turn onto Drimnagh Road. This route option ends at the Drimnagh Road/Kildare Road junction.

Outbound: From Crumlin Road this route option turns onto St. Marys Road/Bunting Road as far as Cromwell's Fort Road before turning right towards Walkinstown Roundabout. This route option ends at Walkinstown Roundabout.

Stops: A total of 3 stops in each direction would likely be provided along this route option.

6.4.3.1 Indicative Scheme Design

WC3a – Bus Lanes and Raised Adjacent Cycle Lanes in Each Direction (Cycle Lanes on Bunting Road)

Figure 6.45 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

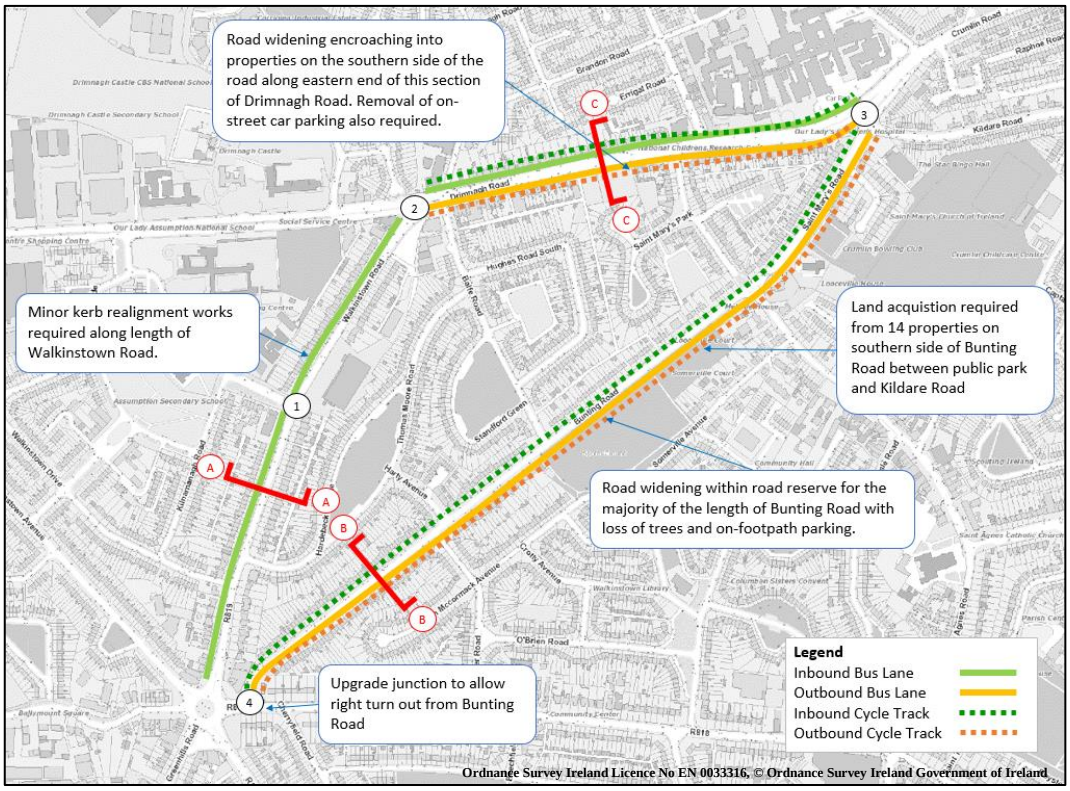


Figure 6.45: WC3a Indicative Scheme Design

It is possible to provide a third lane along Walkinstown Road with only minor road widening. For this route option, as Walkinstown Road would be catering for inbound bus routes only, it is proposed to allocate this third lane as an inbound bus lane.

Along 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 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. A cross-section on Drimnagh Road for this proposal is illustrated in **Figure 6.30**.

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. A cross-section on Walkinstown Road and Bunting Road for this option are illustrated in **Figure 6.46** and **Figure 6.47**.

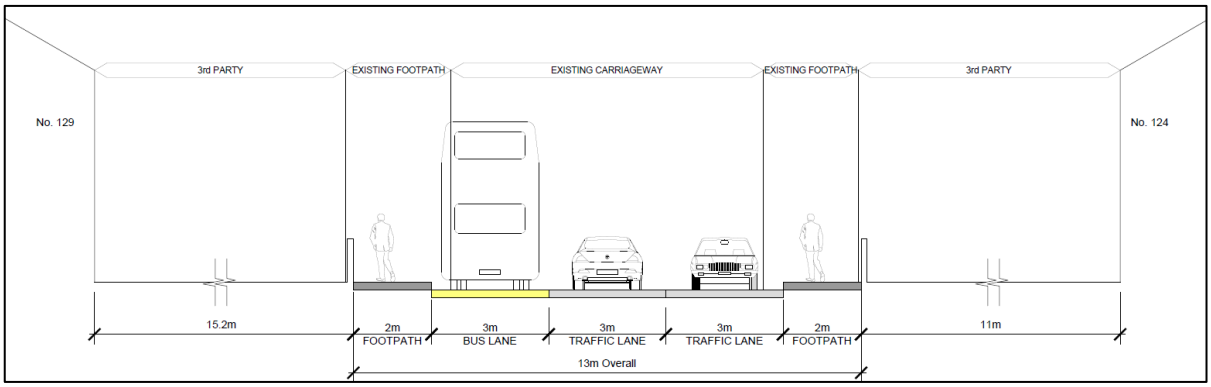


Figure 6.46: WC3a Cross-Section A-A: Walkinstown Road

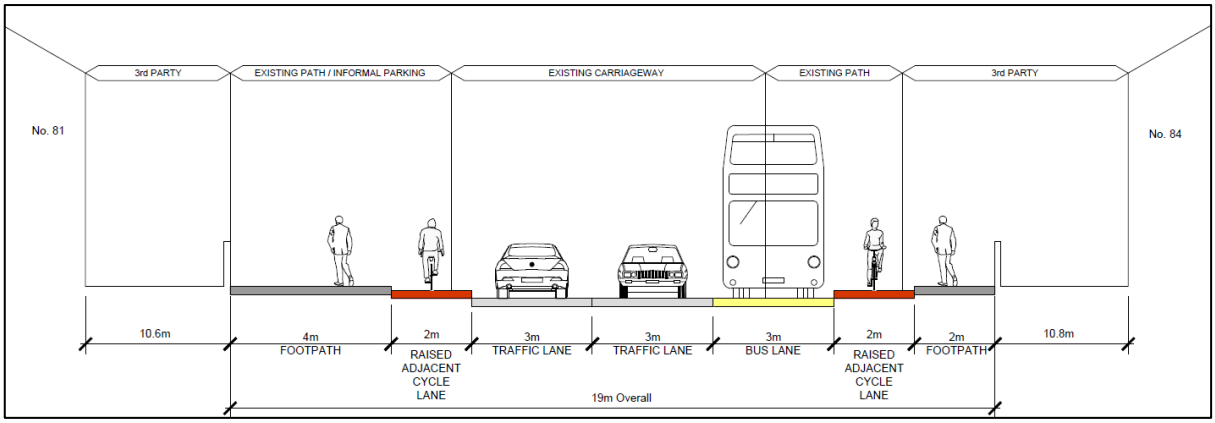


Figure 6.47: WC3a Cross-Section B-B: Bunting Road

Junctions:

There are 4 junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 6.45** and discussed below.

1. **Walkinstown Road/Kilnamanagh Road:** This junction would need to be upgraded to accommodate bus lanes on the southern approach to the junction. There is also a possible requirement to relocate/provide new signal equipment;

2. **Walkinstown Road/Drimnagh Road:** This junction currently has bus lanes on the Walkinstown Road and Drimnagh Road approaches to the junction. There is limited potential to improve the junction layout, and as such only minor improvements are likely; and

3. **Walkinstown Road/Kildare Road**: There are currently bus lanes on both the eastern and western approaches to the junction, and as such only minor changes to this junction are likely;

4. **Bunting Road/Cromwell's Fort Road**: This junction is currently a left-in/left-out junction. To facilitate right turning buses from Bunting Road it would be necessary to upgrade this junction to traffic signals, with right turn movements from Bunting Road allowed for buses only.

WC3b – Bus Lanes and Raised Adjacent Cycle Lanes in Each Direction (Cycle Lanes on Walkinstown Road)

Figure 6.48 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

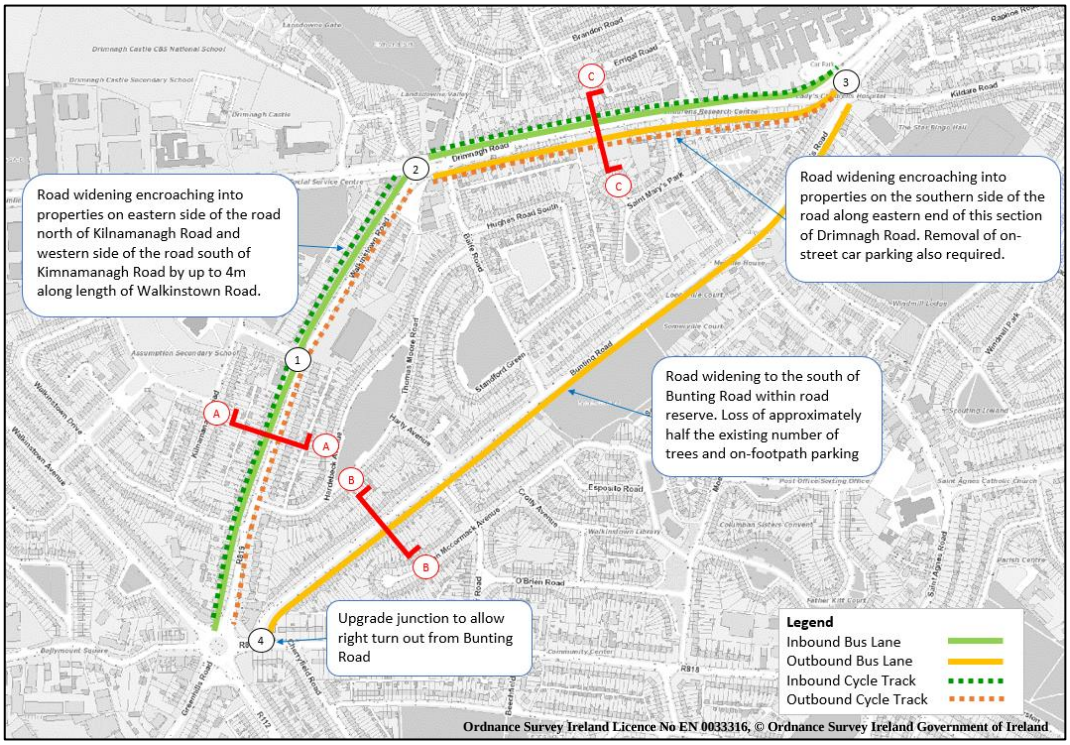


Figure 6.48: WC3b Indicative Scheme Design

Option WC3b proposes widening 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 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 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. A cross-section on Walkinstown Road and Bunting Road for this option are illustrated in **Figure 6.49** and **Figure 6.50** respectively. A cross-section on Drimnagh Road for this proposal is illustrated in **Figure 6.30**.

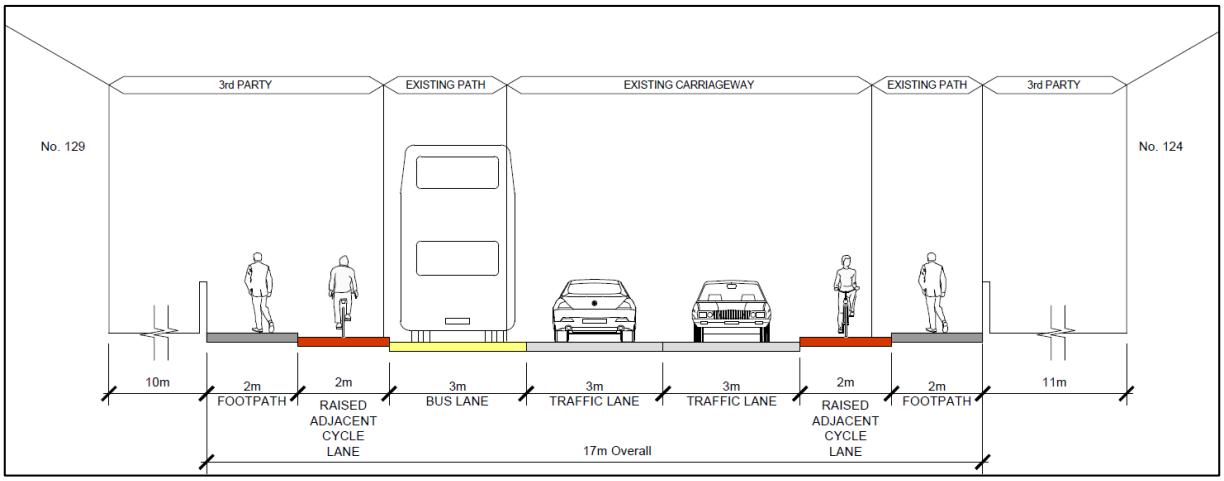


Figure 6.49: WC3b Cross-Section A-A: Walkinstown Road

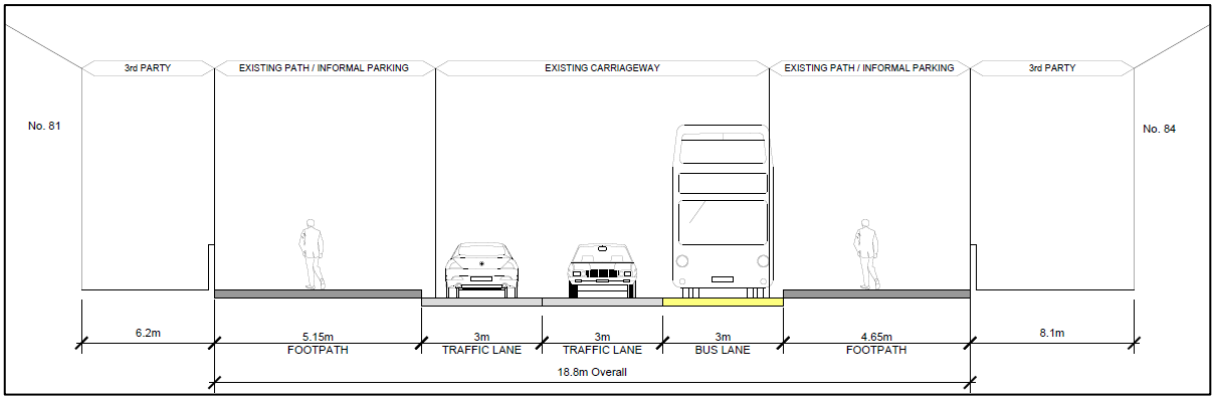


Figure 6.50: WC3b Cross-Section B-B: Bunting Road

Junctions:

There are 4 junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 6.48** and discussed below.

1. **Walkinstown Road/Kilnamanagh Road:** This junction would need to be upgraded to accommodate bus lanes on the southern approach to the junction. There is also a possible requirement to relocate/provide new signal equipment;

2. **Walkinstown Road/Drimnagh Road:** This junction currently has bus lanes on the Walkinstown Road and Drimnagh Road approaches to the junction. There is limited potential to improve the junction layout, and as such only minor improvements are likely;

3. **Walkinstown Road/Kildare Road**: There are currently bus lanes on both the eastern and western approaches to the junction, and as such only minor changes to this junction are likely; and

4. **Bunting Road/Cromwell's Fort Road**: This junction is currently a left-in/left-out junction. To facilitate right turning buses from Bunting Road it would be necessary to upgrade this junction to traffic signals with right turn movements from Bunting Road allowed for buses only.

WC3c –Bus Lane Inbound, No Bus Lane Outbound

Route Sections:

Figure 6.51 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

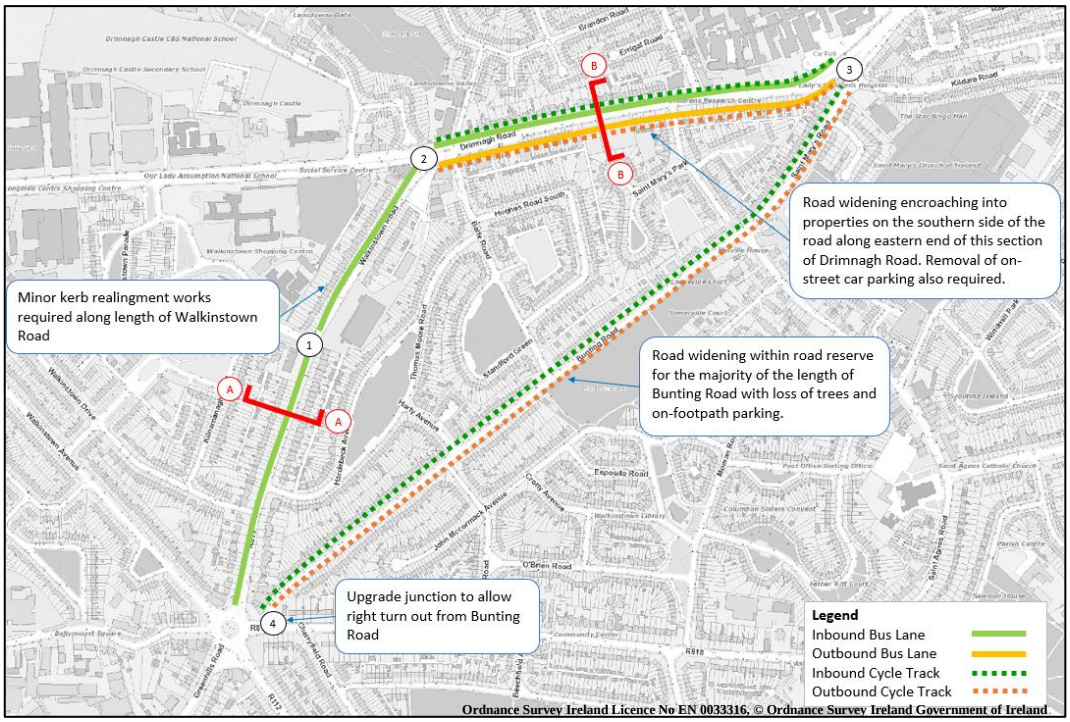


Figure 6.51: WC3c Indicative Scheme Design

It is possible to provide a third lane along Walkinstown Road with only minor road widening. For this route option, as Walkinstown Road would be catering for inbound bus routes only, it is proposed to allocate this third lane as an inbound bus lane.

A cross-section on Walkinstown Road for this option is presented in **Figure 6.52**.

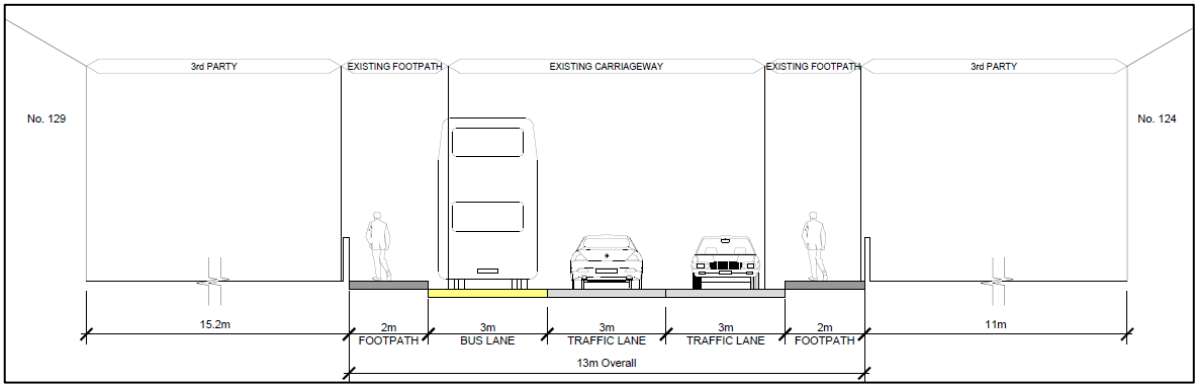


Figure 6.52: WC3c Cross-Section A-A: Walkinstown Road

Along 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 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. A cross-section on Drimnagh Road for this proposal is illustrated in **Figure 6.30**.

As discussed earlier, 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. A cross section on Bunting Road is presented in **Figure 6.43**.

Junctions:

There are 4 junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 6.51** and discussed below.

1. **Walkinstown Road/Kilnamanagh Road:** This junction would need to be upgraded to accommodate bus lanes on the southern approach to the junction. There is also a possible requirement to relocate/provide new signal equipment;
2. **Walkinstown Road/Drimnagh Road:** This junction currently has bus lanes on the Walkinstown Road and Drimnagh Road approaches to the junction. There is limited potential to improve the junction layout, and as such only minor improvements are likely; and
3. **Walkinstown Road/Kildare Road**: There are currently bus lanes on both the eastern and western approaches to the junction, and as such only minor changes to this junction are likely;
4. **Bunting Road/Cromwell's Fort Road**: This junction is currently a left-in/left-out junction. To facilitate right turning buses from Bunting Road it would be necessary to upgrade this junction to traffic signals with right turn movements from Bunting Road allowed for buses only.

6.4.4 Other Options Considered

A number of other options were also considered in the area but were not carried forward for the reasons briefly outlined below:

- **Option to convert 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.

- **Option to close access to and egress from the Walkinstown Road approach to the junction for general traffic while maintaining it for buses.** This option would require through traffic to continue along Walkinstown Avenue or Bunting Road, 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.

Further detail on traffic management measures considered in this area are discussed in Section 6.3 regarding Walkinstown Roundabout upgrade options.

6.4.5 Route Options Assessment

Details of the Stage 2 route options assessment undertaken for the Walkinstown to Crumlin study area section are presented in **Appendix A6 to A8**.

The relative ranking of route options against the scheme assessment sub-criteria is summarised in **Table 6.11**.

Table 6.11: Walkinstown Route Options Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	WC1a	WC1b	WC1c	WC1d	WC2a	WC2b	WC2c	WC3a	WC3b	WC3c
Economy	Capital Cost										
	Transport Reliability and Quality of Service										
Integration	Land Use Integration										
	Residential Population & Employment										
	Transport Network Integration										
	Cycling Integration										
Accessibility & Social Inclusion	Key Trip Attractors										
	Deprived Geographic Areas										
Safety	Road Safety										
Environment	Archaeology and Cultural Heritage										
	Architectural Heritage										
	Flora and Fauna										
	Soils and Geology										
	Hydrology										
	Landscape and Visual										
	Air Quality										
	Noise & Vibration										
	Land Use Character										

In terms of economy, options WC1c, WC1d and WC2c represents the cheapest 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, scheme options along route option WC1 and WC2 rank marginally better than WC3 as the inbound and outbound routing is along the same route. Scheme options along route WC3 ranks poorest as there is a comparatively small population that is served by bus services in both directions.

In terms of transport network integration, routes WC1 and WC3 coincides with more Dublin Bus routes, and as such schemes along these routes rank higher than those along route option WC2. In terms, of cycling integration, those route options which propose dedicated raised adjacent facilities along roads which are included in the GDA Cycle Network Plan (WC2a, WC2c, 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, options along WC1 rank marginally higher as they serve more key trip attractors, particularly schools.

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

In terms of Environment, generally options which propose greater road widening result in greater impact to the environment such as WC1a, WC2a, WC2b and WC3a. There is a potential for options WC2a and WC2b to impact on the St. Mary's Road/St. Agnes Road Conservation Area, and as such these options receive a relatively poor ranking against Archaeology and Architectural heritage.

A summary of the assessment and relative ranking of route options against the five main assessment criteria is presented in **Table 6.12**.

Table 6.12: Walkinstown Route Options Assessment Summary (Main Criteria)

Assessment Criteria	WC1 a	WC1 b	WC1 c	WC1 d	WC2 a	WC2 b	WC2 c	WC3 a	WC3 b	WC3 c
Economy										
Integration										
Accessibility & Social Inclusion										
Safety										
Environment										

Based on the assessment undertaken, route options WC1b, WC1c and WC1d appear to offer more benefits over other options. However, the primary differentiator between these options is that WC1b offers slightly better journey times and better physical bus priority, thus providing better journey time reliability. 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, any potential impact on the environment can be mitigated against.

7 Study Area Section 3: Crumlin to Grand Canal

7.1 Stage 1: Route Options Assessment

As with Sections 1 and 2, there are a large number of potential end-to-end routes within the Section 3 study area, the roads available for CBC routing have been subdivided into shorter sections for the purposes of the Stage 1 route options sifting process. Following the route sifting process, remaining routes have been combined to form longer routes where possible.

Figure 7.1 presents the initial potential route options identified. A summary of the Stage 1 route options sifting process is presented in **Table 7.1**.

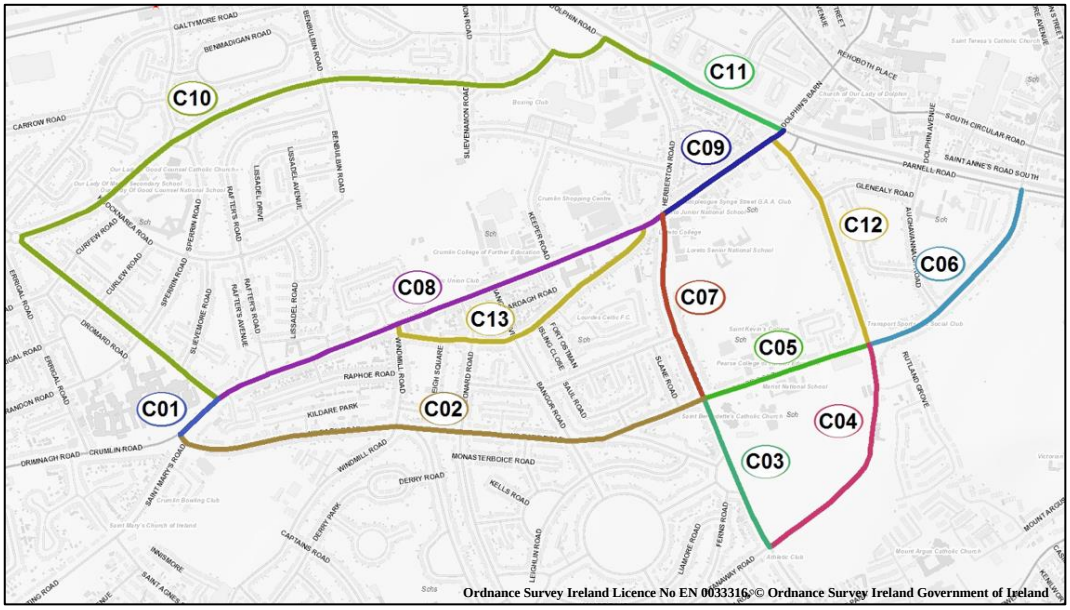


Figure 7.1: Section 3 Route Options –Crumlin to Grand Canal

Table 7.1: Section 3 Route Option Sifting (Stage 1) Summary – Crumlin to Grand Canal

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
C01	Crumlin Road (Kildare Road to Cooley Road)	Secondary Route 8A	This short section of Crumlin Road runs in front of Crumlin Children's Hospital and consists of a general traffic lane and bus lane in each direction.	Pass
C02	Kildare Road/Clogher Road (Sundrive Road to Crumlin Road)	Secondary Route 8C	Kildare Road is a residential road and consists of a single traffic lane in each direction. The road provides direct access to several residential properties along its length and a mix of on-street parking, parking on kerb and parking on footpath was observed during the site visit. There is some scope to widen the road to provide bus and cycle lanes in each direction by narrowing the footpath and removing on-street parking. However, this might prove difficult as many houses fronting onto Kildare Road do not have driveways. This route also makes use of Clogher Road which is similar to Kildare Road. The provision of bus lanes on this section of the route would require land acquisition and removal of on-street car parking. Notwithstanding this, traffic volumes are observed to be low compared to the alternative route option on Crumlin Road (C09) and therefore this is considered to be a viable alternative. This route option is therefore progressed to the next assessment stage.	Pass
C03	Sundrive Road (Stannaway Road to Clogher Road)	Secondary Route S02	This route option consists of a single traffic lane in each direction. There is potential to provide a bus lane in one direction without any land acquisition. Bus and cycle lanes could be provided in both directions by acquiring land from Eamonn Ceannt Park and St. Bernadette's Church. However, this route does not tie into any feasible route option to the south and is therefore not considered any further.	Fail
C04	New Link Road through Eamonn Ceannt Park (Sundrive Road to Clogher Road)	Secondary Route 9C	This option proposes a new bus and cycle only link road through Eamonn Ceannt Park. This route would follow the general alignment of the existing walkway in the park and would require the removal of a large number of trees to implement and is therefore not considered any further.	Fail
C05	Clogher Road (Sundrive Road to Rutland Avenue)	Secondary Route 8C	This section of Clogher Road is a single traffic lane in each direction. There is some scope to widen the road to provide a bus lane in one direction by narrowing the footpath. However to provide bus lanes in both directions would require land acquisition from adjacent properties. St. Kevin's College and Marist National School front onto this section and attract a large number of cars in the peak school periods with parking on the kerb and footpath observed. This activity would likely interfere with the operation of a bus lane during these periods.	Fail

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
C06	Clogher Road (Rutland Avenue Grand Canal)	Secondary Route 8C	This section of Clogher Road is a single traffic lane in each direction. There is some scope to widen the road to provide bus lanes in each direction by narrowing the footpath. There may be issues with narrowing footpath as this currently caters for unofficial car parking associated with adjacent residential properties, many of which do not have driveways.	Fail
C07	Sundrive Road (Clogher Road to Crumlin Road)	Secondary Route S02	This route option consists of a single traffic lane in each direction. There is potential to provide a bus lane in one direction without any land acquisition. However, to provide bus and cycle lanes in both directions would require land acquisition from adjacent residential properties and/or Loreto College. Notwithstanding this, this route option, combined with C02 provides an alternative to the existing bottleneck along Crumlin Road, and is therefore progressed to the next stage.	Pass
C08	Crumlin Road (Cooley Road to Sundrive Road)	Primary Route 8 / Secondary Route 8A	This section of Crumlin Road consists of a single lane of traffic in each direction. A short section of bus lane is provided in the inbound direction at the start and end of this route option. The road provides direct access to several residential properties as well as a number of retail units and Crumlin Shopping Centre. It may be possible to provide a bus lane in one direction (or partially in each direction) by removing cycle lanes. The provision of bus and cycle lanes in each direction would require land acquisition from numerous residential properties. However, there are limited alternative routes in this area and therefore despite the constraints, this route option is progressed to the next assessment stage.	Pass
C09	Crumlin Road (Sundrive Road to Grand Canal)	Primary Route 8	This section of Crumlin Road consists of a general traffic lane and bus lane in each direction.	Pass
C10	Cooley Road/Mourne Road/Dolphin Road	N/A	This route option runs on residential roads which are a single lane in each direction. On-street parking is prevalent along the route, particularly along Cooley Road where vehicles mount the kerb. There is limited opportunity to provide bus lanes along the route. Furthermore, the route option is somewhat circuitous and does not meet the criteria for a CBC. This route option is therefore not considered any further.	Fail
C11	Dolphin Road (Mourne Road to Crumlin Road)	Primary Route S01 / N10	Dolphin Road runs along the Grand Canal and carries a single lane of traffic and cycle lanes in each direction. This route option is constrained by the canal to the north and residential properties to the south and as such there is no scope to widen the road to facilitate bus and cycle lanes in each direction. Given the high traffic volumes on this section during the peak hours, and therefore the potential to delay buses, this route option is not considered any further.	Fail

Route Option Number	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
C12	Rutland Avenue (Clogher Road to Crumlin Road)	N/A	Rutland Avenue is a narrow, traffic calmed residential road, with parking on the kerb prevalent along its length. There is no scope for widening the road to provide bus lanes, as this would remove driveways from houses along the route. In addition, it would be difficult for buses to join Crumlin Road from Rutland Avenue in its current arrangement. As such, it would be necessary to signalise the Rutland Avenue/Crumlin Road junction, which is only 20m from the Parnell Road/Crumlin Road junction. For these reasons, this route option is not considered any further.	Fail
C13	Old County Road	N/A	Old County Road is a narrow traffic calmed street which is fronted by residential and retail properties. On-road/on-kerb parking is observed along the length of the road. Road widening to facilitate bus lanes would require land acquisition from properties on each side of the road. For this reason, this route option is not considered any further.	Fail

Following the Stage 1 sift, 5 of the 13 route options assessed passed the initial sifting stage and were progressed to the next assessment stage. These route options are presented in **Figure 7.2**.

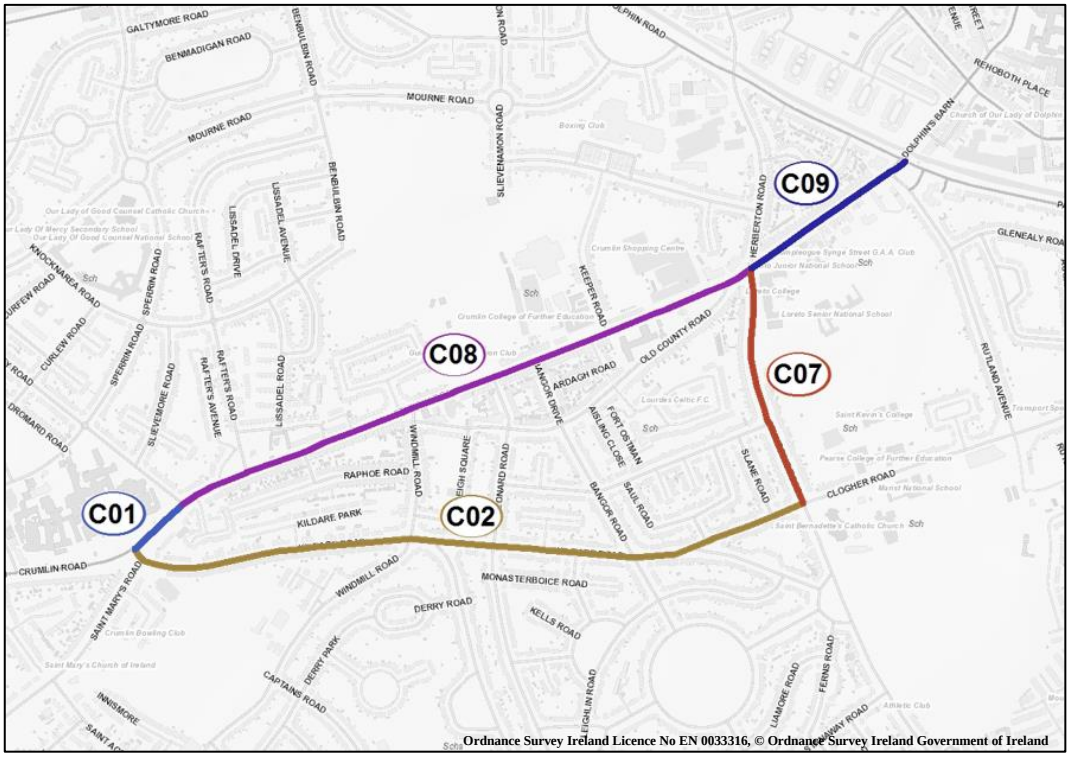


Figure 7.2: Section 3 Route Options Remaining After Stage 1 Assessment

7.2 Stage 2: Route Options Assessment

Following the Stage 1 sift 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:

- CG1 - A route option via Crumlin Road;
- CG2 - A route option via Kildare Road and Sundrive Road;
- 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 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 etc.).

It is important to note that in some instances, the final scheme option will be a combination of some or all of the above based on the multi-criteria assessment undertaken.

7.2.1 Route Option CG1: Crumlin Road

Route Option CG1 is presented in **Figure 7.3** and described in the following text.

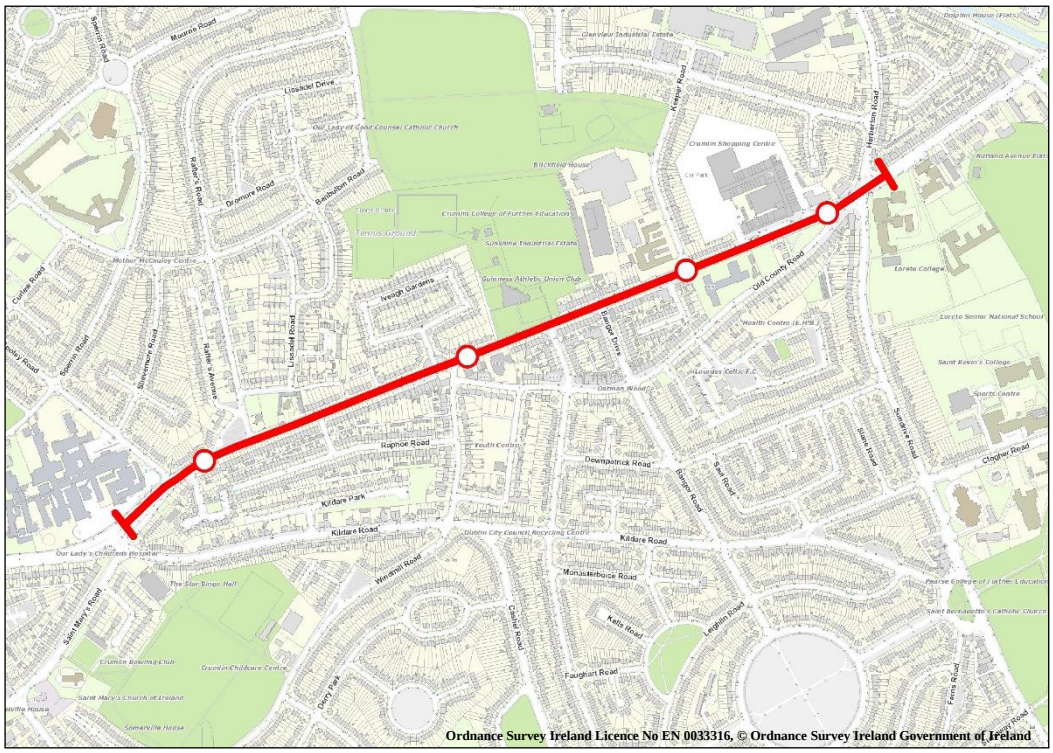


Figure 7.3: Route Option CG1

Inbound: This route option runs along Crumlin Road between Kildare Road and Sundrive Road.

Outbound: The outbound routing would follow the same route as the inbound routing.

Stops: A total of 4 stops would likely be provided in each direction along this route option.

7.2.1.1 Indicative Scheme Designs

CG1a – Bus Lanes and Raised Adjacent Cycle Lanes in Each Direction

Route Sections:

The indicative scheme design for this option is illustrated in **Figure 7.4**. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

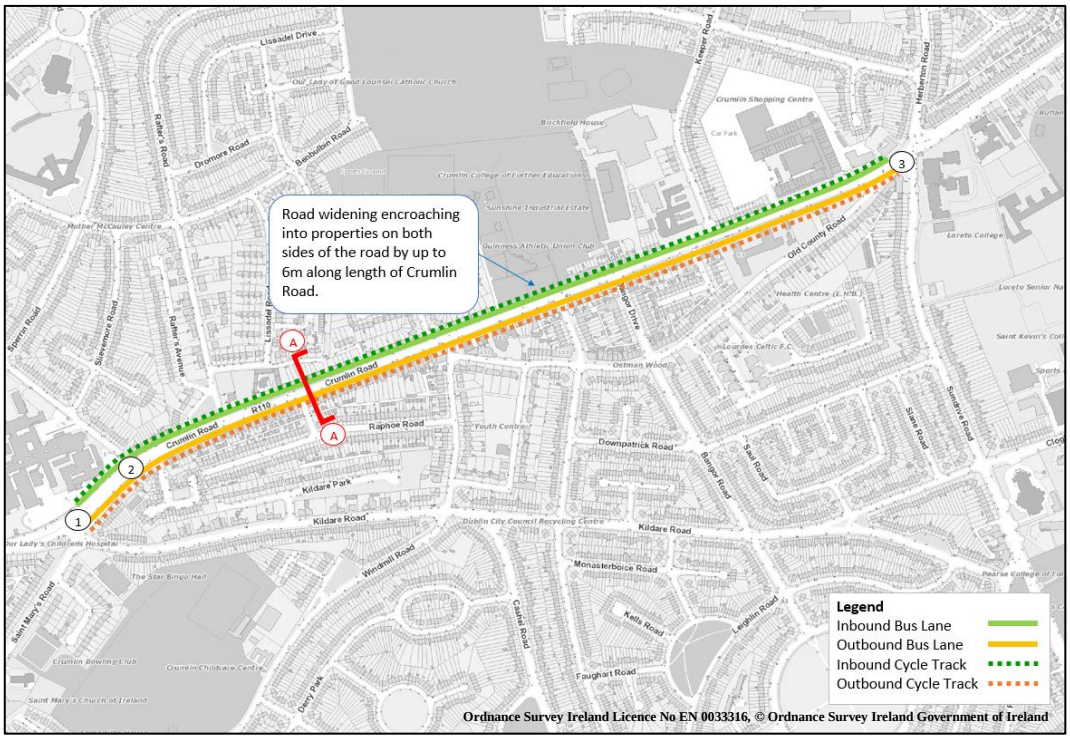


Figure 7.4: CG1a Indicative Scheme Design

Option CG1a requires road widening along 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. A cross-section for CG1a on Crumlin Road is presented in **Figure 7.5**.

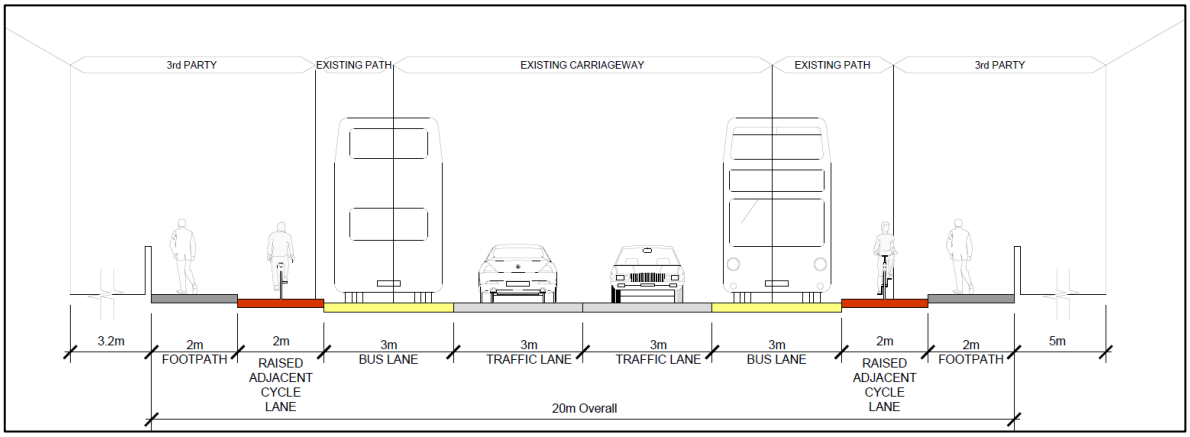


Figure 7.5: CG1a Cross-Section A-A: Crumlin Road

Junctions:

There are 3 signalised junctions along this route option, 3 which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 7.4** and discussed below.

1. **Crumlin Road/Kildare Road:** Bus lanes are already provided to the stopline on Crumlin Road in each direction and as such only minor works are required;
2. **Crumlin Road/Cooley Road:** Adjustments to the junction layout may be required to facilitate bus lanes on the eastern approach to the junction. There is also a possible requirement to relocate/provide new signal equipment; and
3. **Crumlin Road/Sundrive Road**: Adjustments to the junction layout may be required to facilitate bus lanes on approach to the junction. There is also a possible requirement to relocate/provide new signal equipment.

CG1b – Bus Lanes in Each Direction, Raised Adjacent Cycle Lanes along Kildare Road/Clogher Road/Sundrive Road

Route Sections:

The indicative scheme design for this option is illustrated in **Figure 7.6**. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

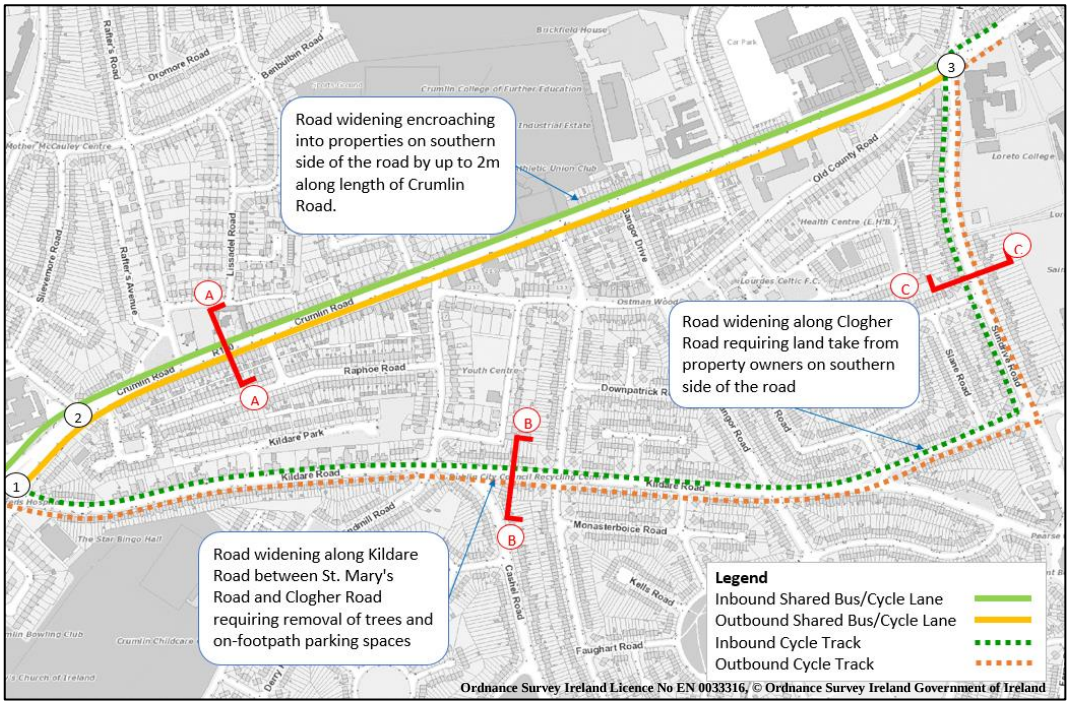


Figure 7.6: CG1b Indicative Scheme Design

Option CG1b would also require widening along 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. A cross-section on Crumlin Road is presented in **Figure 7.7**.

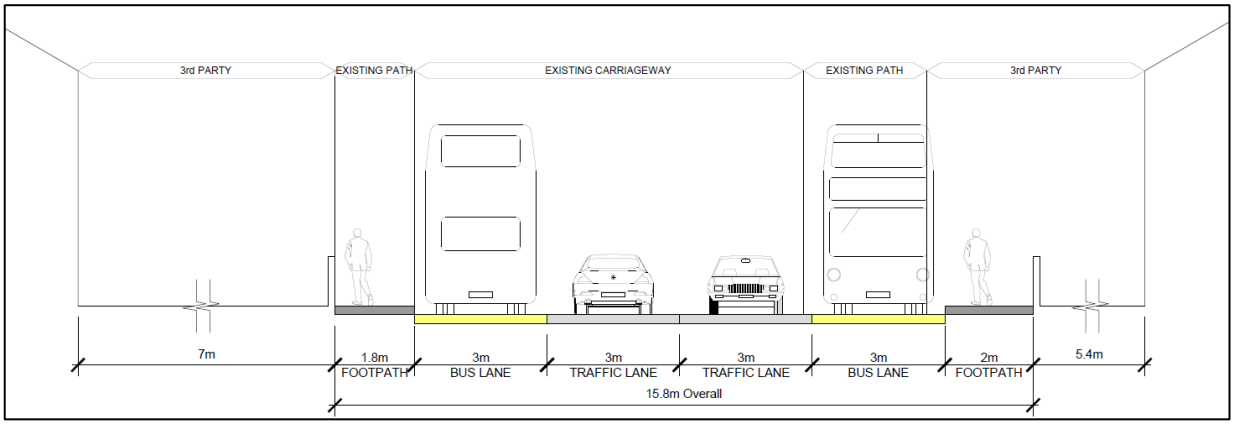


Figure 7.7: CG1b Cross-Section A-A: Crumlin Road

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 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. The current GDA Cycle Network Plan and the changes required under this option are illustrated in **Figure 7.8** and **Figure 7.9** respectively.

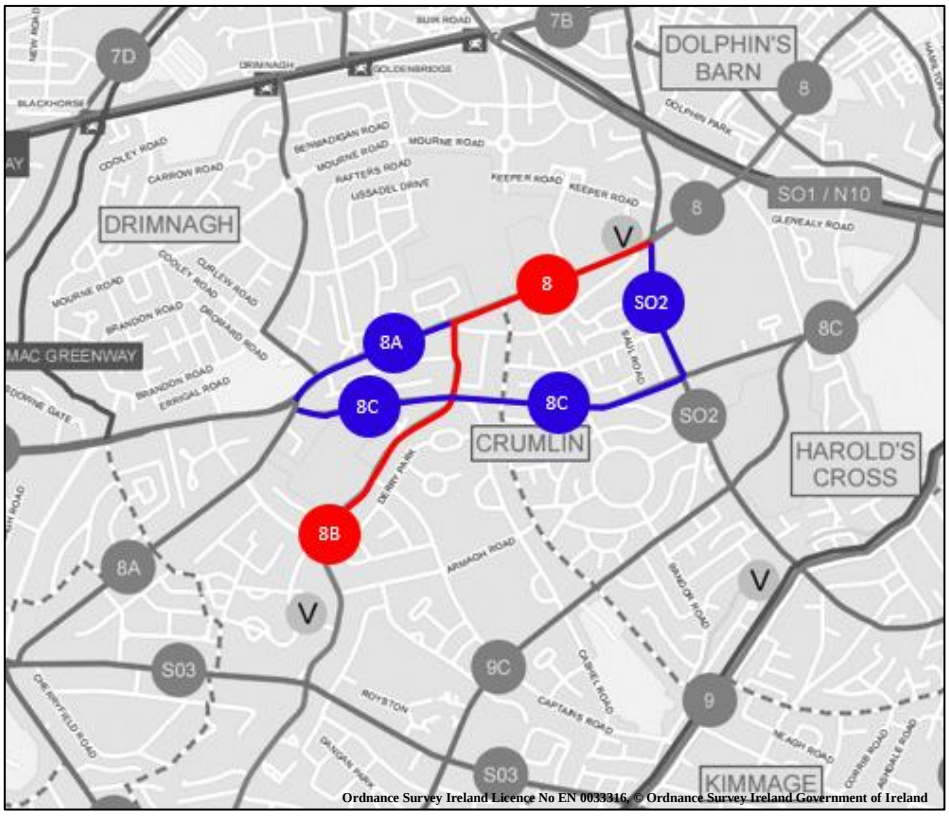


Figure 7.8: Existing GDA Cycle Network

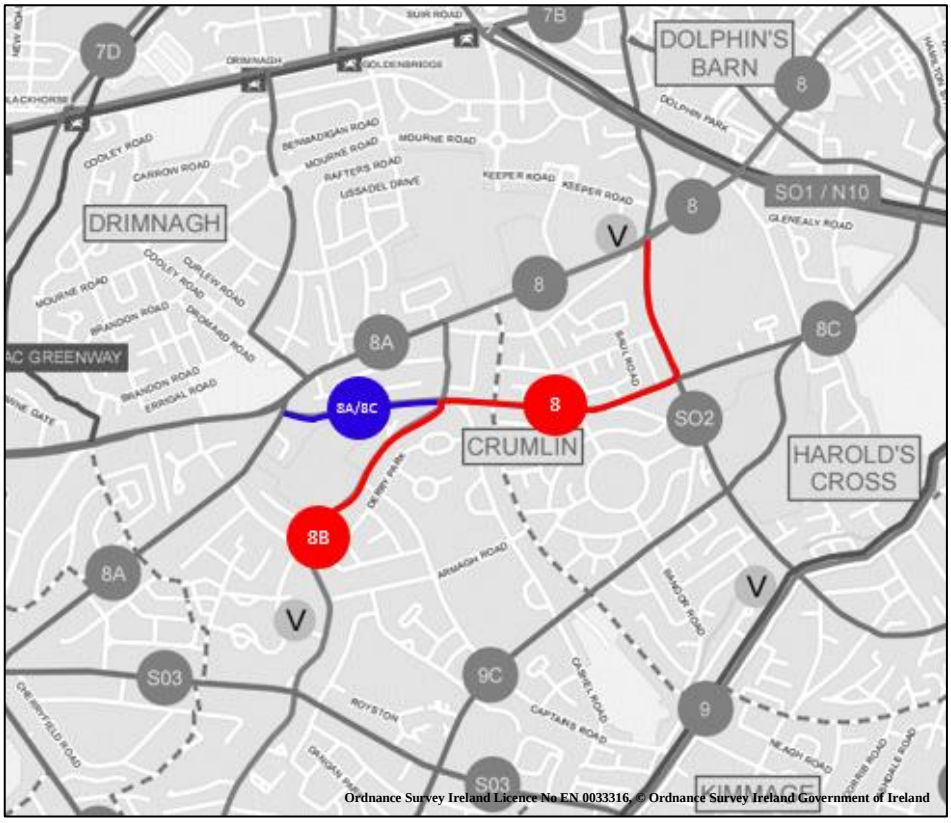


Figure 7.9: Proposed Changes to GDA Cycle Network

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. **Figure 7.10** and **Figure 7.11** presents a cross-section for this arrangement on Kildare Road and Sundrive Road respectively.

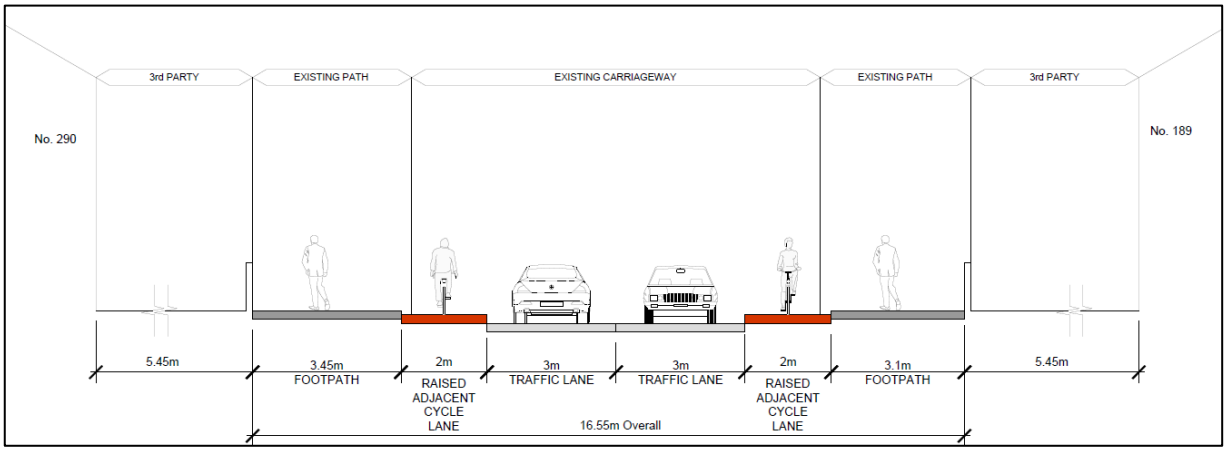


Figure 7.10: CG1c Cross-Section B-B: Kildare Road

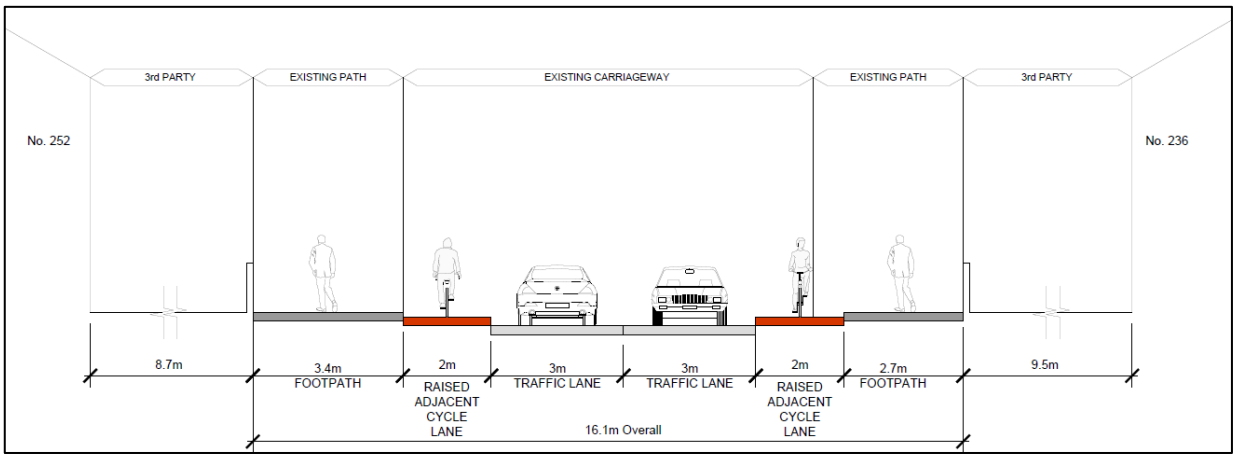


Figure 7.11: CG1c Cross-Section C-C: Sundrive Road

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Bus lanes in each direction along Crumlin Road; and
- Raised adjacent cycle lanes in each direction along Kildare Road and Sundrive Road.

Junctions:

There are 3 signalised junctions along this route option, 3 of which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 7.6** and discussed below.

1. **Crumlin Road/Kildare Road:** Bus lanes are already provided to the stopline on Crumlin Road in each direction, and as such only minor works are required;

2. **Crumlin Road/Cooley Road:** Adjustments to the junction layout may be required to facilitate bus lanes on the eastern approach to the junction. There is also a possible requirement to relocate/provide new signal equipment; and
3. **Crumlin Road/Sundrive Road**: Adjustments to the junction layout may be required to facilitate bus lanes on approach to the junction. There is also a possible requirement to relocate/provide new signal equipment.

CG1c - Partial Bus Lanes in Each Direction, Raised Adjacent Cycle Lanes along Kildare Road/Clogher Road/Sundrive Road

Route Sections:

Figure 7.12 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

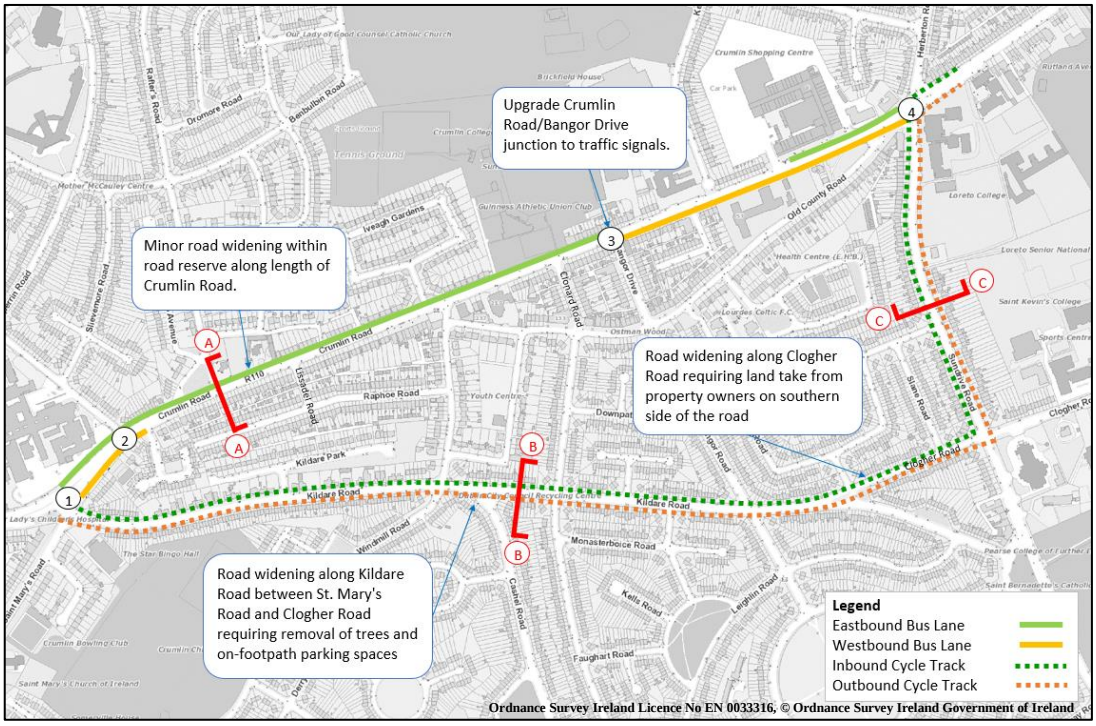


Figure 7.12: Route Option CG1c Indicative Scheme Design

It is possible to provide one additional lane along this section of 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 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. **Figure 7.13** presents a cross-section on Crumlin Road.

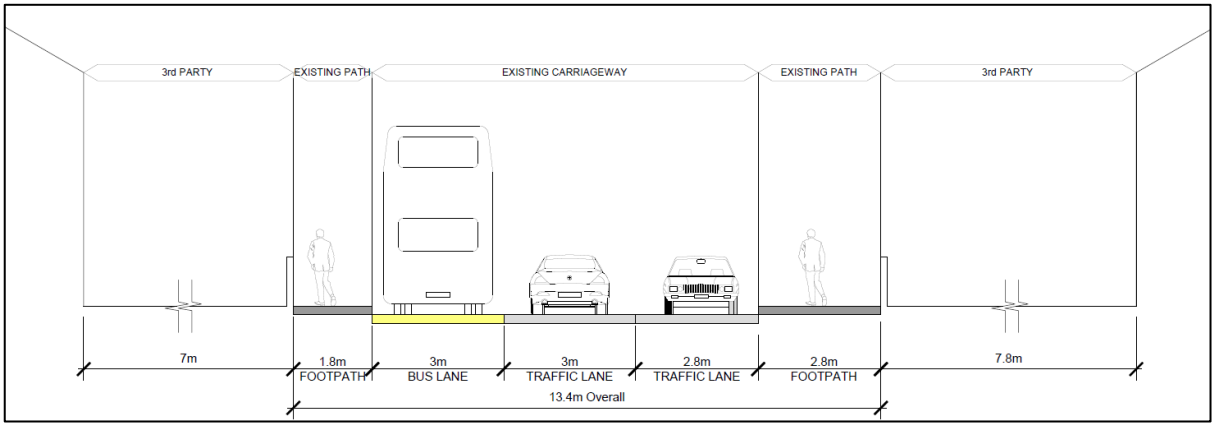


Figure 7.13: CG1c Cross Section A-A: Crumlin Road

Similar to option CG1b, for this option cycle facilities would be provided along Kildare Road (see **Figure 7.10** and **Figure 7.11**).

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Inbound bus lane between Cooley Road and Bangor Drive;

- Outbound bus lane between Sundrive Road and Bangor Drive; and
- Raised adjacent cycle lanes along Kildare Road and Sundrive Road.

Junctions:

There are 4 signalised junctions along this route option, 3 of which would require upgrading to facilitate bus priority, and 1 new signalised junction. The location of these junctions are presented in **Figure 7.12** and discussed below.

1. **Crumlin Road/Kildare Road:** Bus lanes are already provided to the stopline on Crumlin Road in each direction and as such only minor works are required;
2. **Crumlin Road/Cooley Road:** Adjustments to the junction layout may be required to facilitate bus lanes on approach to the junction. There may also be a possible requirement to relocate/provide new signal equipment;
3. **Crumlin Road/Bangor Drive:** It is necessary to upgrade this junction to traffic signals to manage queuing on sections where no bus lane is provided; and
4. **Crumlin Road/Sundrive Road**: Adjustments to the junction layout may be required to facilitate bus lanes on approach to the junction. There is also a possible requirement to relocate/provide new signal equipment.

CG1d - Partial Bus Lanes in Each Direction (alternative), Raised Adjacent Cycle Lanes along Kildare Road/Clogher Road/Sundrive Road

Route Sections:

Figure 7.14 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

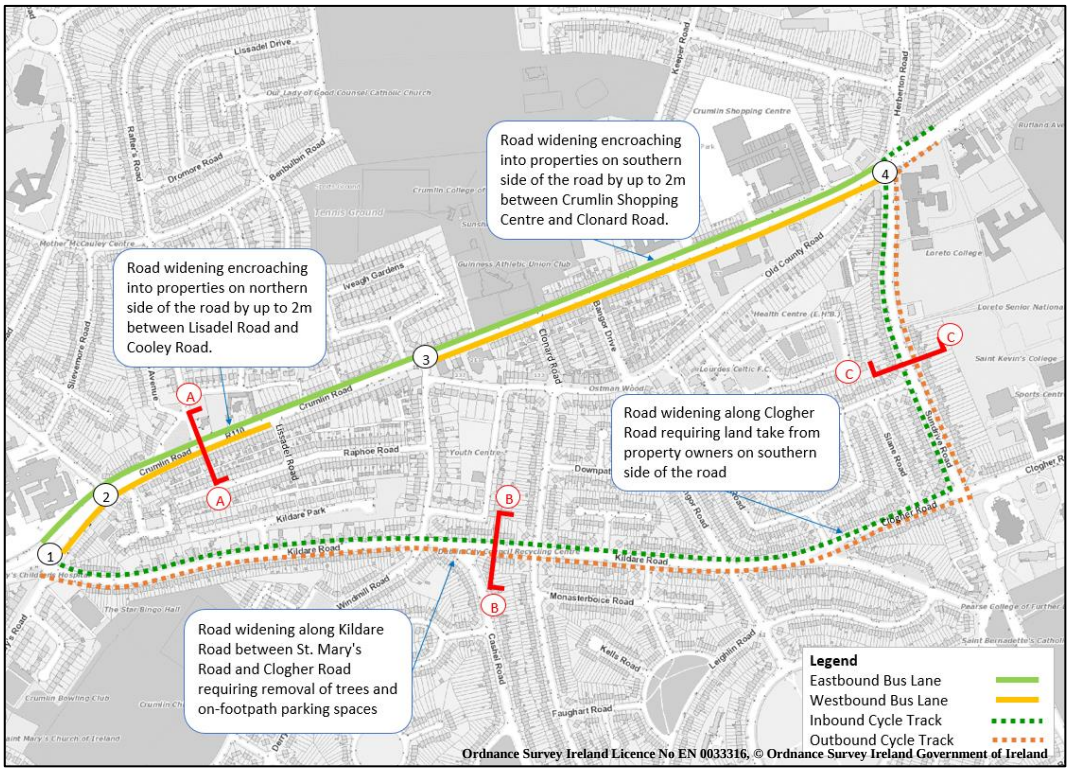


Figure 7.14: Route Option CG1d Indicative Scheme Design

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 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 Crumlin Road.

Similar to option CG1c, this option would make use of queue relocation signals to manage queuing on the outbound section of 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 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.

Figure 7.15 presents a cross-section on Crumlin Road.

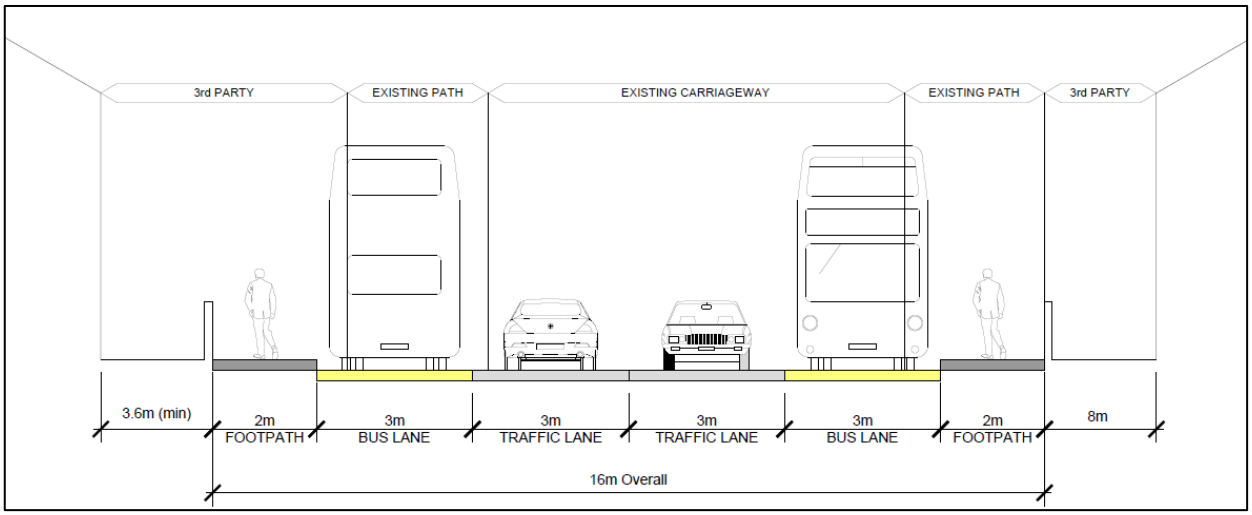


Figure 7.15: CG1d Cross-Section A-A: Crumlin Road

Similar to option CG1b, for this option cycle facilities would be provided along Kildare Road (see **Figure 7.10** and **Figure 7.11**).

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Inbound bus along the full length of Crumlin Road;
- Outbound bus lane between Sundrive Road and Windmill Road;
- Outbound bus lane between Lissadel Road and Kildare Road; and
- Raised adjacent cycle lanes along Kildare Road and Sundrive Road.

Junctions:

There are 4 signalised junctions along this route option, 3 which would require upgrading to facilitate bus priority, and 1 new signalised junction. The location of these junctions are presented in **Figure 7.14** and discussed below.

1. **Crumlin Road/Kildare Road:** Bus lanes are already provided to the stopline on Crumlin Road in each direction, and as such only minor works are required;
2. **Crumlin Road/Cooley Road:** Adjustments to the junction layout may be required to facilitate bus lanes on approach to the junction. There is also a possible requirement to relocate/provide new signal equipment;

3. **Crumlin Road/Windmill Road:** It is necessary to upgrade this junction to traffic signals to manage queuing on sections where no bus lane is provided; and

4. **Crumlin Road/Sundrive Road**: Adjustments to the junction layout may be required to facilitate bus lanes on approach to the junction. There is also a possible requirement to relocate/provide new signal equipment.

7.2.2 Route Option CG2: Kildare Road and Sundrive Road

Route Option CG2 is presented in **Figure 7.16** and described in the following text.

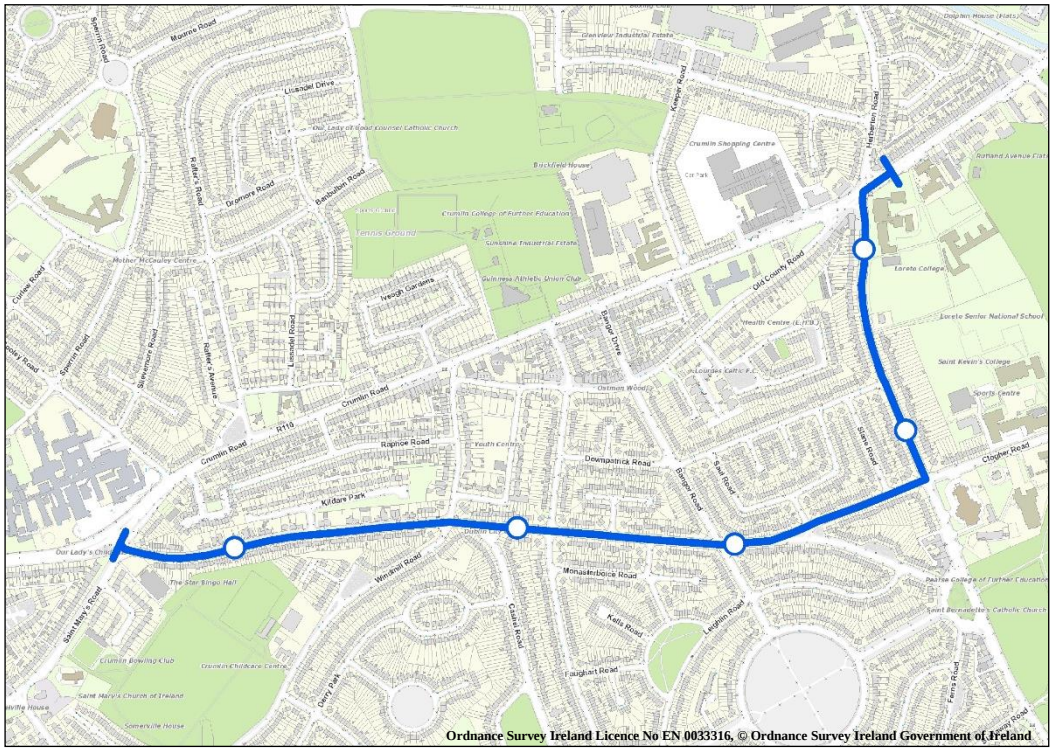


Figure 7.16: Route Option CG2

Inbound: This route option runs along Kildare Road from the Bunting Road/Crumlin Road junction. The route turns onto Clogher Road for a short section before turning onto Sundrive Road. This route options ends at the Sundrive Road/Crumlin Road junction.

Outbound: The outbound routing would follow the same route as the inbound routing.

Stops: A total of 5 stops would likely be provided in each direction along this route option.

7.2.2.1 Indicative Scheme Designs

CG2a – Bus Lanes and Raised Adjacent Cycle Lanes in Each Direction

The indicative scheme design for this option is illustrated in **Figure 7.17**. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

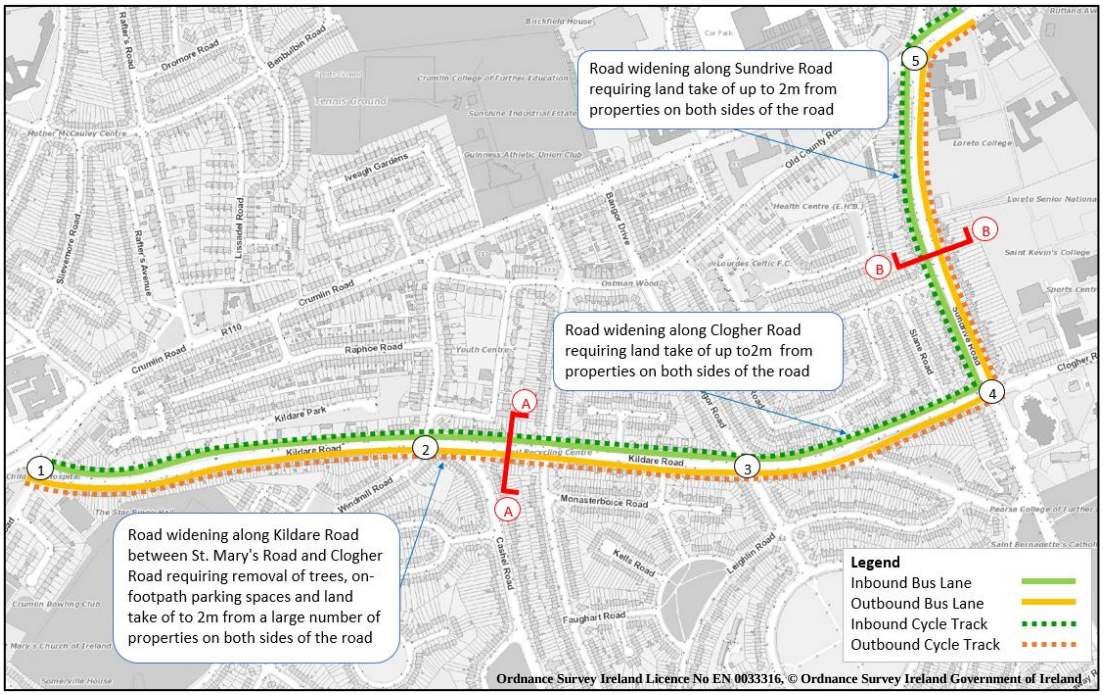


Figure 7.17: Route Option CG2a Indicative Scheme Design

Option CG2a 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.

Cross-sections on Kildare Road and Sundrive Road are illustrated in **Figure 7.18** and **Figure 7.19** respectively.

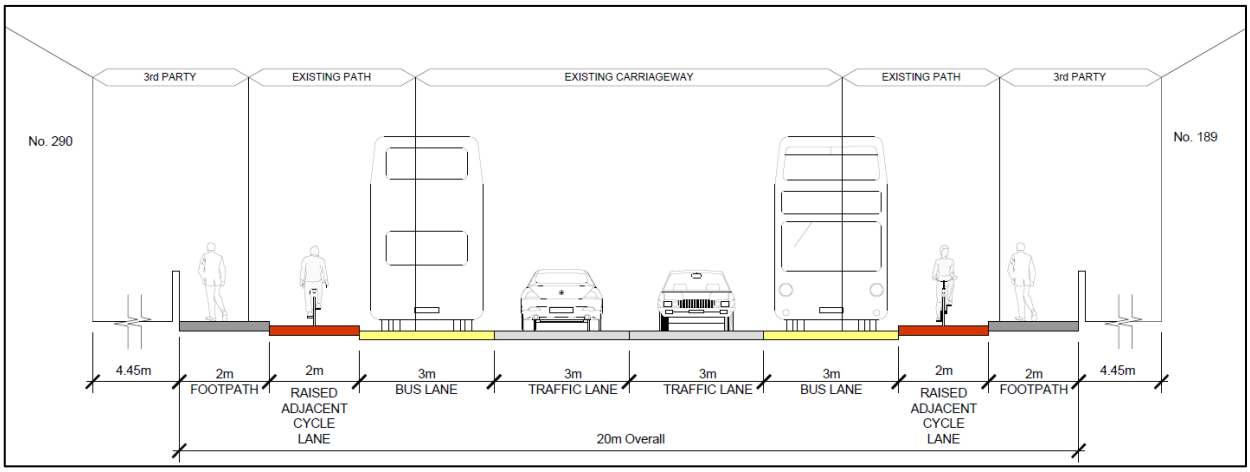


Figure 7.18: CG2a Cross-Section A-A: Kildare Road

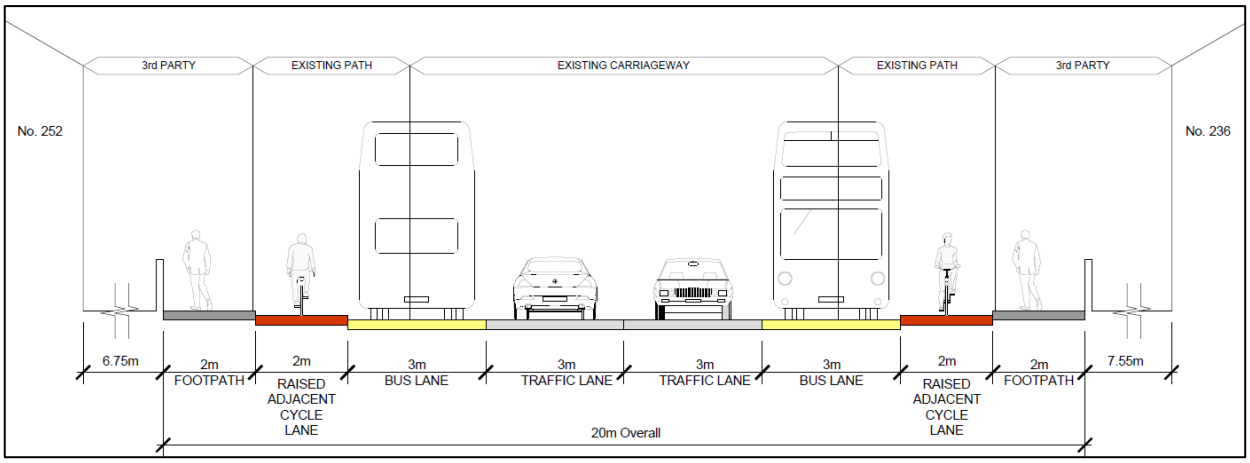


Figure 7.19: CG2a Cross-Section B-B: Sundrive Road

Junctions:

There are 4 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 7.17** and discussed below.

1. **Crumlin Road/Kildare Road:** Bus lanes are currently provided on Crumlin Road however consideration would need to be given to how buses would get from the bus lane to the right turn lane into Kildare Road. For the purposes of this assessment it is assumed that buses would weave across from the bus lane to the right turn lane in advance of the junction. It would be necessary to widen the Kildare Road approach to the junction to provide a bus lane to the stop line. There would also be a possible requirement to relocate/provide new signal equipment;

2. **Kildare Road/Windmill Road:** This junction would need to be upgraded to accommodate bus lanes on both the eastern and western Kildare Road approaches. There would also be a possible requirement to relocate/provide new signal equipment;

3. **Kildare Road/Bangor Road:** This junction would need to be upgraded to accommodate bus lanes on both the eastern and western Kildare Road approaches. There would also be a possible requirement to relocate/provide new signal equipment;
4. **Sundrive Road/Clogher Road:** The Clogher Road western approach and Sundrive Road northern approach to this junction would need to be widened to facilitate bus lanes to the stop line. It is assumed that buses turning right from Sundrive Road would weave from the bus lane into the right turn lane There would also be a possible requirement to relocate/provide new signal equipment; and
5. **Crumlin Road/Sundrive Road**: Bus lanes are currently provided on the Crumlin Road eastern approach to the junction. The junction would need to be upgraded to facilitate a bus lane on the Sundrive Road approach to Crumlin Road. There would also be a possible requirement to relocate/provide new signal equipment.

CG2b – Bus Lanes in Each Direction

The indicative scheme design for this option is illustrated in **Figure 7.20**. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

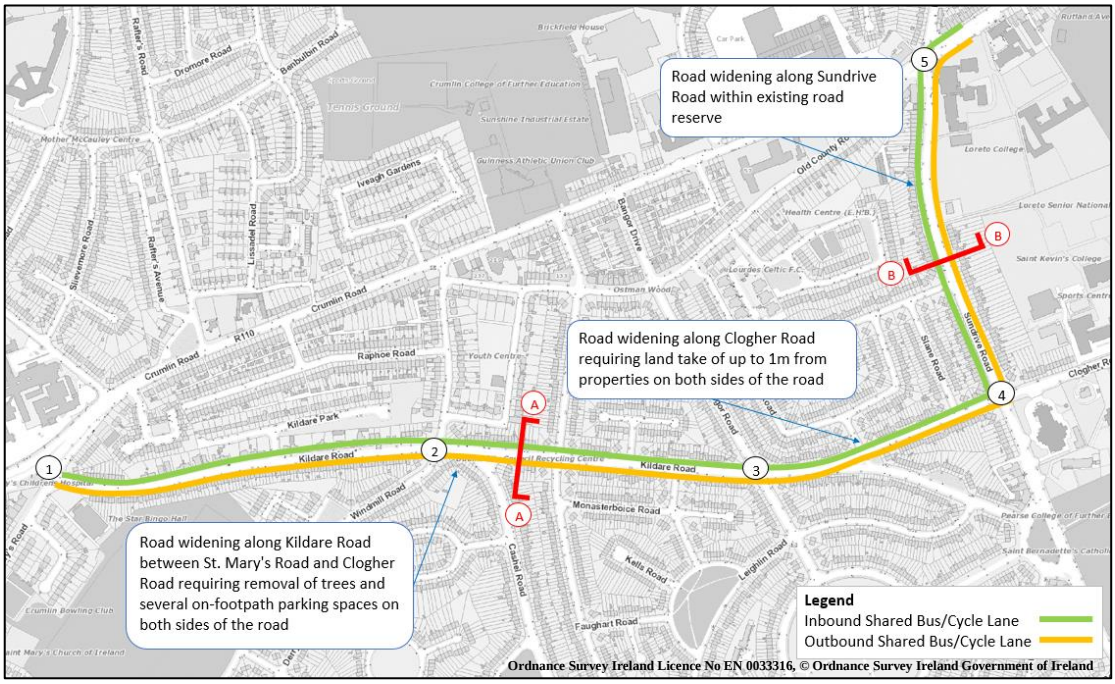


Figure 7.20: Route Option CG2b Indicative Scheme Design

Option CG2b 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.

A cross-section on Kildare Road and Sundrive Road is illustrated in **Figure 7.21** and **Figure 7.22** respectively.

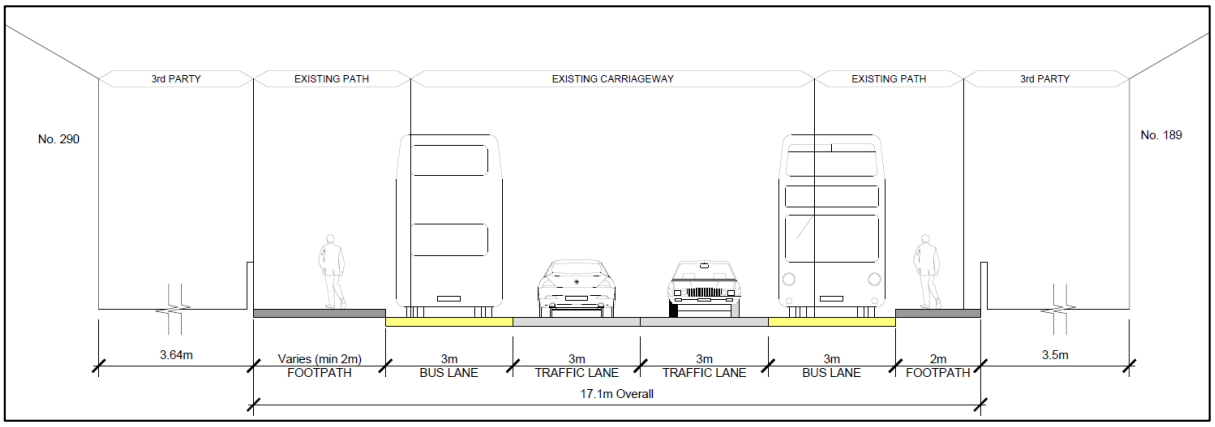


Figure 7.21: CG2b Cross-Section A-A: Kildare Road

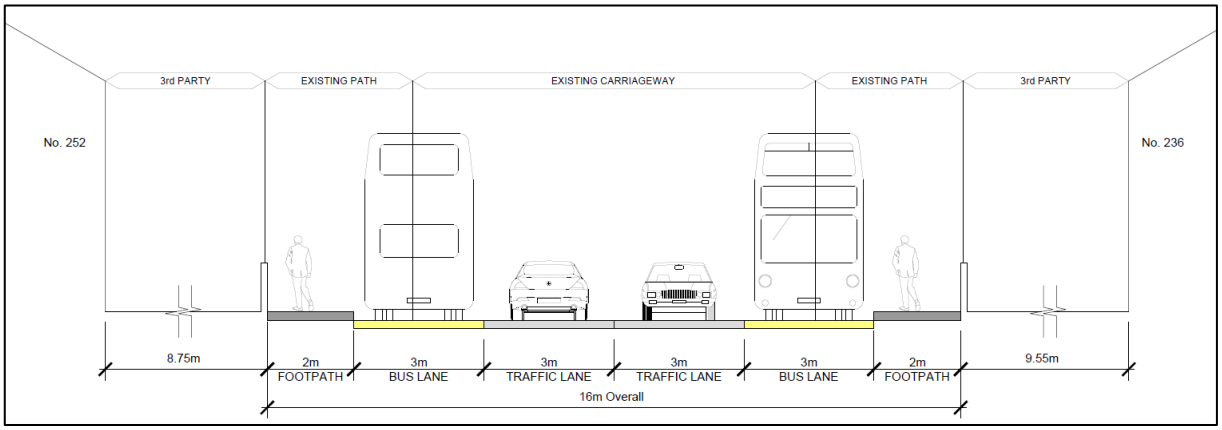


Figure 7.22: CG2b Cross-Section B-B: Sundrive Road

Junctions:

There are 3 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 7.20** and discussed below.

1. **Crumlin Road/Kildare Road:** Bus lanes are currently provided on Crumlin Road however consideration would need to be given to how buses would get from the bus lane to the right turn lane into Kildare Road. For the purposes of this assessment it is assumed that buses would weave across from the bus lane to the right turn lane in advance of the junction. It is not considered practical to provide a bus lane on the Kildare Road approach to the junction. As such no major changes to the junction are required;

2. **Kildare Road/Windmill Road:** This junction would need to be upgraded to accommodate bus lanes on both the eastern and western Kildare Road approaches. There is also requirement to relocate/provide new signal equipment;
3. **Kildare Road/Bangor Road:** This junction would need to be upgraded to accommodate bus lanes on both the eastern and western Kildare Road approaches. There would also be a possible requirement to relocate/provide new signal equipment;
4. **Sundrive Road/Clogher Road:** The Clogher Road western approach and Sundrive Road northern approaches to this junction would need to be widened to facilitate bus lanes to the stop line. There would also be a possible requirement to relocate/provide new signal equipment; and
5. **Crumlin Road/Sundrive Road**: Bus lanes are currently provided on the Crumlin Road Eastern approach to the junction. The junction would need to be upgraded to facilitate a bus lane on the Sundrive Road approach to Crumlin Road. There would also be a possible requirement to relocate/provide new signal equipment.

CG2c - Partial Bus Lane Inbound, No Bus Lane Outbound

Route Sections:

Figure 7.23 illustrates the indicative scheme design for this route option.

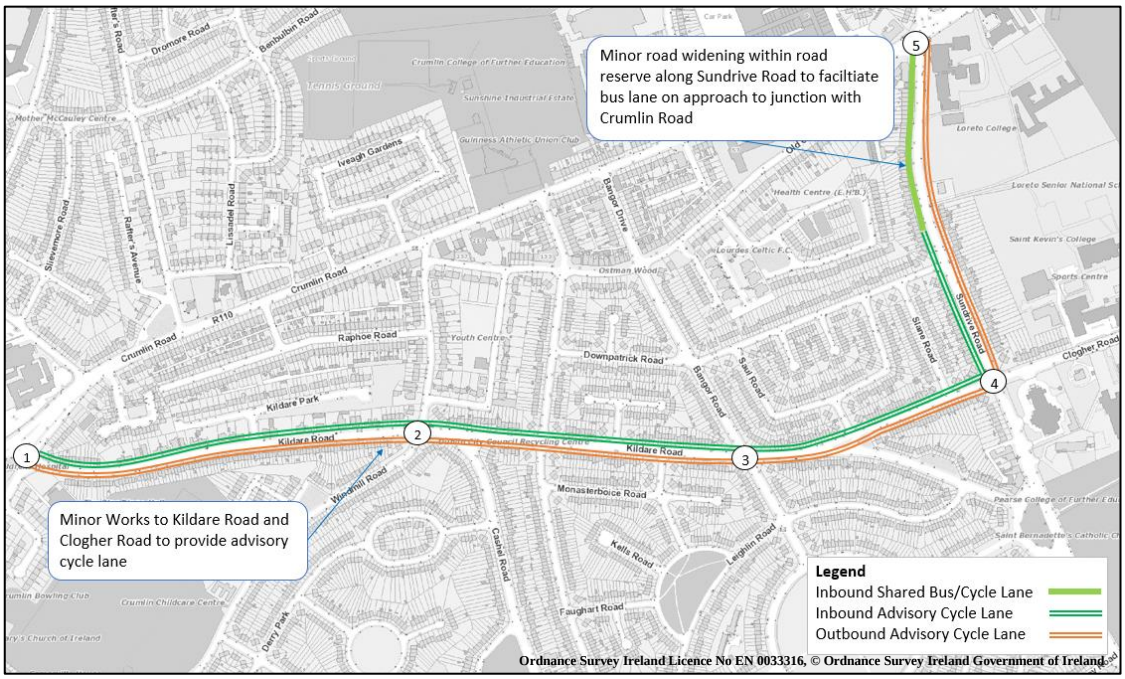


Figure 7.23: Route Option CG2c Indicative Scheme Design

This option does not propose any widening works along Kildare Road to minimise landtake 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.

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- A 200m section of inbound bus lane on Sundrive Road on approach to the Sundrive Road/Crumlin Road junction; and
- Advisory cycle lanes along Kildare Road and Sundrive Road.

Junctions:

There are 3 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 7.23** and discussed below.

1. **Crumlin Road/Kildare Road:** Bus lanes are currently provided on Crumlin Road however consideration would need to be given to how buses would get from the bus lane to the right turn lane into Kildare Road. For the purposes of this assessment it is assumed that buses would weave across from the bus lane to the right turn lane in advance of the junction. It is not considered practical to provide a bus lane on the Kildare Road approach to the junction. As such no major changes to the junction are required;
2. **Kildare Road/Windmill Road:** This junction would require modification to facilitate cycle lanes through the junction. There would also be a possible requirement to relocate/provide new signal equipment;

3. **Kildare Road/Bangor Road:** This junction would require modification to facilitate cycle lanes through the junction There may be requirement to relocate/provide new signal equipment;
4. **Sundrive Road/Clogher Road:** There is limited opportunity to provide any improvements to the layout of this junction as bus lanes are not feasible on either approach to the junction without land-take; and
5. **Crumlin Road/Sundrive Road**: Bus lanes are currently provided on Crumlin Road Eastern approach to the junction. The junction would need to be upgraded to facilitate a bus lane on the Sundrive Road approach to Crumlin Road. There is also a possible requirement to relocate/provide new signal equipment.

7.2.3 Route Option CG3: Crumlin Road /Kildare Road and Sundrive Road Outbound

Route Option CG3 is presented in **Figure 7.24** and described in the following text.

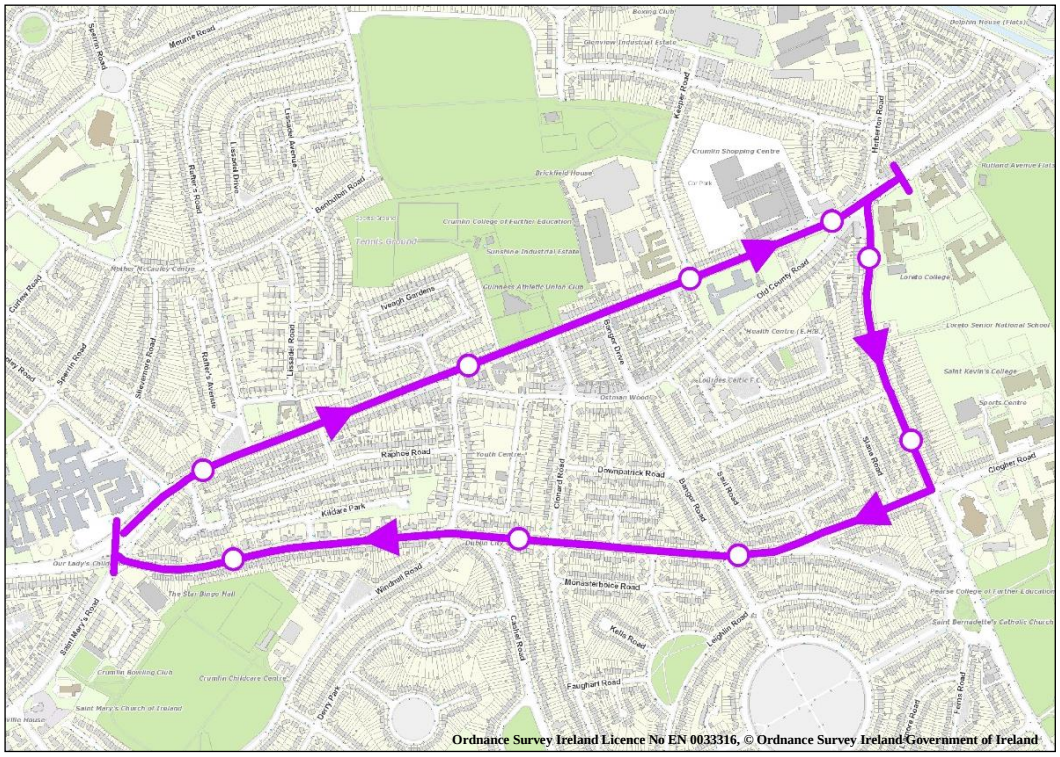


Figure 7.24: Route Option CG3

Inbound: This route option runs along Crumlin Road between Kildare Road and Sundrive Road.

Outbound: From Crumlin Road, this route option would turn onto Sundrive Road before turning onto Clogher Road for a short section. From here the route would continue onto Kildare Road before turning onto Drimnagh Road. This route options ends at the Kildare Road/Drimnagh Road junction.

Stops: A total of 4 stops would likely be provided in the inbound direction and 5 in the outbound.

7.2.3.1 Indicative Scheme Designs

CG3a – Bus Lanes and Raised Adjacent Cycle Lanes in Each Direction

Figure 7.25 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

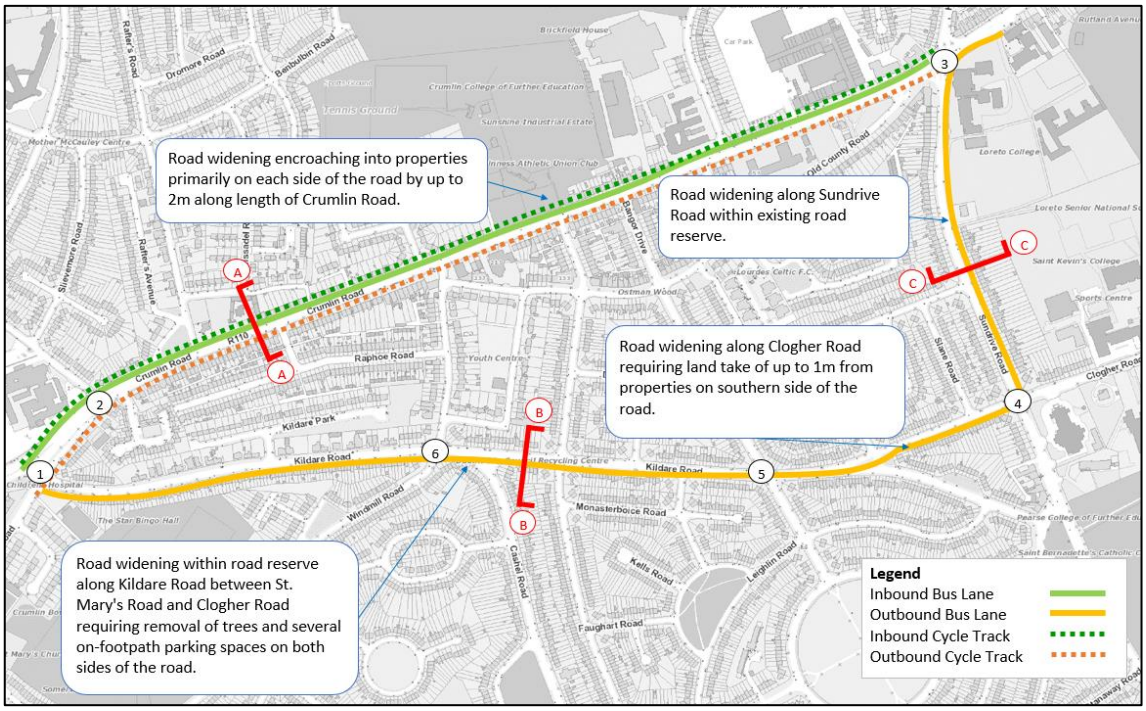


Figure 7.25: Route Option CG3a Indicative Scheme Design

Option CG3a requires widening along 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. A cross-section on Crumlin Road is illustrated in **Figure 7.26**.

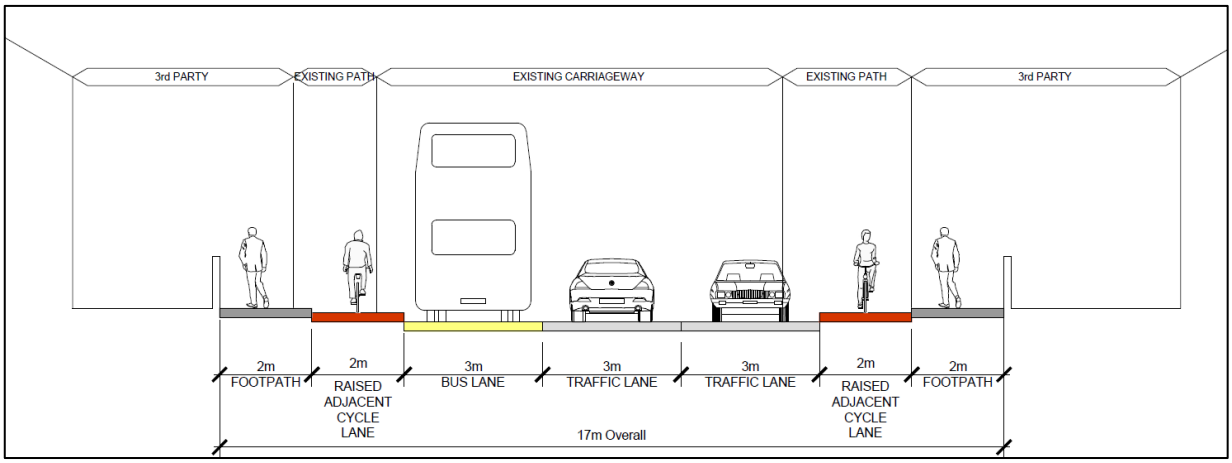


Figure 7.26: CG3a Cross-Section A-A: Crumlin Road

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. A cross-section on Kildare Road and Sundrive Road are illustrated in **Figure 7.27** and **Figure 7.28**.

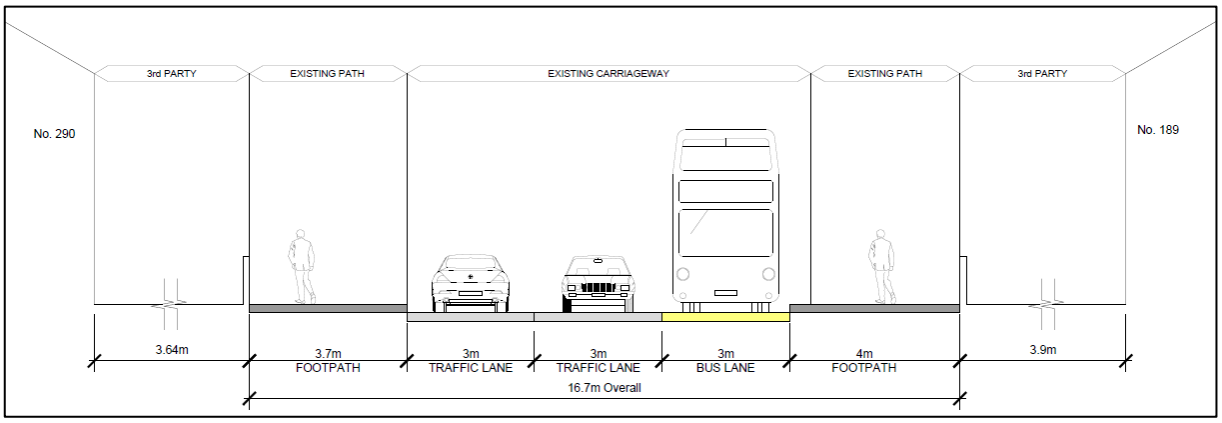


Figure 7.27: CG3a Cross-Section B-B: Kildare Road

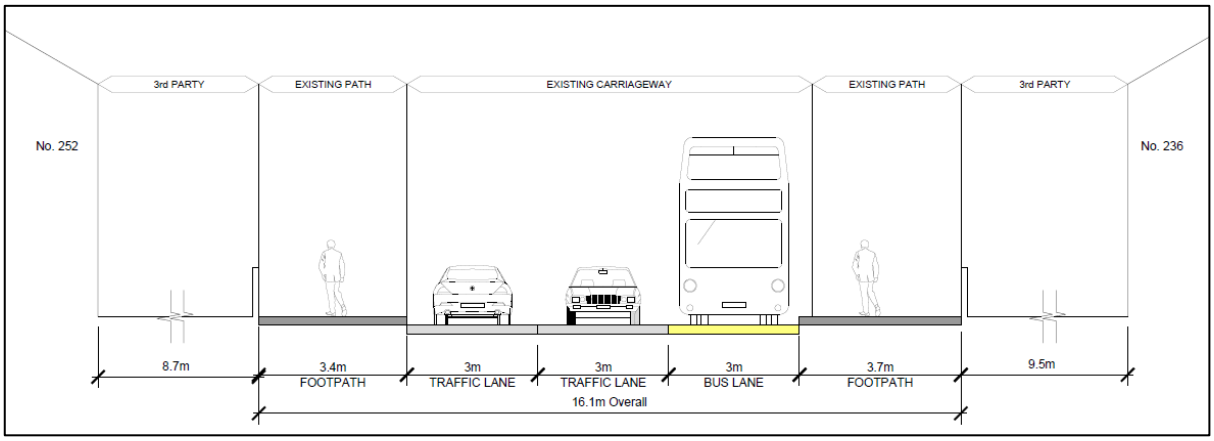


Figure 7.28: CG3a Cross-Section C-C: Sundrive Road

Junctions:

There are 3 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 7.25** and discussed below.

1. **Crumlin Road/Kildare Road:** Bus lanes are currently provided on Crumlin Road. It would be necessary to widen the Kildare Road approach to the junction to provide a bus lane to the stop line. There would also be a possible requirement to relocate/provide new signal equipment;
2. **Sundrive Road/Clogher Road:** The Clogher Road western approach and Sundrive Road northern approaches to this junction would need to be widened to facilitate a bus lanes to/from the stop line. It is assumed that buses turning right from Sundrive Road would weave from the bus lane into the right turn lane There would also be a possible requirement to relocate/provide new signal equipment;
3. **Crumlin Road/Sundrive Road**: Bus lanes are currently provided on Crumlin Road eastern approach to the junction. The junction would need to be upgraded to facilitate a bus lane on the Sundrive Road approach to Crumlin Road. There would also be a possible requirement to relocate/provide new signal equipment;
4. **Sundrive Road/Clogher Road:** The Clogher Road western approach and Sundrive Road northern approaches to this junction would need to be widened to facilitate bus lanes to/from the stop line. There would also be a possible requirement to relocate/provide new signal equipment;
5. **Kildare Road/Bangor Road:** This junction would need to be upgraded to accommodate a bus lane on the southern side of Kildare Road. There would also be a possible requirement to relocate/provide new signal equipment; and
6. **Kildare Road/Windmill Road:** This junction would need to be upgraded to accommodate a bus lane on the southern side of Kildare Road. There would also be a possible requirement to relocate/provide new signal equipment.

CG3b – Bus Lanes in Each Direction

Figure 7.29 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

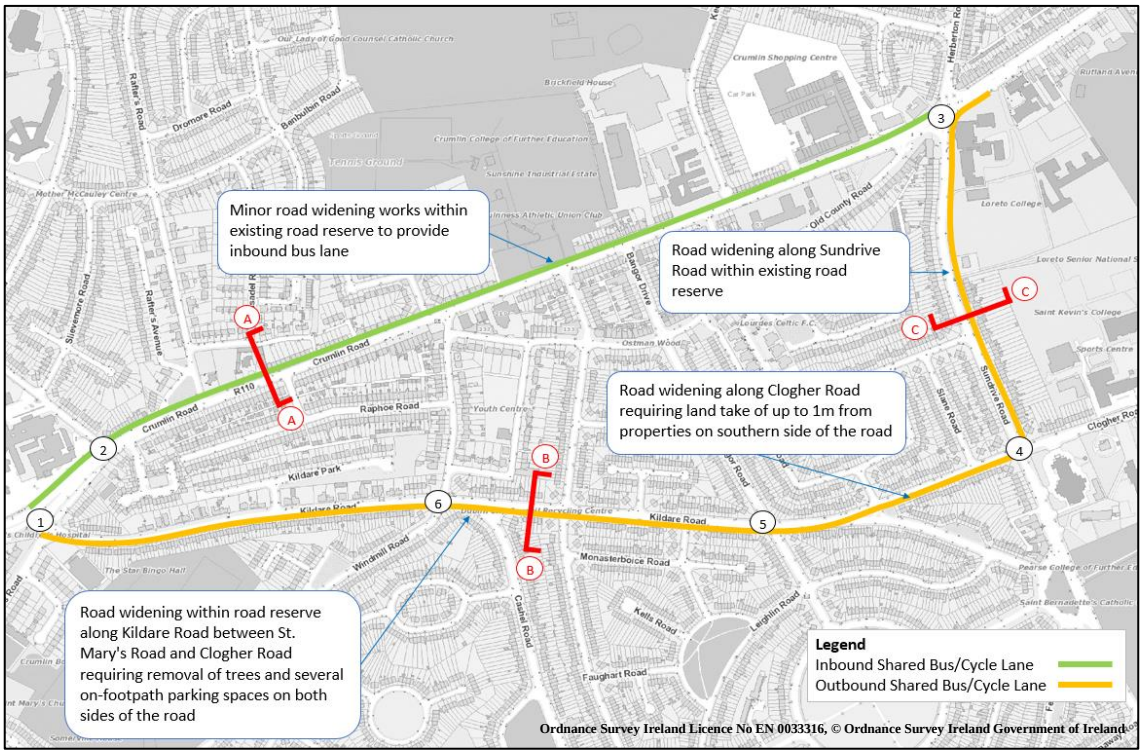


Figure 7.29: Route Option CG3b Indicative Scheme Design

Option CG3b 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. A cross-section on Crumlin Road, Kildare Road and Sundrive Road is illustrated in **Figure 7.30**, **Figure 7.31** and **Figure 7.32** respectively.

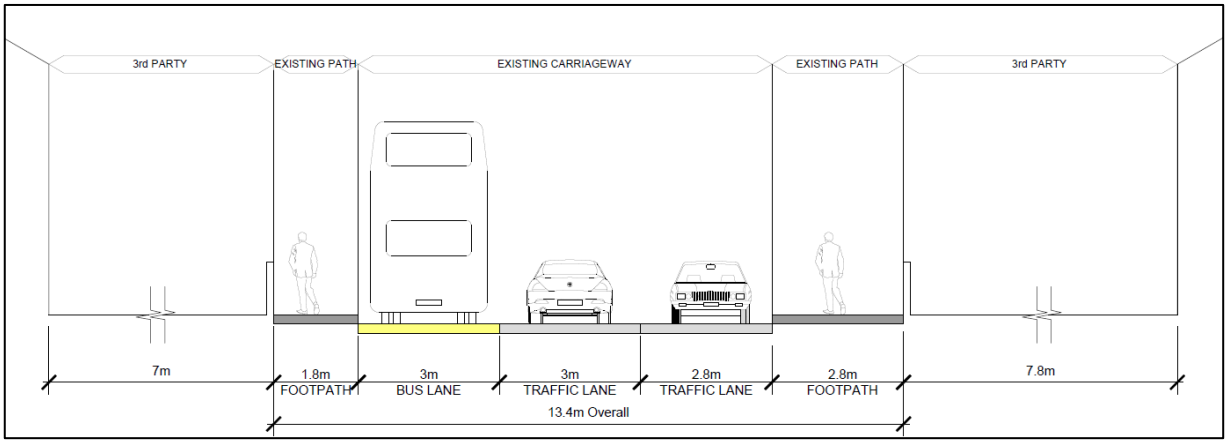


Figure 7.30: CG3b Cross-Section A-A: Crumlin Road

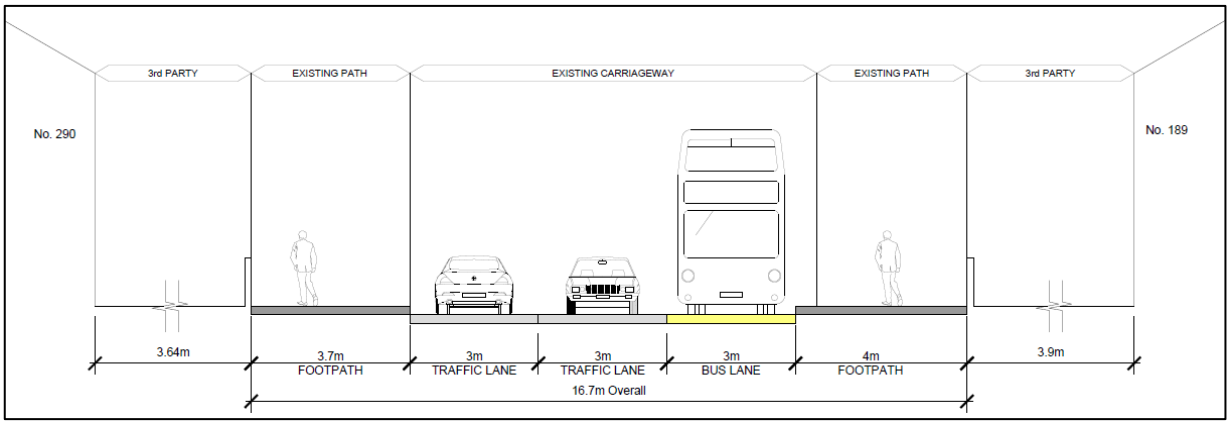


Figure 7.31: CG3b Cross-Section B-B: Kildare Road

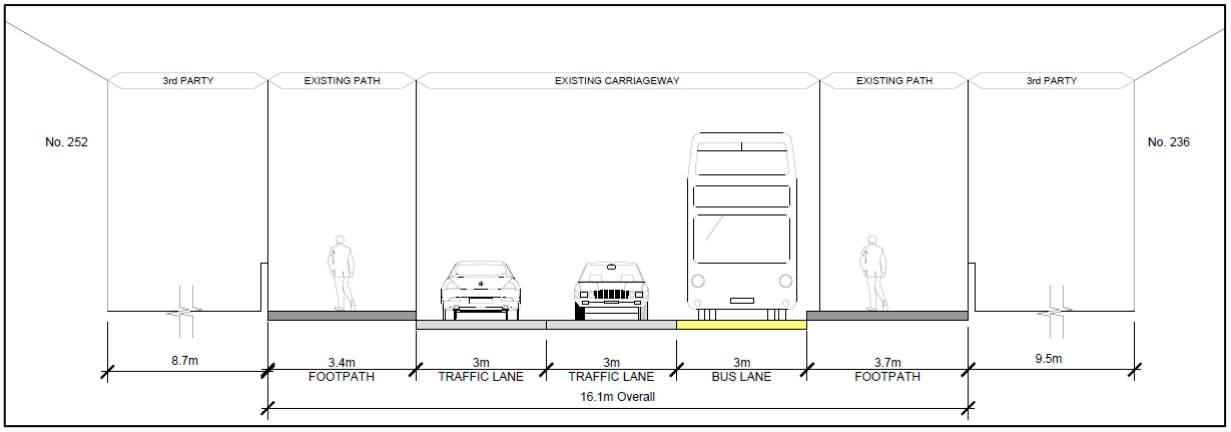


Figure 7.32: CG3b Cross-Section C-C: Sundrive Road

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.

Junctions:

There are 3 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 7.29** and discussed below.

1. **Crumlin Road/Kildare Road:** Bus lanes are currently provided on Crumlin Road. It would be necessary to widen the Kildare Road approach to the junction to provide a bus lane to the stop line. There would also be a possible requirement to relocate/provide new signal equipment;

2. **Sundrive Road/Clogher Road:** The Clogher Road western approach and Sundrive Road northern approaches to this junction would need to be widened to facilitate bus lanes to the stop line. It is assumed that buses turning right from Sundrive Road would weave from the bus lane into the right turn lane There would also be a possible requirement to relocate/provide new signal equipment; and

3. **Crumlin Road/Sundrive Road**: Bus lanes are currently provided on Crumlin Road eastern approach to the junction. The junction would need to be upgraded to facilitate a bus lane on the Sundrive Road approach to Crumlin Road. There would also be a possible requirement to relocate/provide new signal equipment;
4. **Sundrive Road/Clogher Road:** The Clogher Road western approach and Sundrive Road northern approaches to this junction would need to be widened to facilitate bus lanes to the stop line. There would also be a possible requirement to relocate/provide new signal equipment;
5. **Kildare Road/Bangor Road:** This junction would need to be upgraded to accommodate a bus lane on the southern side of Kildare Road. There would also be a possible requirement to relocate/provide new signal equipment; and
6. **Kildare Road/Windmill Road:** This junction would need to be upgraded to accommodate a bus lane on the southern side of Kildare Road. There would also be a possible requirement to relocate/provide new signal equipment.

CG3c –Bus Lane Inbound, No Bus Lane Outbound

Figure 7.33 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

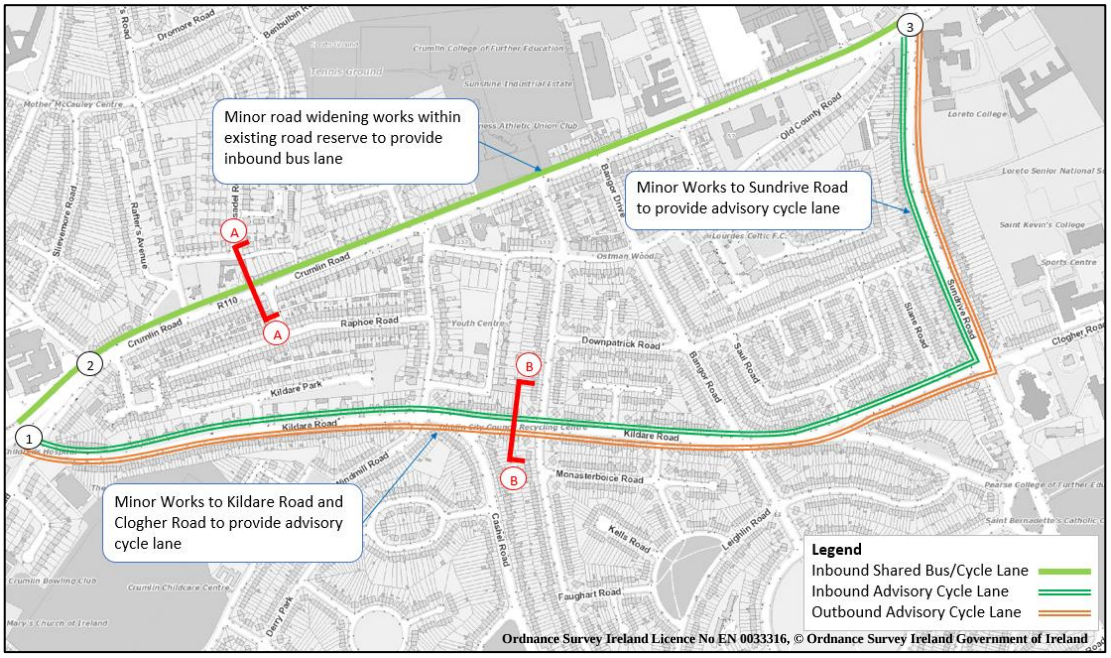


Figure 7.33: Route Option CG3c Indicative Scheme Design

Option CG3c would still require minor widening on 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. Cross-sections on Crumlin Road and Kildare Road are illustrated in **Figure 7.34** and **Figure 7.35** respectively.

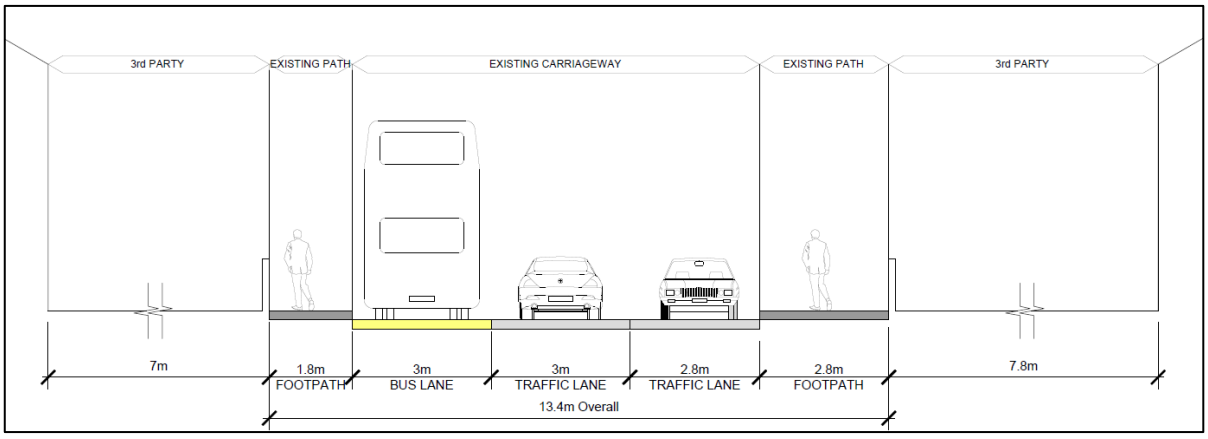


Figure 7.34: CG3c Cross-Section A-A: Crumlin Road

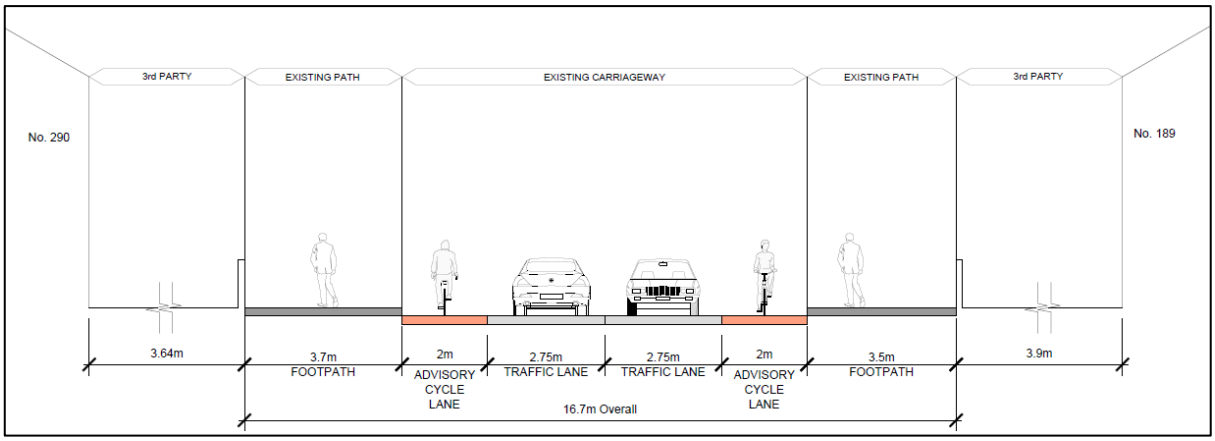


Figure 7.35: CG3c Cross-Section B-B: Kildare Road

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 landtake. 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.

Junctions:

There are 3 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 7.33** and discussed below.

1. **Crumlin Road/Kildare Road:** Bus lanes are currently provided on the Crumlin Road approaches to this junction. As such, only minor works are required to this junction.

2. **Sundrive Road/Clogher Road:** There is limited opportunity to provide any improvements to the layout of this junction as bus lanes are not feasible on either approach to the junction without land-take; and

3. **Crumlin Road/Sundrive Road**: Bus lanes are currently provided on the Crumlin Road eastern approach to the junction. As such, only minor works are required to this junction.

7.2.4 Other Options Considered

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 Crumlin Road and reallocate road space to bus lanes**. Options to divert traffic from Crumlin Road were also considered including making Crumlin Road one-way in either direction for general traffic with bus lanes in each direction. Options to close 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 Crumlin Road along residential roads would detract from the residential environment along Kildare Road. As such, all proposals to reroute traffic from Crumlin Road were discounted.

  Options to use Old County Road for diverted outbound traffic were also considered which would allow 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.

7.2.5 Route Options Assessment

Details of the Stage 2 route options assessment undertaken for the Crumlin to Grand Canal study area section are presented in **Appendix A9 to A11**.

The resulting relative ranking of route options against the scheme assessment sub-criteria is summarised in **Table 7.2**.

Table 7.2: Crumlin Route Options Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	CG1a	CG1b	CG1c	CG1d	CG2a	CG2b	CG2c	CG3a	CG3b	CG3c
Economy	Capital Cost										
	Transport Reliability and Quality of Service										
Integration	Land Use Integration										
	Residential Population and Employment Catchments										
	Transport Network Integration										
	Cycling Integration										
Accessibility & Social Inclusion	Key Trip Attractors										
	Deprived Geographic Areas										
Safety	Road and Pedestrian Safety										
Environment	Archaeology and Cultural Heritage										
	Architectural Heritage										
	Flora and Fauna										
	Soils and Geology										
	Hydrology										
	Landscape and Visual										
	Air Quality										
	Noise & Vibration										
	Land Use Character										

In terms of economy, route option CG2c represents the cheapest solution. The most expensive 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 option CG1 and CG2 rank marginally better as both the inbound and outbound routing is along the same route. Scheme options along route 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, routes CG1 coincides with more Dublin Bus routes and as such schemes along these routes rank higher than those along route option 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 GDA Cycle Network Plan 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 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 options CG1b, CG1c and CG1d which necessitate the removal of existing cycle lanes on Crumlin Road. It should be noted however that 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 such as CG1a, CG2a, CG2b and CG3a.

A summary of the assessment and relative ranking of route options against the five main assessment criteria is presented in **Table 7.3**.

Table 7.3: Crumlin Route Options Assessment Summary (Main Criteria)

Assessment Criteria	CG1 a	CG1 b	CG1 c	CG1 d	CG2 a	CG2 b	CG2 c	CG3 a	CG3 b	CG3 c
Economy										
Integration										
Accessibility & Social Inclusion										
Safety										
Environment										

Based on the assessment undertaken, route options CG1b, CG1c and CG1d offer more benefits over other options. However, the primary differentiator between these options is that CG1b offers better physical bus priority and better journey time reliability. Option **CG1b** therefore better meets the 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. Furthermore any scheme design would be sensitive to the buildings status and would unlikely result in any material impact on the buildings.

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

7.2.7 Route Description

Following the Stage 1 sift only one route option was identified between Sundrive Road and Dolphin Road as described below. This route is identified as route C09 in **Figure 7.2**.

Inbound: This section of route would run along Crumlin Road between Sundrive Road and Dolphin Road.

Outbound: The outbound routing would follow the same roads as the inbound routing.

Stops: One inbound bus stop and 2 outbound bus stops would be provided along this route section.

7.2.7.1 Concept Scheme Design

On Crumlin Road between Sundrive Road and the Dolphin Road, there are currently bus lanes in each direction. Under these proposals, these bus lanes would be maintained.

This road also forms part of Primary Route 8 in the GDA Cycle Network Plan. 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 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 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.

8 Study Area Section 4: Grand Canal to Christchurch

8.1 Stage 1: Route Options Assessment

As with all other route sections, there are a large number of potential end-to-end routes within the Section 4 study area, the roads available for CBC routing have been subdivided into shorter sections for the purposes of the Stage 1 route options sifting process. Following the route sifting process, remaining routes have been combined to form longer routes where possible.

Figure 8.1 presents the initial potential route options identified. A summary of the Stage 1 route options sifting process is presented in **Table 8.1**.

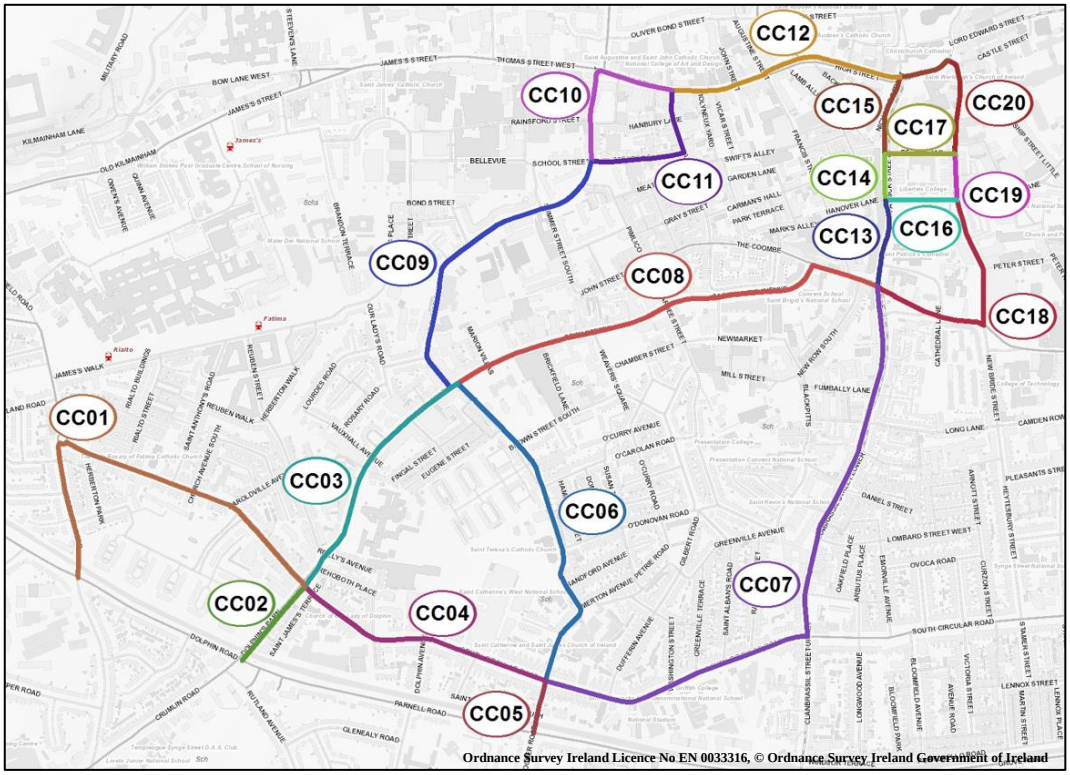


Figure 8.1: Section 4 Route Options – Grand Canal to Christchurch

Table 8.1: Section 4 Route Option Sifting (Stage 1) Summary – Grand Canal to Christchurch

Route	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
CC01	Herberton Road/South Circular Road (Dolphin Road to Dolphins Barn Street)	Secondary Route C7	This is a circuitous route off the core corridor which passes through Rialto Village Centre. These roads are a single lane in each direction and the provision of bus and cycle lanes in each direction, would require land acquisition and removal of on-street parking. Furthermore, this route option does not connect to any feasible route option to the south, and is therefore not considered any further.	Fail
CC02	Dolphins Barn (Dolphin Road to South Circular Road)	Primary Route 8	Dolphins Barn consists of a single traffic lane and bus lane in each direction, and is therefore progressed to the next assessment stage.	Pass
CC03	Dolphins Barn Street/Cork Street (South Circular Road to Donore Avenue)	Primary Route 8	This short section of Dolphins Barn Street/Cork Street consists of a single traffic lane, bus lane and cycle lane in each direction and is therefore progressed to the next assessment stage.	Pass
CC04	South Circular Road (Dolphins Barn Street to Donore Avenue)	Secondary Route C7	This section of South Circular Road consists of a single traffic lane and bus lane in the inbound direction, and a single traffic lane only in the outbound direction. The bus lane is currently only operational during the 3 hour morning peak period, and is open to parking outside of these hours. While this route option currently has a bus lane and is a feasible route, there is a more direct, less constrained alternative along Cork Street (CC03 and CC08). As such, this route option has not been considered any further.	Fail
CC05	Donore Avenue (Parnell Road to South Circular Road)	Secondary Route 8C	Donore Avenue carries a single lane of traffic in each direction. There is potential to widen the road to provide a short section of bus lane in one direction between the bridge and South Circular Road. However, this route option does not connect to any feasible route option to the south, and is therefore not considered any further.	Fail
CC06	Donore Avenue (South Circular Road to Cork Street)	Secondary Route 8C	Donore Avenue is a traffic calmed residential road with on street parking along much of its length. There is limited potential to widen the road to provide bus or cycle lanes. Combining this route with other route options (CC07, CC08, or CC09) would result in a circuitous route, and as such this route option is not considered any further.	Fail
CC07	South Circular Road/Clanbrassil Street/New Street South (Donore Avenue to Cork Street)	Secondary Route C7 / Secondary Route 9B	Between Donore Avenue and Clanbrassil Street, South Circular Road consists of a single traffic lane and bus lane in the inbound direction, and a single traffic lane only in the outbound direction. The bus lane is currently only operational during the 3 hour morning peak period, and is open to parking outside of these hours. There may be some potential to remove on-street parking along the road to provide an outbound bus lane along part of this section.	Fail

Route	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
			Most of Clanbrassil Street within this section consists of a bus lane and traffic lane in the inbound direction and two traffic lanes in the outbound direction. There is potential to provide a bus and cycle lanes in each direction by converting one of the traffic lanes to a bus lane, removing on-street car parking and/or removing the central median. While this route option currently has a bus lane and offers potential to provide a bus lane in the other direction, there is a more direct, less constrained alternative along Cork Street (CC03 and CC08). As such this route option has not been considered any further.	
CC08	Cork Street/The Coombe/Dean Street (Donore Avenue to Patrick Street)	Primary Route 8	This section of Cork Street consists of a single traffic lane, and bus lane in each direction. Along The Coombe and Dean Street, there is limited opportunity to widen the road due to the proximity of buildings to the road. Given the good facilities already in place along Cork Street, this option is progressed to the next assessment stage.	Pass
CC09	Marrowbone Lane	Primary Route 7B / Feeder Route	Marrowbone Lane between Cork Street and Robert Street consists of a single lane in each direction. There is no scope to widen the road to provide bus and cycle lanes on this section. Between Robert Street and School Street there is scope to widen within the existing road reserve to provide a bus lane in one direction or in both directions with some land acquisition. However, this route does not connect to any feasible option and as such this route option is not considered any further.	Fail
CC10	Thomas Court/Thomas Street	Secondary Route 7A / Primary Route 7A	Thomas Court is a narrow road which accommodates one-way southbound traffic only. On-street car parking is provided along its length serving several residential properties without driveways. The provision of bus and cycle lanes in either direction would require the removal of on-street car parking. However, it is noted that traffic volumes are likely light and therefore the bus lanes are not necessarily required. This route could be used in tandem, with route CC11 providing the inbound route and Thomas Court providing the outbound route. However, the route is somewhat circuitous and does not offer any benefits over the existing core corridor along Cork Street and as such it is not considered any further.	Fail
CC11	Earl Street South/Meath Street	Primary Route 7B	Earl Street South is a narrow road which accommodates one-way inbound traffic only. On-street car parking is provided along its length serving several residential properties without driveways. The provision of bus and cycle lanes in either direction would require the removal of on-street car parking. However, it is noted that traffic volumes are likely light and therefore bus lanes are not necessarily required.	Fail

Route	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
			Meath Street is one-way northbound. There is no scope to provide a bus lane on approach to the Thomas Street junction. As noted under route CC10, this route, when used in combination with CC10, is somewhat circuitous and does not offer any benefits over the existing core corridor along Cork Street. As such, is not considered any further.	
CC12	Thomas Street/High Street	Primary Route 7	Between Meath Street and Francis Street, bus and cycle lanes are currently provided in each direction. Between Francis Street and High Street there is no bus lane provided in either direction, but a bus lane is provided in the outbound direction between Nicholas Street and Back Lane. However, this route does not connect to any feasible option, and as such this route option is not considered any further.	Fail
CC13	Patrick Street (Dean Street to Bull Alley Street)	Secondary Route 9B	This section of Patrick Street consists of a bus lane, an advisory cycle lane, and traffic lane in the northbound direction, and two traffic lanes and an advisory cycle lane in the southbound direction. There is potential to provide a bus lane in the outbound direction by converting one of the traffic lanes to a bus lane or widening the road by narrowing the footpath on the eastern side of the road.	Pass
CC14	Patrick Street (Bull Alley Street to Bride Road)	Secondary Route 9B	This section of Patrick Street consists of a bus lane, advisory cycle lane and traffic lane in the northbound direction and two traffic lanes and an advisory cycle lane in the southbound direction. There is potential to provide a bus lane in the outbound direction by converting one of the traffic lanes to a bus lane, or widening the road by narrowing the footpath on the eastern side of the road.	Pass
CC15	Nicholas Street/ Christchurch Place (Bride Road to Werburgh Street)	Secondary Route 9B	Northbound Nicholas Street consists of three traffic lanes flaring to four at the junction with High Street. There is potential to provide a bus lane inbound by converting a traffic lane to a bus lane. Outbound, a traffic lane could be converted to bus lane. Inbound, Christchurch Place consists of two traffic lanes, one of which is a right turn lane into Werburgh Street. Outbound, there are 2 traffic lanes. There is potential to provide a bus lane in one direction through this section.	Pass
CC16	Bull Alley Street (Bride Street to Patrick's Street)	N/A	Bull Alley Street is one-way outbound with a contra-flow cycle lane. Coach parking is provided on the southern side of the road. At Patrick's Street, turn movements are restricted to left out only. A bus lane on this section would require the removal of the coach parking. Furthermore, the junction with Patrick's Street would need to be converted to traffic signals to ensure buses could enter and exit Bull Alley Street. On balance, this route option is not considered to be feasible.	Fail

Route	Description	Part of GDA Cycle Network	Comments	Pass/ Fail
CC17	Bride Road (Bride Street to Nicholas Street)	N./A	Bride Road is one-way outbound and carries two lanes of traffic. On-street parking is present on the northern side of the road. This road is very busy in peak hours and removal of a traffic lane to facilitate bus lanes would further restrict this important link.	Fail
CC18	Bride Street/Kevin Street Upper (Bull Alley Street to Patrick Street)	Primary Route 9 / Primary Route 8	This section of Bride Street consists of a bus lane in the southbound direction and a single traffic lane northbound. There is limited opportunity to provide an inbound bus lane. Kevin Street consists of two traffic lanes in each direction, and one lane could be converted to a bus lane. This route could form part of the outbound CBC, forming a loop with Bride Street/Werburgh Street (CC19, CC20) and with Patrick Street/Christchurch Place forming the corresponding inbound part of the loop (CC13, CC14, CC15).	Pass
CC19	Bride Street (Bull Alley Street to Patrick Street)	Primary Route 9	This section of Bride Street consists of a single traffic lane in each direction. There is limited opportunity to provide a bus lane in either direction. However, reduced bus lane priority through this short section may be acceptable. This route could form part of the outbound CBC, forming a loop with Bride Street/Werburgh Street (CC18, CC20), and with Patrick Street/Christchurch Place forming the corresponding inbound part of the loop (CC13, CC14, CC15).	Pass
CC20	Werburgh Street (Christchurch Place to Bride Road)	Primary Route 9	Werburgh Street is one-way southbound and consists of two traffic lanes. A bus lane could be provided to shortly in advance of Bride Road by converting one traffic lane to a bus lane. This route could form part of the outbound CBC forming a loop with Bride Street (CC18, CC19), and with Patrick Street/Christchurch Place forming the corresponding inbound part of the loop (CC13, CC14, CC15).	Pass

Following the Stage 1 sift, 9 of the 16 route options assessed passed the initial sifting stage and were progressed to the next assessment stage. These route options are presented in **Figure 8.2**.

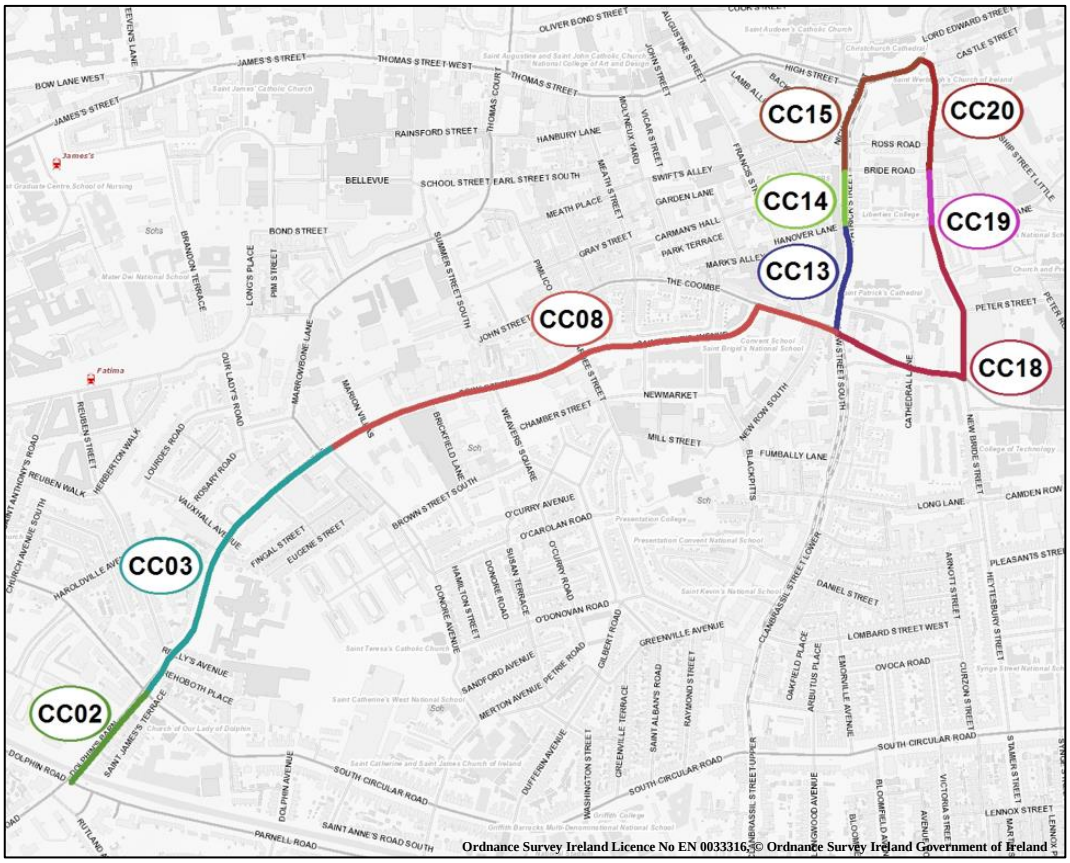


Figure 8.2: Section 4 Route Options Remaining After Stage 1 Assessment

8.2 Stage 2: Route Options Assessment

Following the Stage 1 sift for the Grand Canal to Christchurch study area, there was only one route option between the canal and Patrick Street. However, there were 2 route options available for the remainder of the route.

- GC1 - A route option via Patrick Street/Nicholas Street; and
- GC2 - A route option inbound via Patrick Street/Nicholas Street and outbound via Werburgh Street, Bride Street and Kevin Street Upper.

A number of scheme options along the routes described above were explored covering a range of different of different interventions. These are described in detail in the following sections.

8.2.1 Fixed Route Section: Dolphins Barn/Cork Street between the Grand Canal and Patrick Street

8.2.1.1 Route Description

Following the Stage 1 sift only one route option was identified between the Grand Canal and Patrick Street as described below. This route is formed by a combination of route CC02, CC03 and CC08 which are presented in **Figure 8.2**.

Inbound: This section of route would run along Dolphins Barn, Dolphins Barn Street and Cork Street before turning right onto Dean Street.

Outbound: The outbound routing would follow the same roads as the inbound routing.

Stops: A total of 6 stops would likely be provided in each direction along this route section.

8.2.1.2 Concept Scheme Design

Between the canal and 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 stopline, it is proposed to ban the left turn from Dolphins Barn south of its junction with 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 Cork Street to 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 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 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.

8.2.2 Route Option GC1: Patrick Street and Nicholas Street

Route Option GC1 is presented in **Table 8.3** and described in the following text.

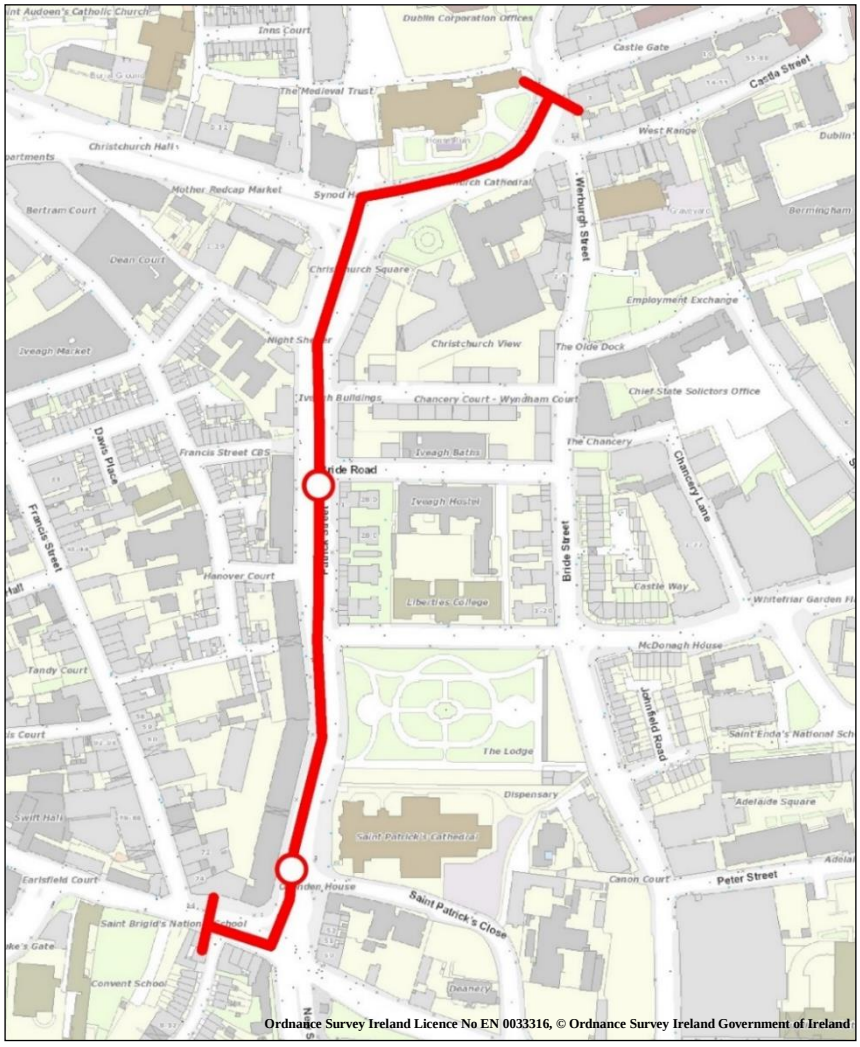


Figure 8.3: Route Option GC1

Inbound: This route option runs along Patrick Street and Nicholas Street.

Outbound: The outbound routing would follow the same route as the inbound routing.

Stops: A total of 2 stops in each direction would likely be provided along this route option.

8.2.2.1 Indicative Scheme Design

GC1a – Remove Central Median on Patrick Street/Nicholas Street

The indicative scheme design for this option is illustrated in **Figure 8.8**. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

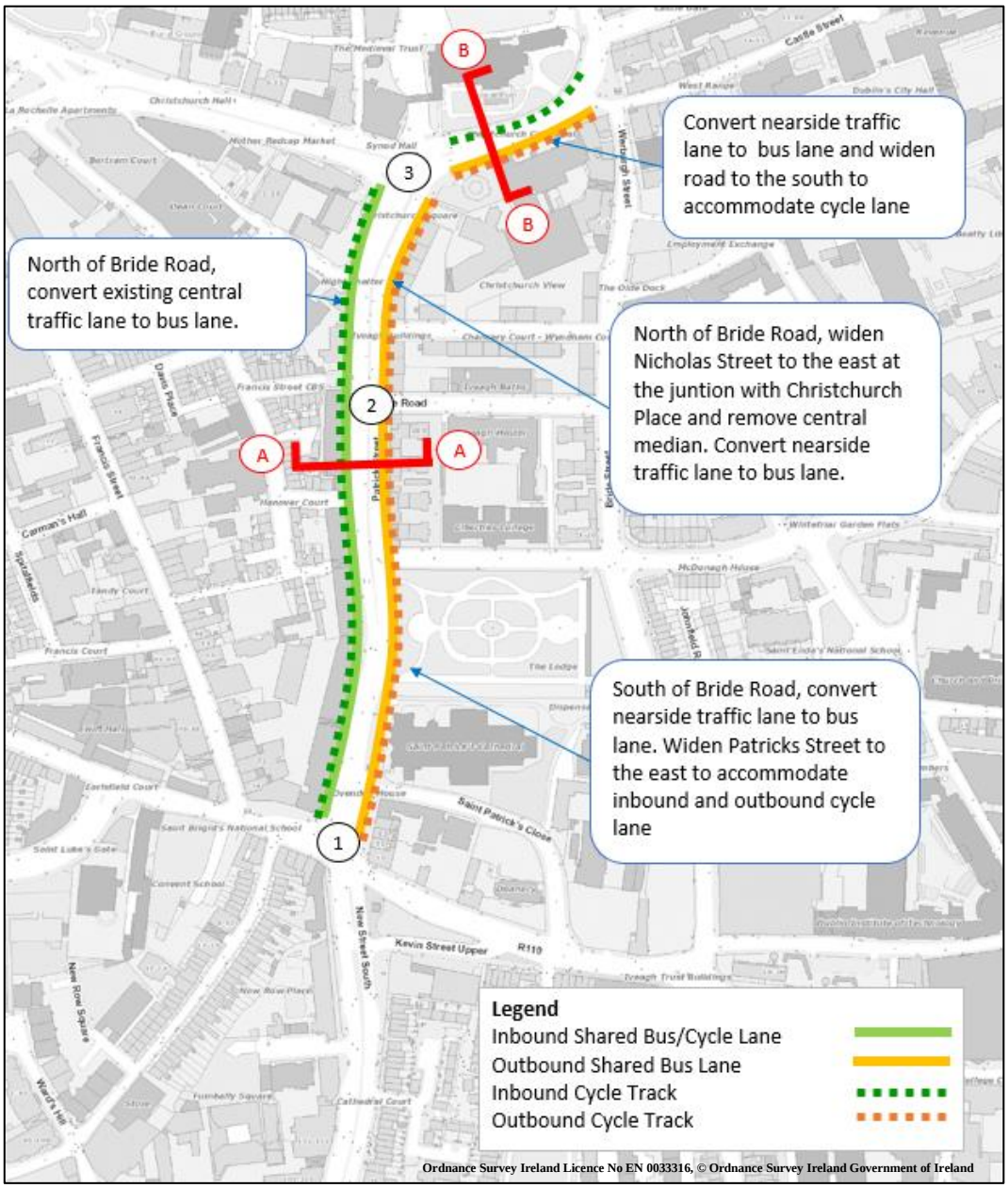


Figure 8.4: GC1a Indicative Scheme Design

This option would provide bus lanes and raised adjacent cycle lanes along each side of Patrick Street/Nicholas Street by widening the road to the east by up to 3m and removing the central median and associated trees.

Inbound, 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 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.

A cross-section on Patrick Street is presented in **Figure 8.5**.

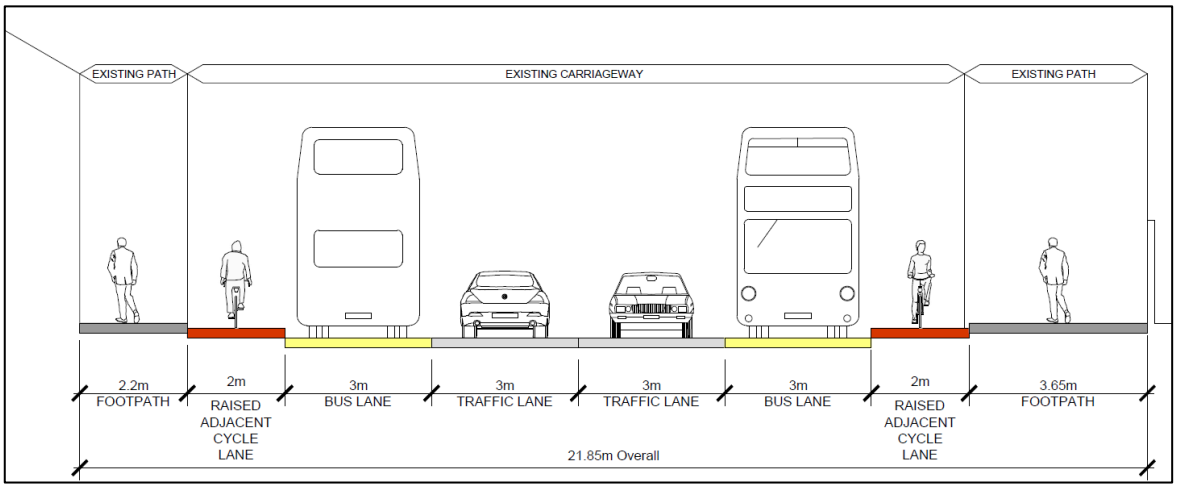


Figure 8.5: GC1a Cross-Section A-A: Patrick Street

Along 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 Nicholas Street. Dedicated inbound and outbound raised adjacent cycle lanes would also be possible by widening Christchurch Place to the south by up to 1m.

A cross-section on Christchurch Place is presented in **Figure 8.6**.

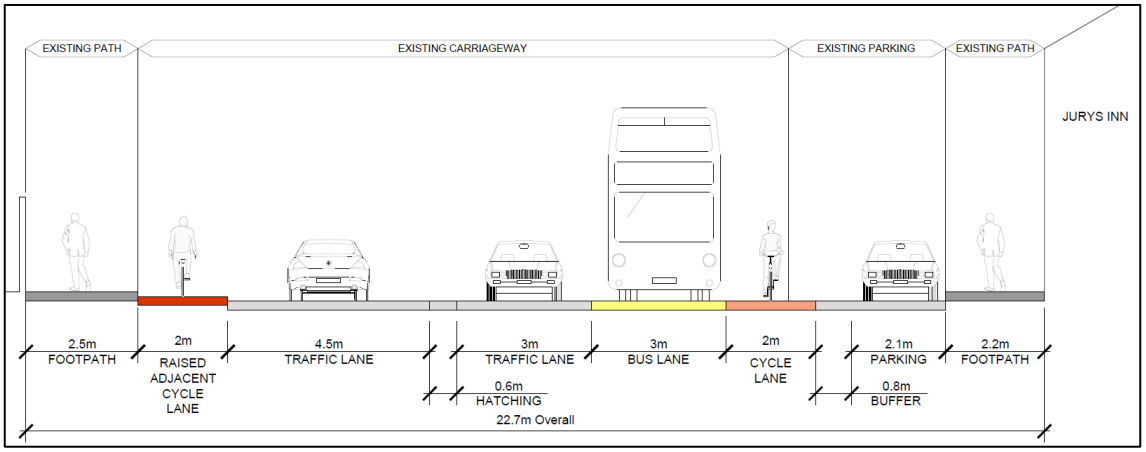


Figure 8.6: GC1a Cross-Section B-B: Christchurch Place

Junctions:

There are 3 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 8.4** and discussed below.

1. **Dean Street/Patrick Street/Kevin Street Upper:** It is proposed to provide a bus lane on the Patrick Street approach to the junction. However consideration would need to be given to how buses would get from the bus lane to the right turn lane into The Coombe. For the purposes of this assessment it is assumed that buses would weave across from the bus lane to the right turn lane in advance of the junction with a yellow box provided in the traffic lanes at this location to allow buses to move across when traffic is stationary. However, in developing the design it may be possible to provide a bus lane to the stop line and allow right turning buses to turn in its own signal stage;
2. **Patrick Street/Bride Road:** Some minor adjustments may be required at this junction to facilitate bus lanes in the outbound direction; and
3. **Nicholas Street/High Street/Christchurch Place**: Some minor adjustments may be required at this junction to accommodate bus lanes to the stop line on the Nicholas Street and Christchurch Place approaches. To accommodate right turning buses from Nicholas Street, it will be necessary to assign the middle lane as a bus lane. A yellow box would be provided in the traffic lane at this location to allow buses to move across when traffic is stationary.

GC1b – Maintain Central Median on Patrick Street/Nicholas Street

Route Sections:

Figure 8.7 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

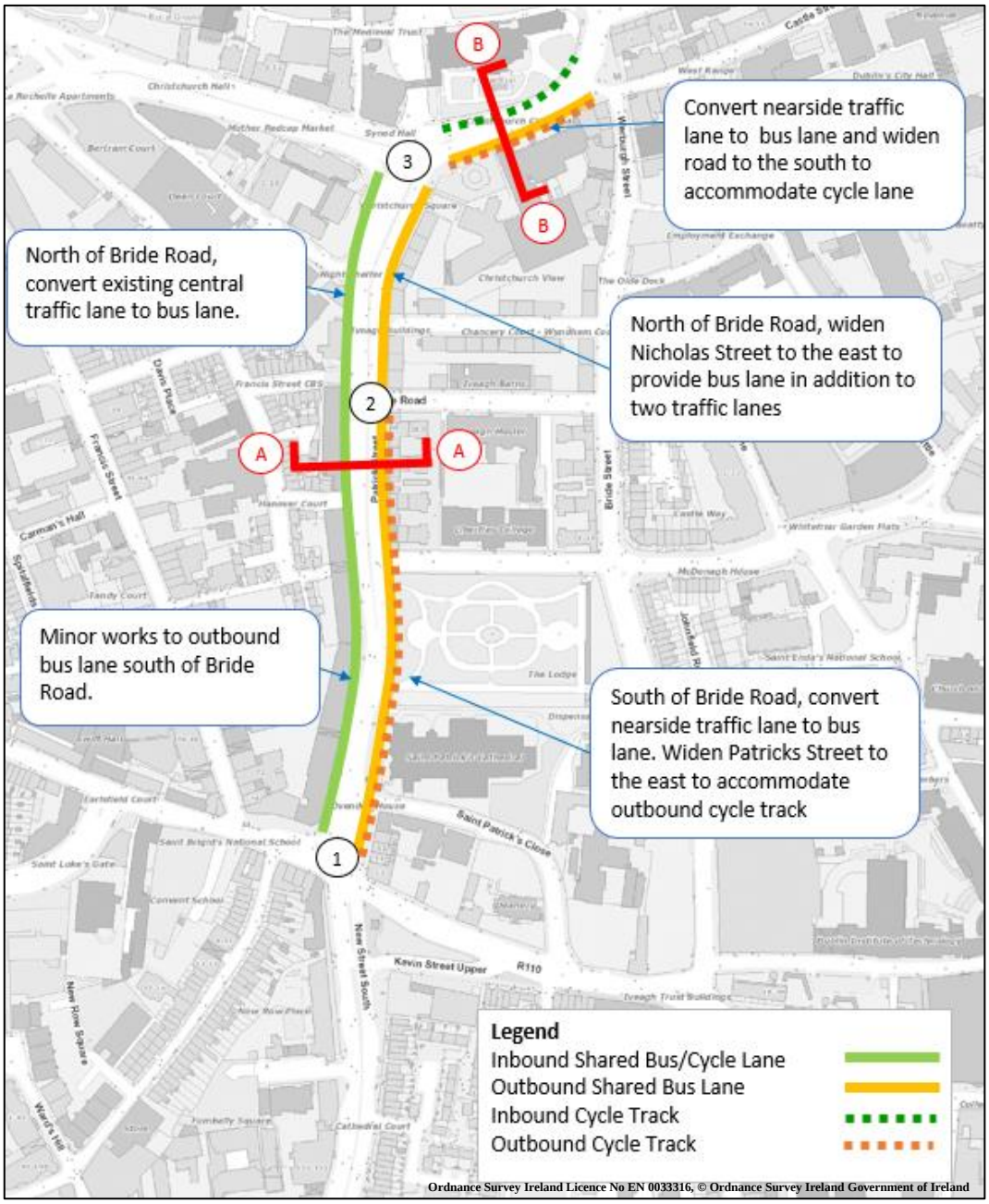


Figure 8.7: Route Option GC1b Indicative Scheme Design

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 Patrick Street and 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 Patrick Street and Nicholas Street.

Outbound, between 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.

A cross-section on Patrick Street is presented in **Figure 8.8**.

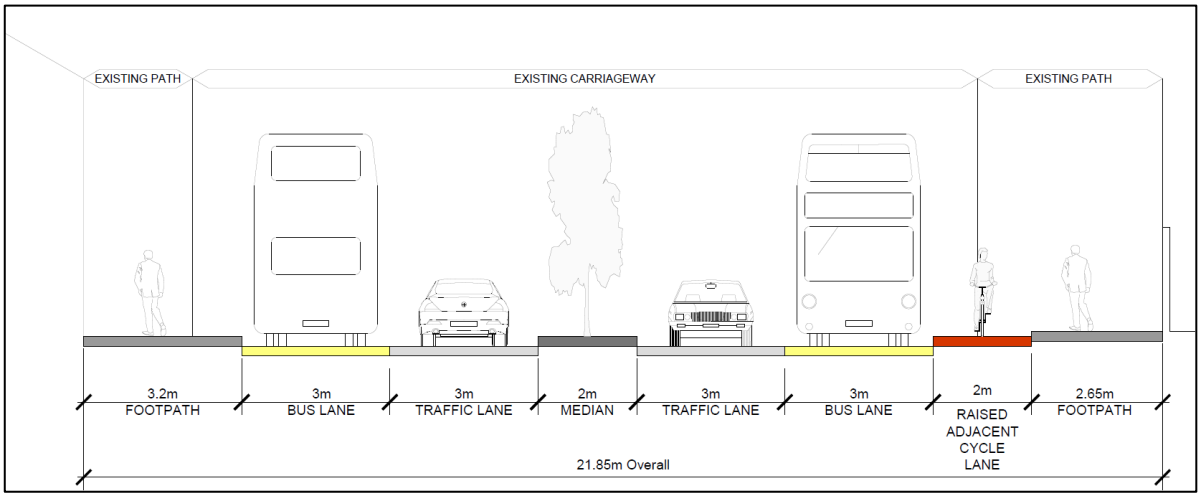


Figure 8.8: GC1b Cross-Section A-A: Patrick Street

Along 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 Nicholas Street. Dedicated inbound and outbound raised adjacent cycle lanes would also be provided by widening Christchurch Place to the south by up to 1m.

A cross-section on Christchurch Place was previously presented in **Figure 8.6**.

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Inbound bus lane on Patrick Street/Nicholas Street between Kevin Street Upper and Christchurch Place;
- Outbound bus lane on Patrick Street/Nicholas Street between Christchurch Place and Kevin Street Upper; and
- Outbound raised adjacent cycle lane between Bride Road and Kevin Street Upper.

Junctions:

There are 3 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 8.7** and discussed below:

1. **Dean Street/Patrick Street/Kevin Street Upper:** It is proposed to provide a bus lane on the Patrick Street approach to the junction. However consideration would need to be given to how buses would get from the bus lane to the right turn lane into The Coombe. For the purposes of this assessment it is assumed that buses would weave across from the bus lane to the right turn lane in advance of the junction with a yellow box provided in the traffic lanes at this location to allow buses to move across when traffic is stationary. However, in developing the design it may be possible to provide a bus lane to the stop line and allow right turning buses to turn in its own signal stage;
2. **Patrick Street/Bride Road:** Some minor adjustments may be required at this junction to facilitate bus lanes in the outbound direction; and
3. **Nicholas Street/High Street/Christchurch Place**: Some minor adjustments may be required at this junction to accommodate bus lanes to the stop line on the Nicholas Street and Christchurch Place approaches. To accommodate right turning buses from Nicholas Street, it will be necessary to assign the middle lane as a bus lane. A yellow box would be provided in the traffic lane at this location to allow buses to move across when traffic is stationary.

GC1c – 2-Way buses on Patrick Street/Nicholas Street, Cyclists on Werburgh Street

Figure 8.9 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

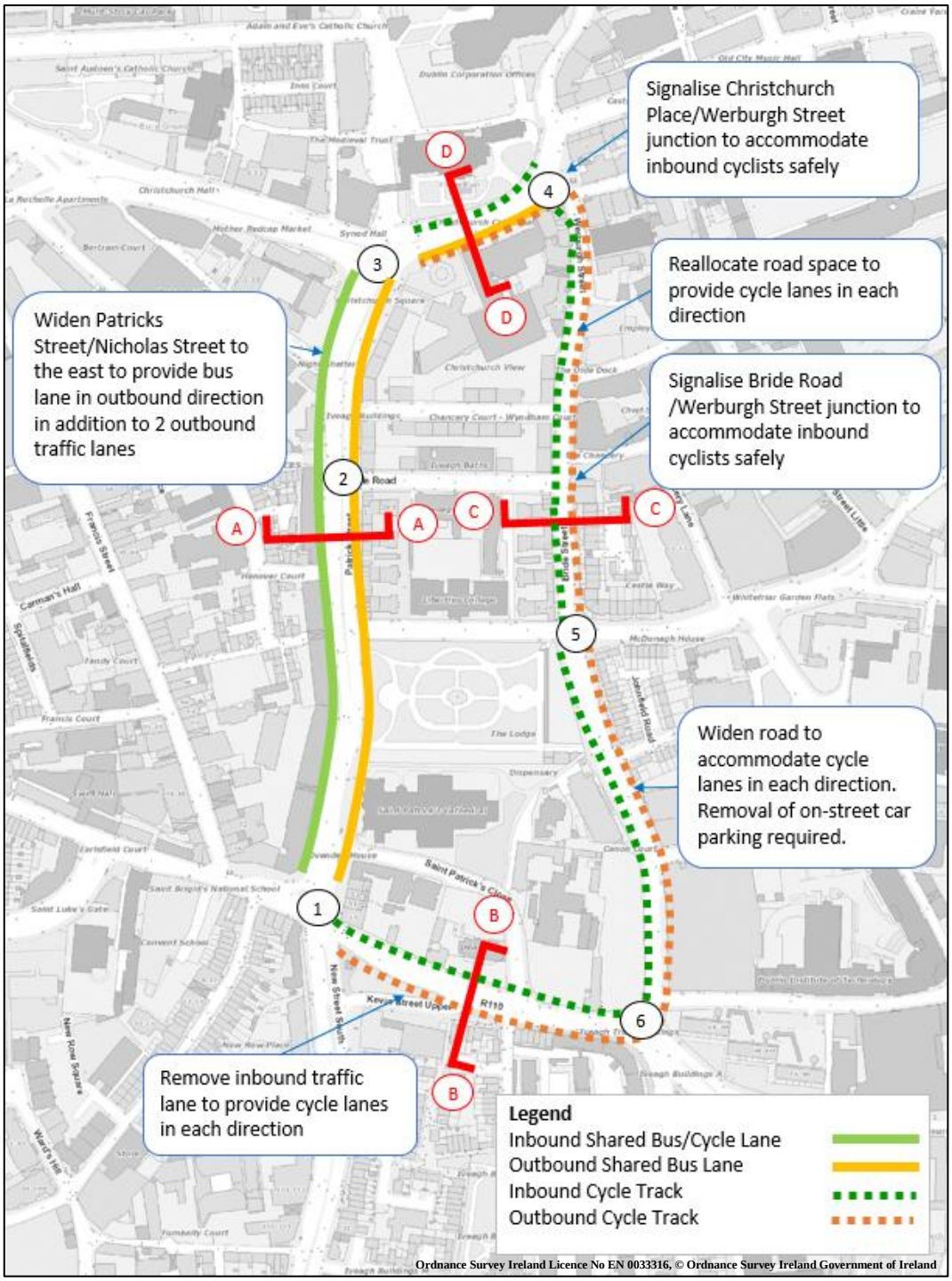


Figure 8.9: Route Option GC1c Indicative Scheme Design

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 Patrick Street and 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 Patrick Street and 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.

A cross-section on Patrick Street is presented in **Figure 8.10**.

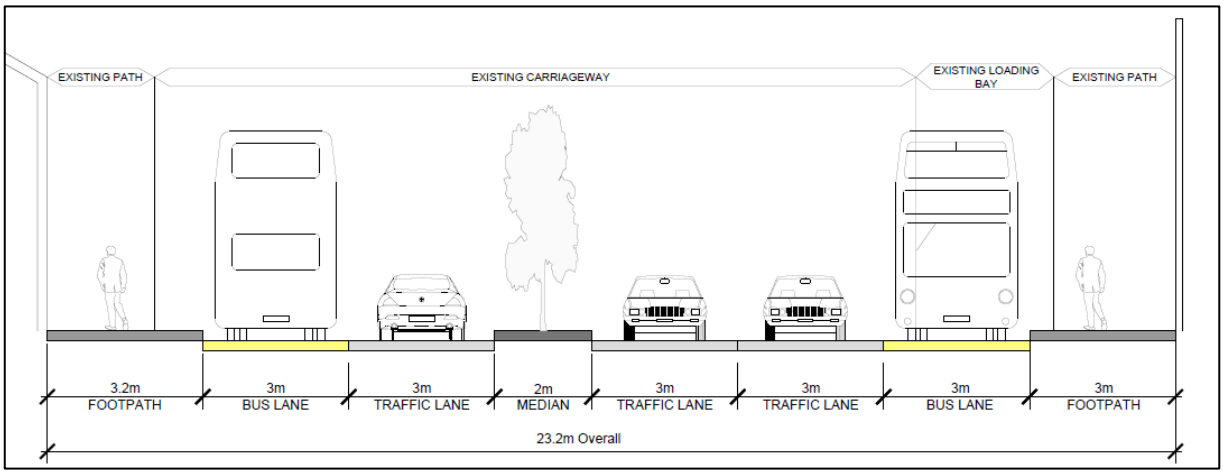


Figure 8.10: GC1c Cross-Section A-A: Patrick Street

Along 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 Nicholas Street. Dedicated inbound and outbound raised adjacent cycle lanes would also be provided by widening Christchurch Place to the south by up to 1m.

A cross-section on Christchurch Place was previously presented in **Figure 8.6**.

Patrick Street / Nicholas Street is identified as a secondary cycle route in the GDA Cycle Network Plan, 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 Cycle Network Plan. 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.

A cross-section on Kevin Street Upper and Bride Street is presented in **Figure 8.11** and **Figure 8.12** respectively.

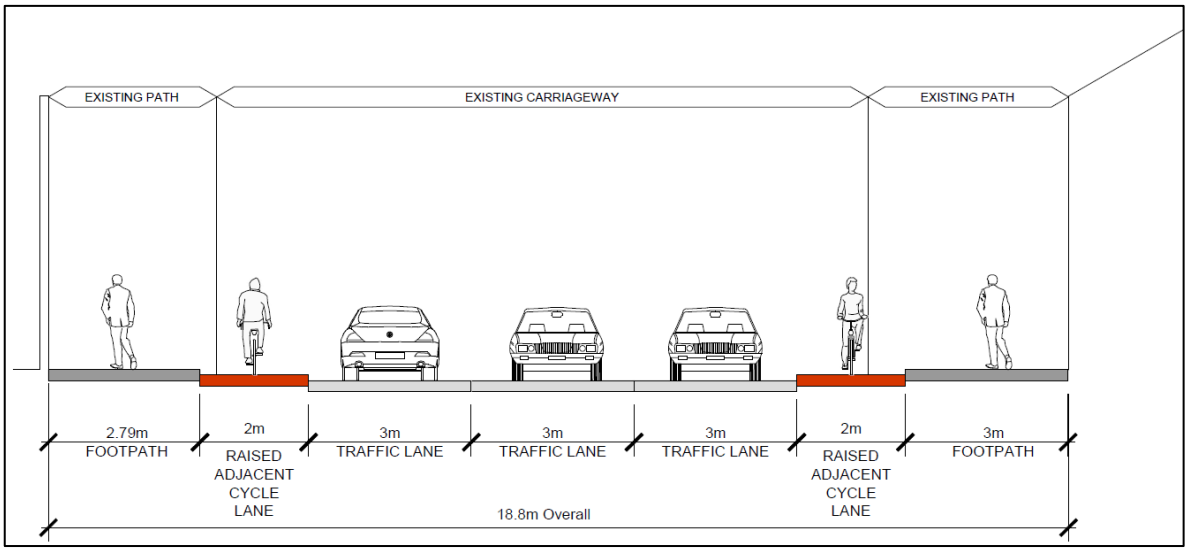


Figure 8.11: GC1c Cross-Section B-B: Kevin Street Upper

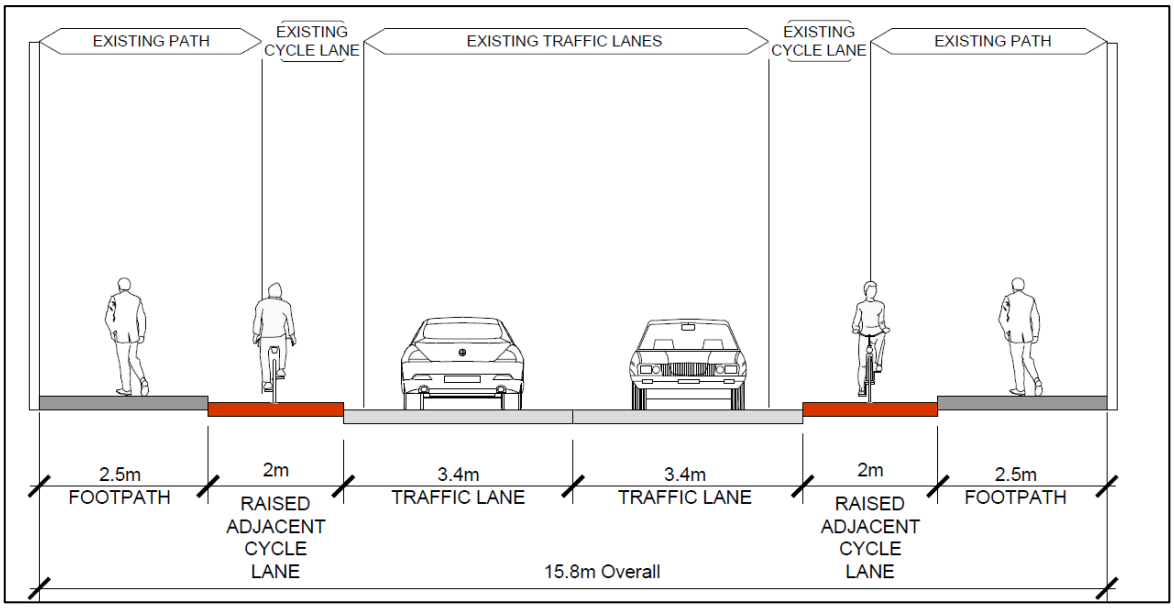


Figure 8.12: GC1c Cross-Section C-C: Bride Street

In summary, this route option would, subject to confirmation at the scheme design stage, result in the following characteristics:

- Inbound bus lane on Patrick Street/Nicholas Street between Kevin Street Upper and Christchurch Place;
- Outbound bus lane on Patrick Street/Nicholas Street between Christchurch Place and Kevin Street Upper; and
- Raised adjacent cycle lanes in each direction along Werburgh Street / Bride Street.

Junctions:

There are 5 signalised junctions along this route option, which would require upgrading to facilitate bus priority and/or cycle facilities. The location of these junctions are presented in **Figure 8.9** and discussed below.

1. **Dean Street/Patrick Street/Kevin Street Upper:** It is proposed to provide a bus lane on the Patrick Street approach to the junction. However consideration would need to be given to how buses would get from the bus lane to the right turn lane into The Coombe. For the purposes of this assessment it is assumed that buses would weave across from the bus lane to the right turn lane in advance of the junction with a yellow box provided in the traffic lanes at this location to allow buses to move across when traffic is stationary. However, in developing the design it may be possible to provide a bus lane to the stop line and allow right turning buses to turn in its own signal stage;
2. **Patrick Street/Bride Road:** Some minor adjustments may be required at this junction to facilitate bus lanes in the outbound direction;
3. **Nicholas Street/High Street/Christchurch Place**: Some minor adjustments may be required at this junction to accommodate bus lanes to the stop line on the Nicholas Street and Christchurch Place approaches. To accommodate right turning buses from Nicholas Street, it will be necessary to assign the middle lane as a bus lane. A yellow box would be provided in the traffic lane at this location to allow buses to move across when traffic is stationary; and
4. **Werburgh Street/Christchurch Place Junction:** This junction is currently a priority controlled junction with no exit from Werburgh Street. To facilitate the safe movement of inbound cyclists from Werburgh Street to the northern side of Christchurch Place it would be necessary to provide a crossing at this location or upgrade the junction to traffic signals. For the purposes of this assessment, it is assumed that the junction would be upgraded to traffic signals.
5. **Bride Road/Werburgh Street:** This junction is currently a priority controlled junction with no exit from Bride Road. To facilitate the safe movement of inbound cyclists on Bride Street/Werburgh Street from the southern side of Bride Road to the northern side of the Bride Road it would be necessary to upgrade the junction to traffic signals.
6. **Bride Street/Kevin Street Upper:** No major changes are required to this junction to facilitate cycle lanes.

8.2.3 Route Option GC2: Patrick Street and Nicholas Street (Inbound Route) and Werburgh Street, Bride Street and Kevin Street Upper (Outbound Route)

Route Option GC2 is presented in **Figure 8.13** and described in the following text.

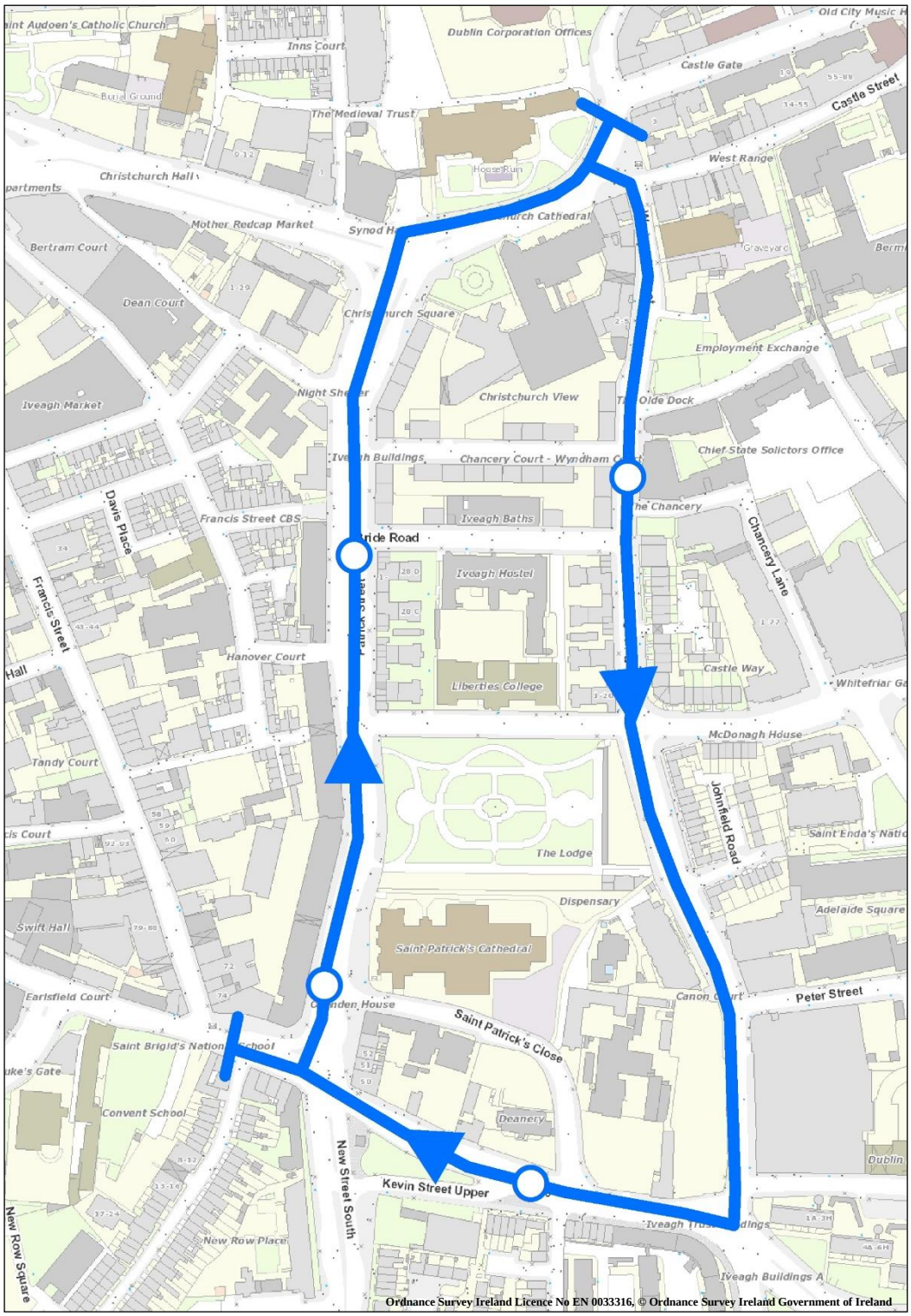


Figure 8.13: Route Option GC2

Inbound: This route option runs along Patrick Street and Nicholas Street.

Outbound: Outbound, the route would turn onto Werburgh Street which continues onto Bride Street. The route would turn right onto Kevin Street Upper before re-joining the core route on The Coombe.

Stops: A total of 2 stops would likely be provided in each direction along this route option.

8.2.3.1 Indicative Scheme Design

Route Sections:

Figure 8.14 illustrates the indicative scheme design for this route option. The location of cross-sections and junctions referenced in subsequent sections describing this route option are also presented in this figure.

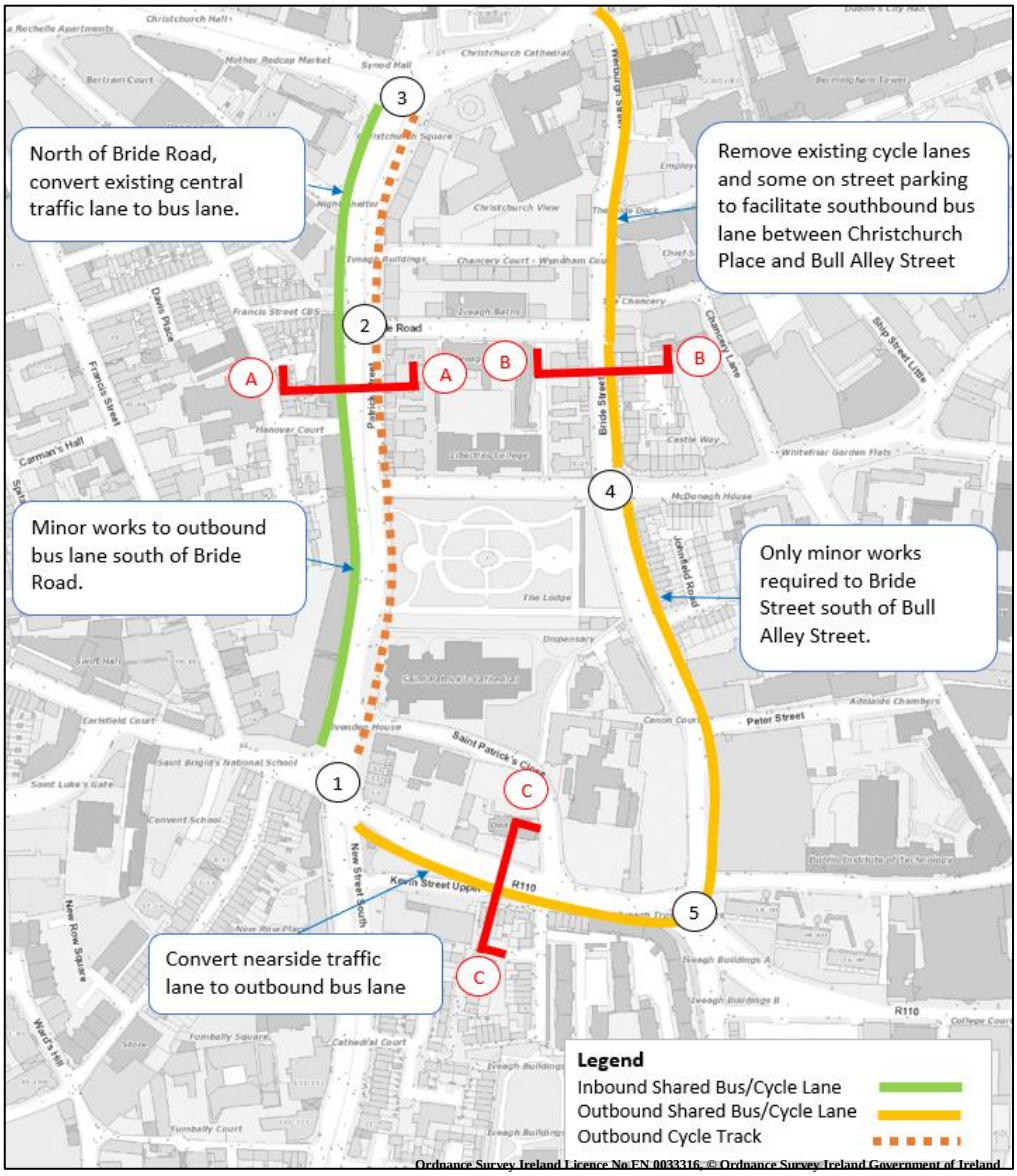


Figure 8.14: Route Option GC2 Indicative Scheme Design

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 Patrick Street and 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 Patrick Street and Nicholas Street.

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

A cross-section on Patrick Street is presented in **Figure 8.15**.

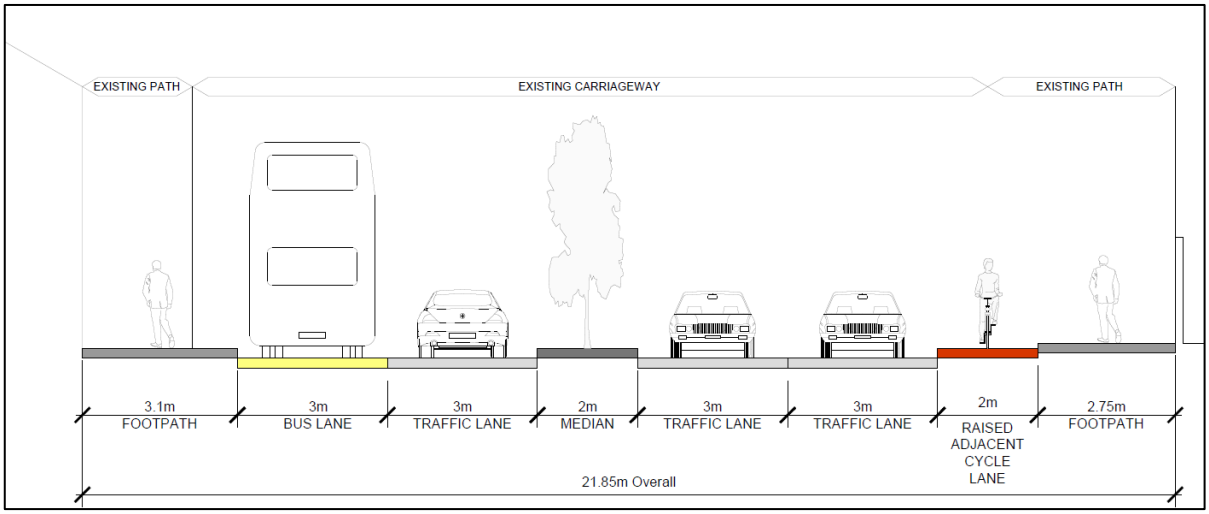


Figure 8.15: GC2 Cross-Section A-A: Patrick Street

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 Mon –Sat) 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. A cross-section on Bride Street north of Bull Alley Street is presented in **Figure 8.16**.

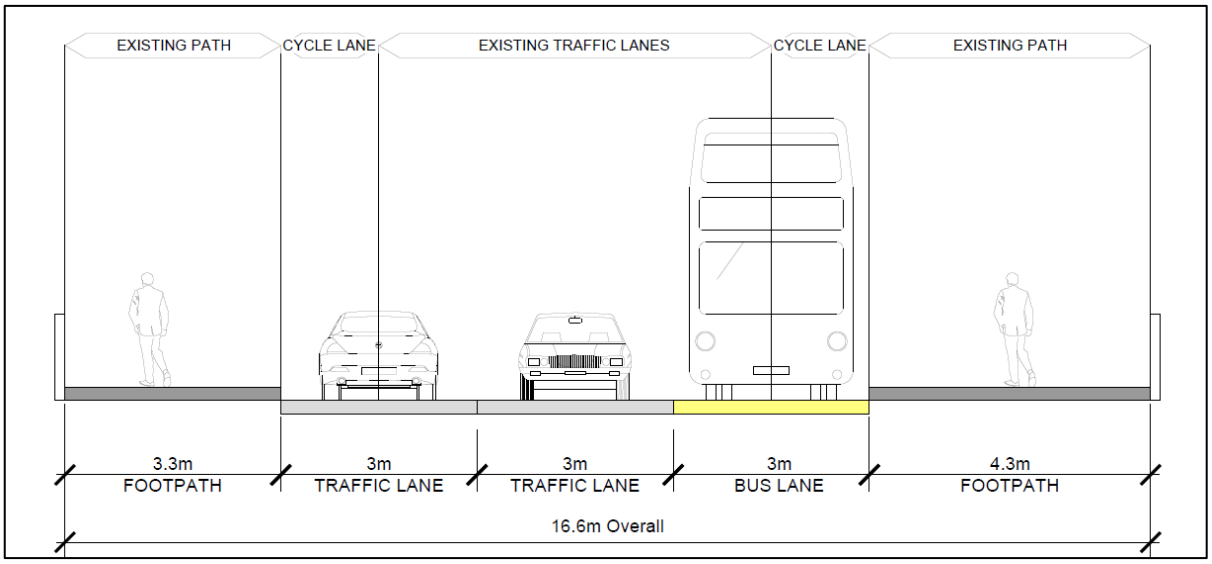


Figure 8.16: GC2 Cross-Section B-B: Bride Street

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. A cross-section on Kevin Street Upper is presented in **Figure 8.17**.

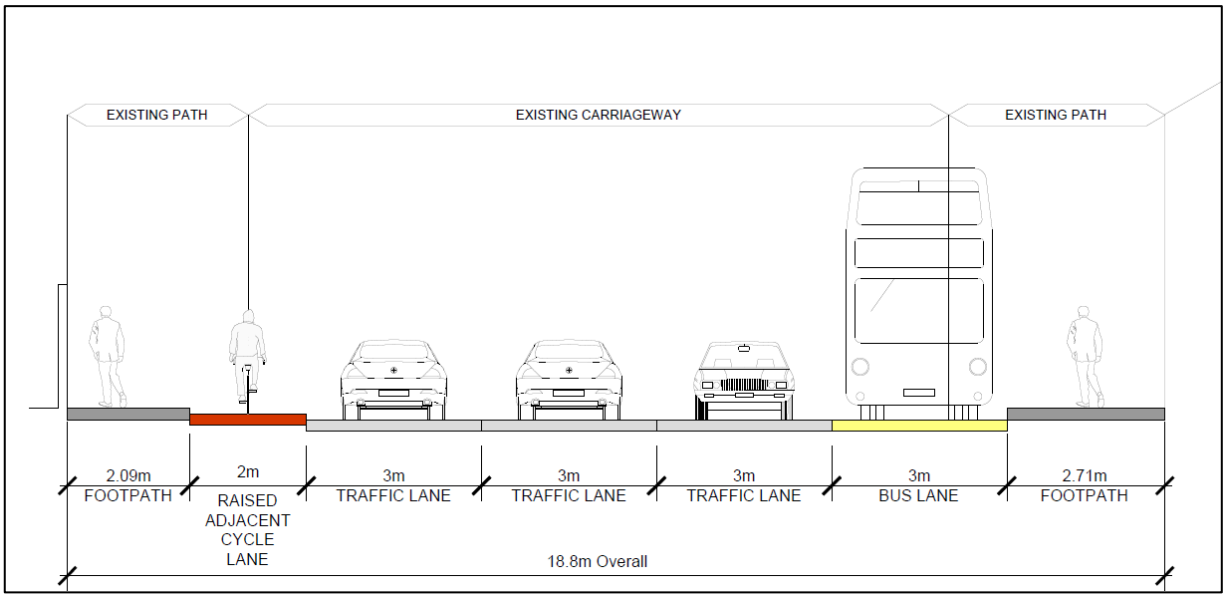


Figure 8.17: GC2 Cross-Section C-C: Kevin Street Upper

Junctions:

There are 5 signalised junctions along this route option, which would require upgrading to facilitate bus priority. The location of these junctions are presented in **Figure 8.14** and discussed below.

1. **Dean Street/Patrick Street/Kevin Street Upper:** No major changes would be required to this junction. Some minor changes may be required to facilitate a bus lane on the Kevin Street approach to the junction;
2. **Patrick Street/Bride Road:** No changes required.
3. **Nicholas Street/High Street/Christchurch Place**: Some minor adjustments may be required at this junction to accommodate bus lanes to the stop line on the Nicholas Street approach. To accommodate right turning buses from Nicholas Street, it would be necessary to assign the middle lane as a bus lane.
4. **Bride Street/Bull Alley Street:** The Bride Street northern approach to the junction would need to be amended to accommodate a bus lane and two traffic lanes. This may also require works to the southern approach to allow inbound and outbound lanes to align, although it is anticipated that all works can be accommodated within existing kerb lines.
5. **Bride Street/Kevin Street Upper:** No changes are required to this junction.

8.2.4 Other Options Considered

The following options were also considered in the area but were not carried forward 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.
- **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 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.

8.2.5 Route Options Assessment

Details of the Stage 2 route options assessment undertaken for the Grand Canal to City Centre study area section are presented in **Appendix A12**.

The relative ranking of route options against the scheme assessment sub-criteria is summarised in **Table 8.2**.

Table 8.2: City Centre Route Options Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	GC1a	GC1b	GC1c	GC2
Economy	Capital Cost				
	Transport Reliability and Quality of Service				
Integration	Land Use Integration				
	Residential Population and Employment Catchments				
	Transport Network Integration				
	Cycling Integration				
Accessibility & Social Inclusion	Key Trip Attractors				
	Deprived Geographic Areas				
Safety	Road Safety				
Environment	Archaeology and Cultural Heritage				
	Architectural Heritage				
	Flora and Fauna				
	Soils and Geology				
	Hydrology				
	Landscape and Visual				
	Air Quality				
	Noise & Vibration				
	Land Use Character				

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, 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 options GC1a and GC1b would result in the removal of a traffic lane along 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, 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 GC2 in terms 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 options GC2 makes this section slightly less safe for cyclists.

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

A summary of the assessment and relative ranking of route options against the five main assessment criteria is presented in **Table 8.3**.

Table 8.3: City Centre Route Options Assessment Summary (Main Criteria)

Assessment Criteria	GC1a	GC1b	GC1c	GC2
Economy				
Integration				
Accessibility & Social Inclusion				
Safety				
Environment				

Based on the assessment undertaken, while there is little to distinguish between routes, route option GC1a appears to offer more benefits 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
- Although it would have relatively higher environmental impact compared to other options, based on this stage of assessment, the severity of impacts are not considered to be significant.

9 Emerging Preferred Route

9.1 Introduction

Sections 5 to 8 of this report presented an appraisal of each of the potential route options for each of the 4 study area sections identified. Within each study area section, where potential route options were considered to be available, they have been assessed in accordance with the methodology set out in Chapter 4 including a 'Multi-Criteria Analysis' under the headings of Economy, Integration, Accessibility and Social Inclusion, Safety and Environment.

Following this appraisal, emerging preferred route sections were combined, along with fixed sections where no viable alternative routing was available, to create an end-to-end emerging preferred route.

This section of the report presents and describes the emerging preferred route identified and the concept scheme design developed. Concept scheme design drawings referenced are presented in **Volume 3**.

A Stage 1 Road Safety Audit has also been undertaken on the concept scheme design and is presented in **Appendix D**.

9.2 Recommended Preferred Route

The emerging preferred route is presented in **Figure 9.1** and described in this section in the Tallaght to city centre direction.

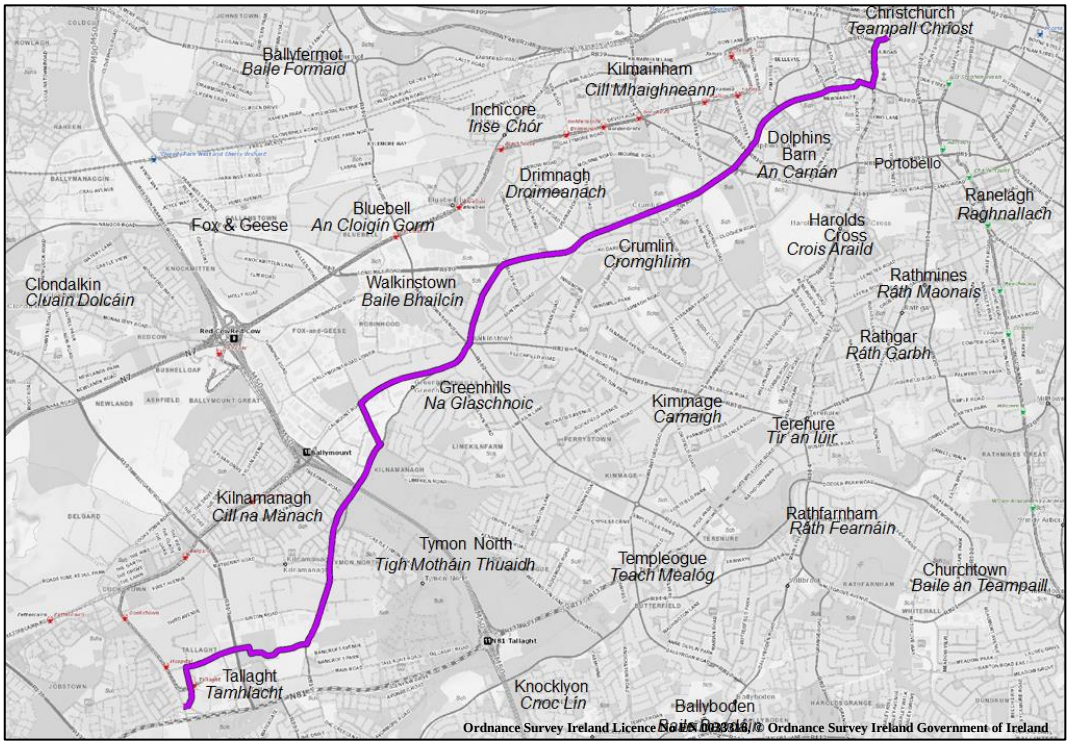


Figure 9.1: Emerging Preferred Route

The CBC commences on Belgard Square West at the junction with Cookstown Way, just west of Tallaght Town Centre. The preferred route continues along Belgard Square West before turning right onto Belgard Square North. At the junction with Belgard Road, buses would continue straight through the junction and into the IT Tallaght campus grounds. Buses would follow the existing road through the campus exiting at the existing IT Tallaght junction on Greenhills Road.

Once on Greenhills Road, buses would continue north along the existing Greenhills Road alignment to a point just south of the Castletymon Road junction, where it is proposed to avail of the South Dublin County Council objective to realign Greenhills Road to the west of the Parkview housing estate for a length of approximately 500m.

Beyond this, buses would once again follow the existing Greenhills Road alignment as far as a point approximately 250m north of the existing Ballymount Industrial Estate entrance on Greenhills Road. At this location it is again proposed to implement the South Dublin County Council objective to create a new road link which would connect Greenhills Road to Ballymount Avenue allowing buses to directly serve the industrial estate. Access to and from Greenhills Road at this location would be closed to traffic. Buses would continue along Ballymount Avenue before turning right onto Calmount Road.

Calmount Road is currently a cul-de-sac but it is proposed as part of this scheme to extend Calmount Avenue to meet Greenhills Road. Once on Greenhills Road, buses would continue northbound through Walkinstown Roundabout and onto Walkinstown Road.

Buses would then turn right onto Drimnagh Road continuing onto Crumlin Road as far as the Grand Canal. At the canal, buses would continue straight onto Dolphin's Barn, Cork Street, and St. Luke's Avenue.

At the junction with The Coombe, buses would turn right onto The Coombe before turning left onto Patrick Street. Buses would continue straight along Patrick Street and Nicholas Street, before turning right onto Christchurch Place where the route ends.

Outbound services running along the CBC would take the same route to return to Tallaght.

9.3 Concept Scheme Design

9.3.1 Section 1: Tallaght to Ballymount (Drawing T0100-01 to T0100-05)

Length of Scheme Section: 3.5km

Indicative Infrastructure Cost: €11 million- €16 million

Indicative Land Acquisition Cost: €7 million

Total Indicative Cost of Scheme Section: €18 million - €23 million

The emerging preferred scheme commences at the Cookstown Way/Belgard Square South junction where buses would travel from Belgard Square South to a bus-only section of Belgard Square West as far as Old Blessington Road. To facilitate the proposed bus only section of Belgard Square West, it is proposed to modify the access to the shopping centre car parks from the west. This proposal would open the existing bus gate off Cookstown Way to general traffic, which would allow access to the car parks from the access point on Belgard Square South. This would include the provision of a right turn pocket for traffic turning from Cookstown Way onto Belgard Square South. A new bus gate would be provided at the Belgard Square South/Belgard Square West junction which would be upgraded from a roundabout to traffic signals. In addition, turning movements from Old Blessington Road into Belgard Square West south of Old Blessington Road would be banned.

On Belgard Square West, north of Old Blessington Road, it is proposed to provide bus lanes in each direction. This would be achieved by removing the central lane which acts as a right turn lane into adjacent properties and by widening the road to the east.

It is proposed to convert the existing Belgard Square East/Belgard Square North/Tallaght Hospital roundabout to a signalised crossroads to better facilitate bus priority through the junction. Along Belgard Square North, it is proposed to widen the road (on each side) to facilitate bus lanes in each direction. Some land acquisition is required from a plot north of the South Dublin County Council offices (it is understood that this plot is currently owned by South Dublin County Council).

It is also proposed to convert the Belgard Square East/Belgard Square North roundabout to traffic signals to better facilitate bus priority. Due to space restrictions it is not considered practical to provide a dedicated right turn pocket on Belgard Square North to accommodate vehicles turning into Belgard Square East. As it is likely that vehicles travelling straight along Belgard Square North would queue in the bus lane, potentially delaying buses, rather than behind a vehicle waiting to turn right, it was considered appropriate to ban the turn at the junction. However, traffic currently undertaking this manoeuvre is traffic coming from Cookstown Way and alternative routes exist for traffic coming from there with a destination in this area (either via Belgard Road or Belgard Square South).

It is also proposed to convert the Belgard Road/Belgard Square North roundabout to a signalised crossroads. Given the conflict with left turning vehicles and the fact that the IT Tallaght access road is offset from the Belgard Square North alignment, a bus gate is proposed to facilitate the safe movement of buses through the junction. As the IT Tallaght access road currently accommodates inbound traffic only, it is proposed to convert one of the existing lanes to a contraflow bus lane.

No bus lanes or road improvements are proposed within the IT Tallaght grounds with the exception of two bus stops which are proposed in the centre of the campus close to the pedestrian connection to Old Blessington Road.

It is proposed to upgrade the IT Tallaght/Greenhills Road junction from a priority controlled junction to traffic signals. A dedicated bus traffic signal is proposed on Greenhills Road to accommodate right turning buses into IT Tallaght. The current design does not include dedicated bus priority on the IT Tallaght approach to the junction, but this may be considered necessary at the next design stage based on more detailed analysis.

Along Greenhills Road between the IT Tallaght access junction and just south of Castletymon Road, it is proposed to widen the road to the west to facilitate bus lanes and raised adjacent cycle lanes in each direction. The extent of encroachment into adjacent lands varies from 6-10m along this length. It is proposed to upgrade both the Greenhills Road/Airton Road junction and the Greenhills Road/Mayberry Road junction to facilitate bus lanes to the stopline in each direction. To remove conflicts with left turning vehicles, it is proposed to provide a left turn lane inside the bus lane on the southern approaches at each of these junctions.

From a point approximately 200m south of Castletymon Road, it is proposed to realign the existing Greenhills Road between Parkview and Treepark Road. This would involve the construction of a new road, 500m in length, consisting of bus lanes and raised adjacent cycle lanes in each direction in addition to traffic lanes. It would also be necessary to extend Castletymon Road to meet the new Greenhills Road alignment and create a new signalised junction. The left turn movement from Greenhills Road would be banned at the junction but accommodated via a route along the existing Greenhills Road alignment further north.

It is not considered practical, due to width constraints on the bridge, to provide dedicated bus and raised adjacent cycle lanes across the existing Greenhills Road M50 overpass. 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 the potential to cause delay to buses. 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, transitioning to/from dedicated facilities in advance of the bridge on each approach.

9.3.2 Section 2: Ballymount to Crumlin (Drawing T0100-06 to T0100-10)

Length of Scheme Section: 3.6km

Indicative Cost of Scheme Section: €10 million- €14 million

Indicative Land Acquisition Cost: €10 million

Total Indicative Cost of Scheme Section: €20 million - €24 million

North of the M50 overpass, it is proposed to widen Greenhills Road to the east and west to facilitate bus and raised adjacent cycle lanes in each direction.

From a point approximately 250m north of the existing Ballymount industrial estate access, it is proposed to realign Greenhills Road to join Ballymount Avenue via a new 210m long road. Access to and from the existing Greenhills Road at this location would be closed to traffic but would remain open to pedestrians and cyclists. A new toucan crossing is proposed at this location.

It is proposed to widen Ballymount Avenue to provide bus lanes and raised adjacent cycle lanes in each direction. It is necessary to acquire some land from adjacent properties to facilitate this.

It is proposed to convert the existing Ballymount Avenue/Calmount Road roundabout to a signalised crossroads. To facilitate inbound buses turning right from Ballymount Avenue to Calmount Road, a dedicated bus traffic signal is proposed. Outbound buses would be facilitated in a dedicated bus-only left turn slip lane.

Along Calmount Road it is proposed to widen the carriageway to facilitate bus lanes in each direction. It is also proposed to upgrade the existing Calmount Road/Calmount Avenue priority controlled junction to traffic signals. This junction would be the only access point to the Greenhills Road in this area which is proposed to be cul-de-saced at either end of the new Ballymount/Calmount Road route. To accommodate this, it is necessary to construct a new section of road connecting Calmount Avenue to Greenhills Road, as well as a new roundabout where the roads meet.

Calmount Road is currently a cul-de-sac, but to facilitate the emerging preferred route, it is proposed to create a new 250m road link to connect to Greenhills Road. Access to and from the existing Greenhills Road at this location would be closed to traffic, but would remain open to pedestrians and cyclists. A new toucan crossing is proposed at this location.

Between Calmount Road and Walkinstown Roundabout, it is proposed to widen the road, primarily to the east, to facilitate bus lanes and raised adjacent cycle lanes in each direction. This section of road would likely require earthworks/retaining structures to maintain the new extended Calmount Road and widened Greenhills Road at its present level. Alternatively, the road could be lowered but there could be equally extensive works associated with the diversion of services through this section. The works required would be investigated further at the detailed design stage. This proposal would require encroachment onto lands to the east of Greenhills Road by up to 10m, including up to 4m into residential properties close to Walkinstown Roundabout.

Two junction upgrade options are presented for Walkinstown Roundabout. The first option (Drawing T0100-08A) proposes maintaining a roundabout arrangement but reducing the number of circulation lanes and entry lanes and to two lanes on all approaches. In addition, a raised zebra crossing would be provided on each approach to the junction. On both the Greenhills Road and Walkinstown Road approaches, bus lanes are proposed to terminate

approximately 30m in advance of the yield line, and shared with traffic for the remainder.

A second option is also presented for consideration (Drawing T0100-08B) at the next design stage which would see the creation of two signalised junctions in close proximity operating as two linked traffic signal controlled junctions. This would require St. Peters Road to be realigned through the car park in front of the Cherrytree Pub to meet Greenhills Road at a three-arm signalised junction. Approximately 50m north of this, a signalised crossroads between Greenhills Road, Walkinstown Road, Cromwellsfort Road and Walkinstown Avenue would be created. This proposal would also require the restriction of Ballymount Road Lower to left-in / left-out as well as the closure of Ballymount Road Lower to through traffic, thus not providing access to Ballymount Industrial Estate. This proposal would provide enhanced bus priority by providing bus lanes to the stop line in each direction. Given the potential for wider regional traffic impacts as a result of this option, detailed strategic traffic modelling is considered necessary at the next stage of the design development in order to assess the feasibility of this option.

Once through Walkinstown Roundabout, it is proposed to widen Walkinstown Road to accommodate bus lanes in each direction. This would require landtake from 57 properties, the majority of which are residential properties. The extent of landtake presented in the concept design ensures that sufficient driveway space in front of properties is maintained to park cars. Further, more detailed design development and assessment of property impacts will be required at the next stage of the project development.

At the Walkinstown Road/Kilnamanagh Road/SuperValu access it is proposed to ban right and left turning movements from Walkinstown Road into both SuperValu and Kilnamanagh Road. However, buses would be allowed to turn right into Kilnamanagh Road to access what is currently the terminus for route 123. Traffic bound for this area coming from Drimnagh Road would be able to enter the area from Longmile Road at the junction with Walkinstown Parade. Similarly, traffic coming from Walkinstown Roundabout can turn into the area at Walkinstown Drive. In terms of access to SuperValu, there is a second access point located approximately 110m north of the junction which can accommodate both right and left turn movements into the site.

On Drimnagh Road, it is proposed to connect existing pieces of inbound bus lane in the vicinity of the Walkinstown Road junction by converting one of the traffic lanes to a bus lane. There are currently bus lanes located along Drimnagh Road which would remain under this proposal. To facilitate raised adjacent cycle lanes in each direction along Drimnagh Road, it is required to widen the road and encroach into approximately 31 properties by up to 2m. In addition, approximately 16 on-street car parking spaces on the southern side of Drimnagh Road would be removed to facilitate the raised adjacent cycle lanes. This section of the route is also therefore potentially sensitive in terms of property impact and will require more detailed assessment of impacts at the next stage of the project development.

9.3.3 Section 3: Crumlin to Grand Canal (Drawing T0100-11 to T0100-14)

Length of Scheme Section: 3.7km

Indicative Cost of Scheme Section: €10 million- €13 million

Indicative Land Acquisition Cost: €3 million

Total Indicative Cost of Scheme Section: €13 million - €16 million

It is proposed to widen Crumlin Road to provide bus lanes in each direction. This proposal would require encroachment into approximately 75 properties along Crumlin Road by up to 2m. No major changes are proposed to junctions along Crumlin Road.

It is not considered practical to provide raised adjacent cycle lanes and bus lanes in each direction along Crumlin Road. As such, it is proposed to reroute Secondary Route 8A and Primary Route 8 along Kildare Road which coincides with Secondary Route 8C. In this area, cars are observed to regularly park on the wide footpaths along the road. This proposal would require the removal of approximately 150 of these informal on-street car parking spaces. In addition, approximately 50 trees would need to be removed to facilitate raised adjacent cycle lanes. Along Kildare Road, it is proposed to rationalise the Cashel Road junction to better provide for pedestrians and cyclists. Additionally, it is proposed to reassign the priority at the Kildare Road/Clogher Road junction to better accommodate cyclists. It is also proposed to upgrade this junction to traffic signals.

Along Clogher Road it is proposed to widen on each side, encroaching into approximately 27 properties along the southern side of the road. Along Sundrive Road it is proposed to widen the road to provide raised adjacent cycle lanes in each direction. To facilitate raised adjacent cycle lanes along Sundrive Road at the junction with Crumlin Road, it is necessary to remove the existing right turn lane on Sundrive Road and reduce general traffic to a single lane at the stopline.

Between Sundrive Road and the Grand Canal, there are currently bus lanes in each direction. Under these proposals, these bus lanes would be maintained. It is not considered practical to provide raised adjacent cycle lanes in either direction through this section.

The majority of this section of the route is potentially sensitive in terms of property impact and will require more detailed assessment of impacts at the next stage of the project development.

9.3.4 Section 4: Grand Canal to Christchurch (Drawing T0100-14 to T100-17)

Length of Scheme Section: 2.3km

Indicative Cost of Scheme Section: €7 million- €9 million

Indicative Land Acquisition Cost: N/A

Total Indicative Cost of Scheme Section: €7 million - €9 million

North of the Grand Canal, minor kerb realignments as well as the reallocation of a traffic lane to bus lane are proposed along Dolphins Barn to facilitate bus lanes and raised adjacent cycle lanes in each direction.

It is proposed to maintain the existing tree lined median in this location. To facilitate bus lanes to the stopline, it is proposed to ban the left turn from Dolphin's Barn south of its junction with 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 Cork Street to 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 raised adjacent cycle lanes provided along the length of Cork Street. It is proposed to upgrade these to meet current standards, particularly the raised adjacent cycle lanes. To facilitate this, minor road widening is required along the length of Cork Street.

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 busses, it is proposed to ban the right turn from Francis Street onto Dean Street.

It is proposed to widen Patrick Street to provide bus lanes and raised adjacent cycle lanes in each direction. While there is already a bus and raised adjacent cycle lane inbound, these are substandard and require widening. It is proposed to widen to the east of Patrick Street by up to 4m. In addition it is proposed to remove the central median, and associated trees, between Bull Alley Street and Christchurch Place.

On the Nicholas Street approach to the High Street/Christchurch Place junction, it is proposed to convert an existing traffic lane to bus lane. To facilitate right turning buses, this lane would be located between a straight ahead lane and the right turning lane for vehicular traffic.

On Christchurch Place, it is proposed to widen the road to provide a bus lane in the outbound direction. There is insufficient width available to provide an inbound bus lane. Raised adjacent cycle lanes are also proposed in each direction.

9.3.5 Concept Scheme Design Summary

9.3.5.1 Infrastructure Provision

In total, the emerging preferred scheme measures 13km, of which 11.2km consists of the emerging preferred route with the remaining 1.8km consisting of a parallel cycle facility in Crumlin.

Along the existing bus route most similar to the emerging preferred route between Tallaght and the city centre (Route 27), existing bus priority infrastructure is only present along approximately 29% (3.2km) of the inbound direction and 26% (2.9km) of the outbound direction of the total route length. The proposed scheme would significantly improve this provision to approximately 91% (10.2km) in each direction along the emerging preferred route. The only place where bus lanes are not provided are along Dean Street, the M50 overpass at Tymon Park and through the grounds of IT Tallaght. Importantly, the concept scheme design improves bus priority to the stop line at signalised junctions and therefore removes the potential for delays to buses at these locations.

In addition to improvements to bus priority infrastructure along the emerging preferred route, high quality cycle infrastructure is also included in the concept scheme design which incorporates sections of primary routes 7, 8 and 8B and secondary routes 8A, 8C and 9B. The overall provision of new/upgraded high quality raisd adjacent cycle lanes as part of this scheme equates to approximately 8km in each direction (75% of overall route).

9.3.5.2 Cost Estimate

A high level cost estimate has been prepared based on the concept scheme design and a number of assumptions regarding the scheme details. Based on this, the proposed CBC scheme infrastructure cost is anticipated to be in the region of €60m - €70m.

9.3.5.3 Journey Time Benefits

Through the provision of increased bus priority infrastructure, the proposed scheme would improve both the overall journey times for buses along the route and their journey time reliability. A review of available journey time data along the route illustrates the issues that will be largely addressed by the proposed scheme.

The following graphs present the existing journey time and bus speed data for the section of bus route 27 which generally overlaps with the emerging preferred route (between The Square and Fishamble Street). The information presented in these graphs has been extracted from the automatic vehicle location system (AVLS) installed on the Dublin Bus fleet and presents journey times inclusive of

dwell times at stops. **Figure 9.2** and **Figure 9.3** present the average journey time per hour over the course of a normal weekday for the inbound and outbound directions respectively.

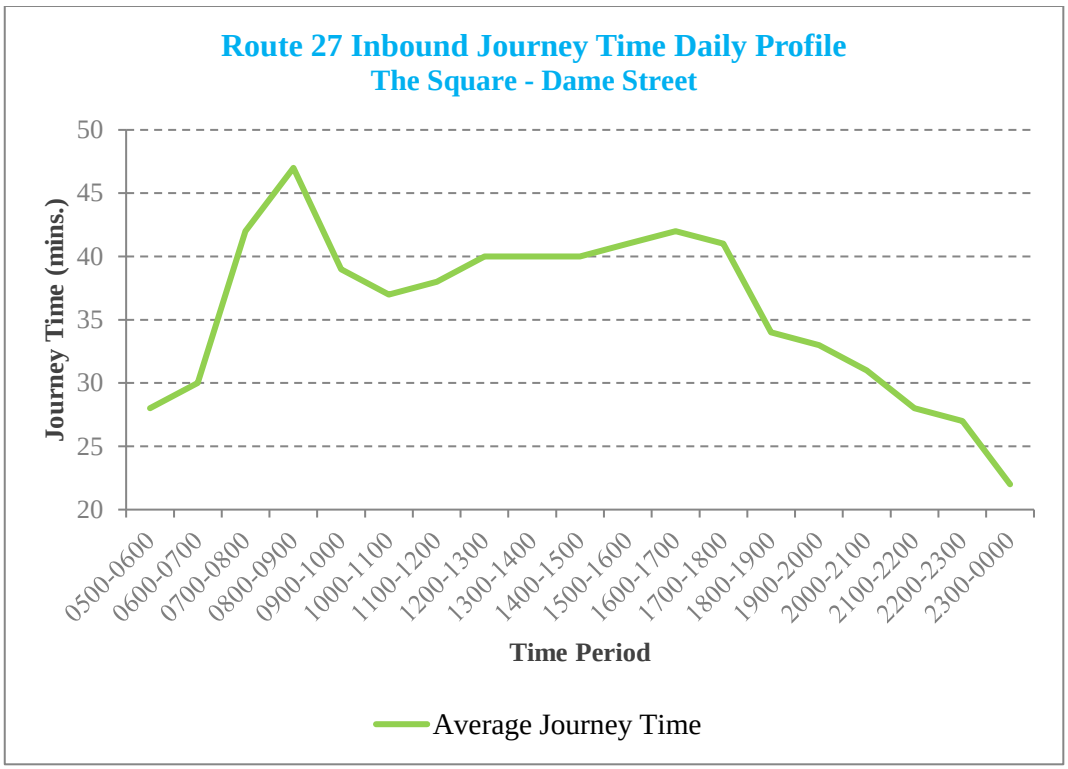


Figure 9.2: Existing Inbound Journey Times between the Square and Dame Street

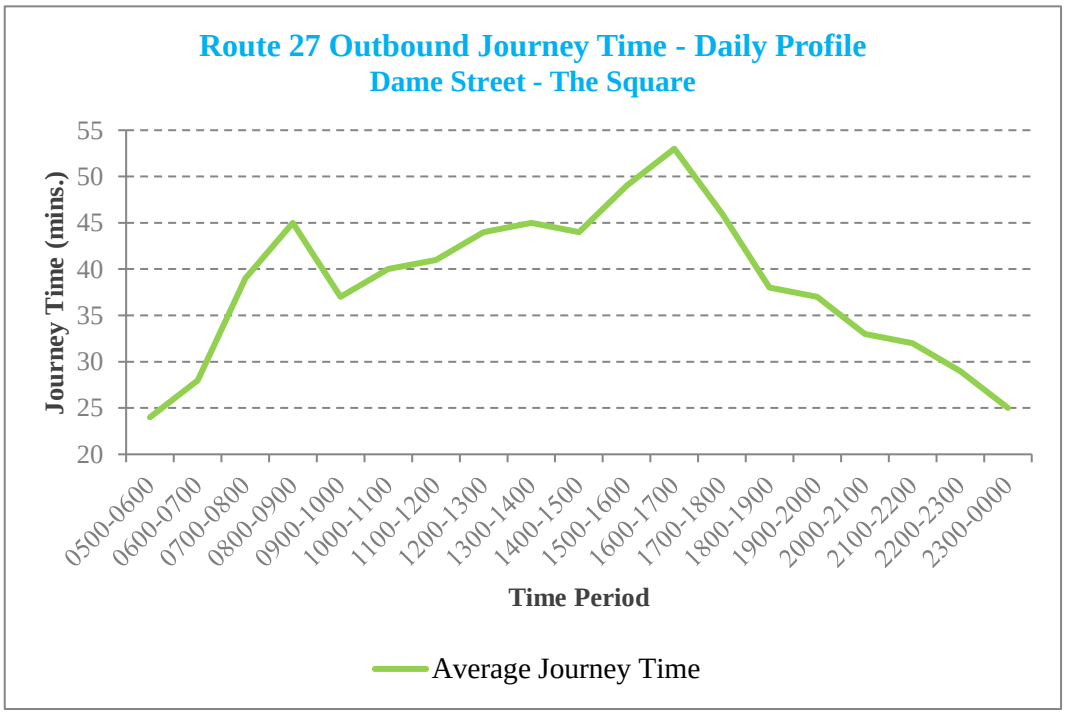


Figure 9.3: Existing Outbound Journey Times between Dame St. and the Square

The graphs presented in **Figure 9.2** and **Figure 9.3** clearly illustrate the current issues with journey time reliability along the route.

Journey times during the core hours of bus operation (07:00 – 19:00) are observed to vary between 37 minutes and 47 minutes in the inbound direction and 39 minutes and 53 minutes in the outbound direction. The variation in journey times is most likely due to the lack of bus priority on large sections of the route and subsequent turbulence caused by traffic congestion, as well as passenger boarding times at stops which are high due to requirements for driver interaction.

As such, the journey times outside of these hours, when traffic volumes and passenger volumes are lower, are more reflective of the journey times which could be achieved through a combination of the proposed bus priority infrastructure improvements, better enforcement of bus lanes and the introduction of cashless fares. In other words, the proposed infrastructure would effectively create an uncongested network for buses.

After 19:00 in the evening, the inbound journey time is observed to reduce to between 27 minutes and 33 minutes. Similarly, outbound journey times are seen to reduce to between 32 minutes and 39 minutes. For both inbound and outbound journey times after 19:00, the overall journey time is seen to drop by up to 14 minutes with the variance between the upper and lower limits halved for each direction.

The benefits can also be seen by comparing the existing average link speeds along the route in the morning peak hour with the late evening. **Figure 9.4** and **Figure 9.5** present this information for the inbound and outbound direction respectively.

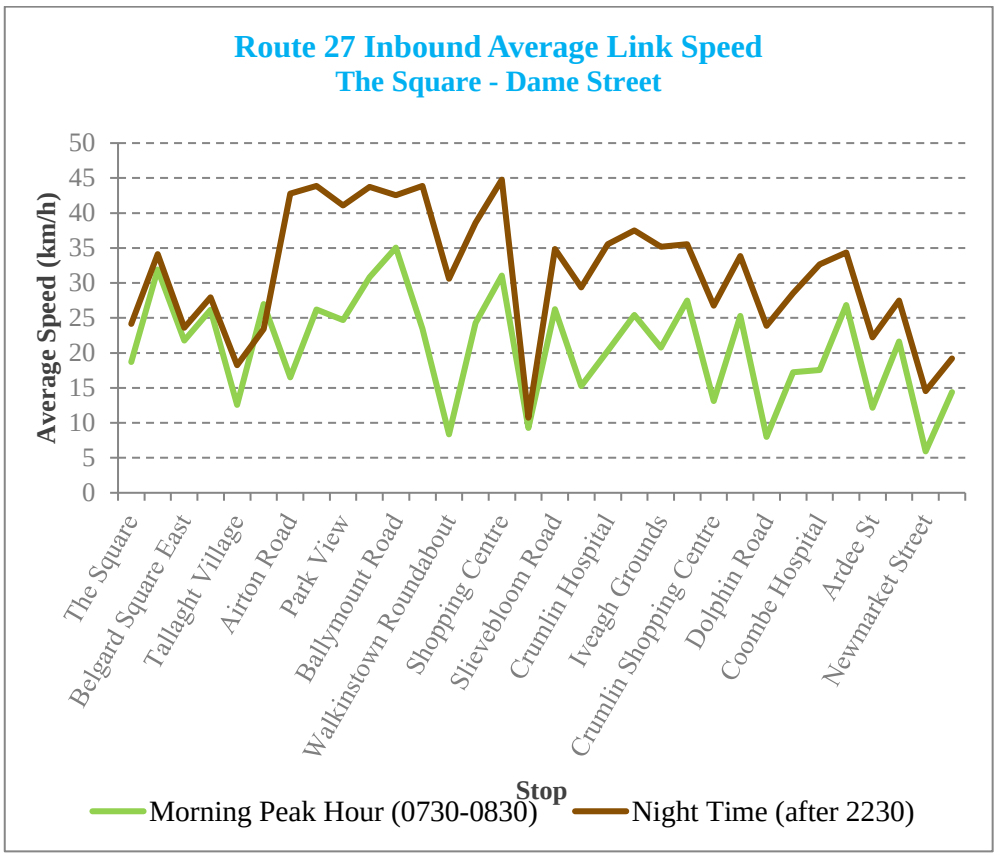


Figure 9.4: Existing Inbound Average Link Speed between the Square and Dame St.

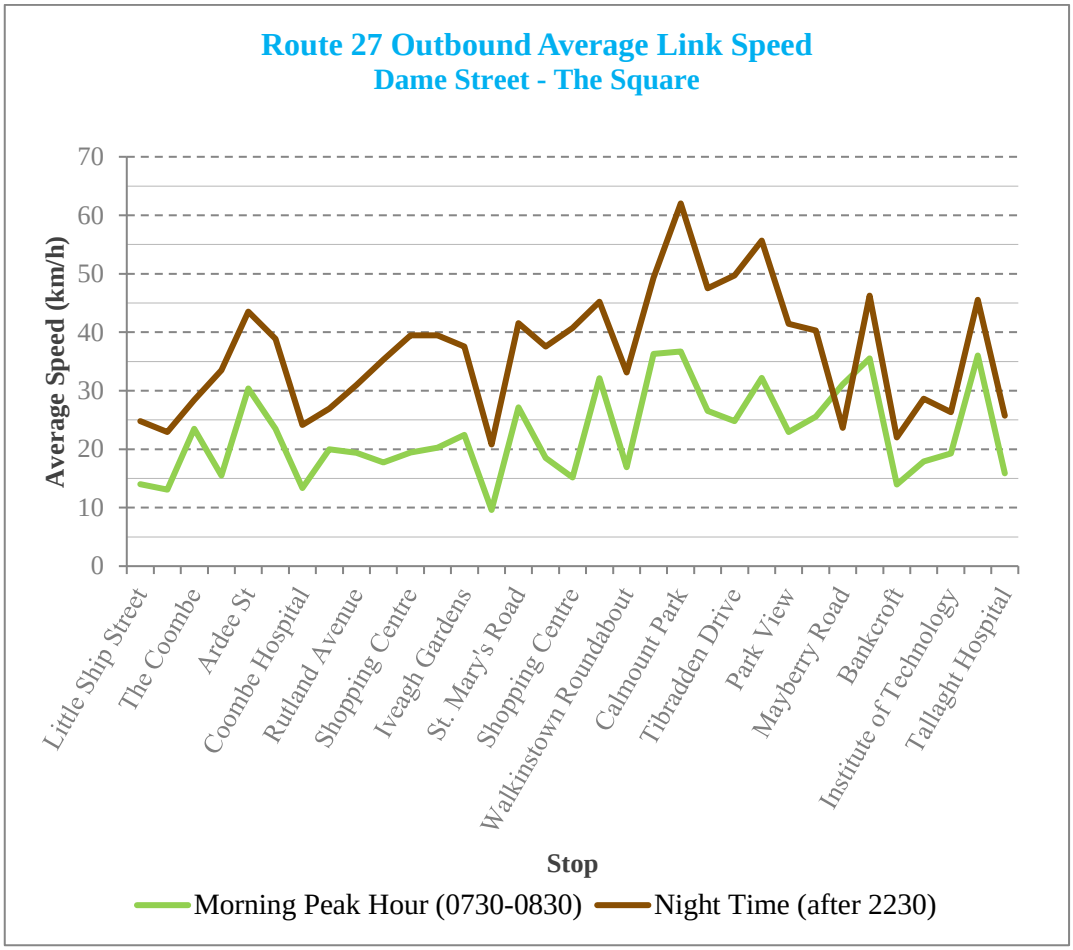


Figure 9.5: Existing Outbound Average Link Speed between Dame St. and the Square

Looking at both the inbound and outbound data, it can be seen that the average speed for buses along the route is consistently higher at night, in uncongested conditions at night, compared to the morning peak hour where congestion slows the progression of buses. This further illustrates the benefits improved bus priority will bring to buses operating along the proposed route.

Based on the above, a conclusion can be drawn that by improving the provision of bus lanes along the route coupled with the introduction of cashless fares, the risk of turbulence to buses would be significantly reduced, allowing buses to move along the route quicker and with more consistent journey times. The extent of these benefits will be confirmed and quantified at the next design stage.

10 Next Steps

This report has identified an emerging preferred route for the bus infrastructure along this Core Bus Corridor for which a concept design has been developed.

The next project stage (the development of a Preliminary Design) will further refine and update the initial concept design along the route. Further account will be taken of likely public transport service levels, particularly the bus service patterns and any changes to the overall bus network which may arise from the separate bus network review process. The proposals will be amended, if and as required, to integrate any resultant changes. The Preliminary Design will define the final practically achievable scheme for the CBC, taking into account more detailed studies of constraints, impacts and environmental assessment required at a local level.

Prior to finalisation of the CBC scheme design, a public consultation process will be undertaken, with inputs and feedback received incorporated where practical and appropriate to do so.

This Preliminary Design will form the basis of the planning consent process for the scheme, which will require a development consent application to be made directly to An Bord Pleanála, due to the nature and extent of the proposed works.