

Chapter 04
Proposed
Scheme
Description

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4. Proposed Scheme Description

4.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) provides a description of the Tallaght / Clondalkin to City Centre Core Bus Corridor Scheme (hereafter referred to as the Proposed Scheme).

Article 5(1)(a) of the EIA Directive¹ requires that the EIAR contains:

'a description of the project comprising information on the site, design, size and other relevant features of the project;....'

Section 50(2)(b)(i) of the Roads Act 1993 (as amended) states that that the EIAR shall contain the following information:

'a description of the proposed road development comprising information on the site, design, size and other relevant features of the development;....'

The layout of the chapter begins with the Proposed Scheme Overview (Section 4.2). This is followed by sections describing the Design Iteration process (Section 4.3) and the overall Design Principles applied to the Proposed Scheme (Section 4.4). Following this, there is a detailed description of the Proposed Scheme (Section 4.5) and a section describing the key infrastructure elements associated with the Proposed Scheme (Section 4.6). These sections should be read in their entirety in order to gain a full understanding of the Proposed Scheme and its associated key infrastructure elements.

4.2 Proposed Scheme Overview

The Proposed Scheme has an overall length of approximately 15.5km with an additional offline cycling facility of approximately 3.9 km. It will be comprised of two main alignments in terms of the route it follows; namely the Tallaght to City Centre section and the Clondalkin to Drimnagh section.

The first section, the Tallaght to City Centre section, begins at the junction of Old Blessington Road / Cookstown Way and is routed along Belgard Square West, Belgard Square North, Belgard Square East and Blessington Road to the junction of R819 Greenhills Road and Bancroft Park. From here, the Proposed Scheme is routed along the R819 Greenhills Road to Walkinstown Roundabout via new transport link roads; in the green area to the east of Birchview Avenue / Treepark Road; in the green area to the south of Ballymount Avenue, and in the green area to the east of Calmount Road. From Walkinstown Roundabout, the Proposed Scheme is routed along the R819 Walkinstown Road to the junction with R110 Long Mile Road and Drimnagh Road. The shared spine with the Clondalkin section commences at this junction and the Proposed Scheme is routed along the R110 to the junction of Dean Street and Patrick Street via Drimnagh Road, Crumlin Road, Dolphins Barn, Cork Street, St. Luke's Avenue and Dean Street. From here the Proposed Scheme is routed along the R137 via Patrick Street to the junction at Winetavern Street and Christchurch Place where the Proposed Scheme terminates within the City Centre. An offline cycle provision is proposed to facilitate cycling between Walkinstown Roundabout and Parnell Road (Grand Canal) where end to end cycle facilities are not feasible along the main corridor and provides a more direct route towards the City Centre. This offline section of the Proposed Scheme is routed via Bunting Road, Kildare Road and Clogher Road.

The second section, the Clondalkin to Drimnagh section, begins at the junction of New Nangor Road and Woodford Walk and is routed along the R134 New Nangor Road, R810 Naas Road, R112 Walkinstown Avenue

¹ Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (hereafter collectively referred to as the Environmental Impact Assessment (EIA Directive))

and the R110 Long Mile Road to the junction of Walkinstown Road and Drimnagh Road where it is routed towards the City Centre along the shared spine section as described above.

The route of the Proposed Scheme is shown in Image 1.1 in Chapter 1 (Introduction).

The Proposed Scheme includes an upgrade of the existing bus priority and cycle facilities. The scheme includes a substantial increase in the level of bus priority provided along the corridor, including the provision of additional lengths of bus lane resulting in improved journey time reliability. Throughout the Proposed Scheme bus stops will be enhanced to improve the overall journey experience for bus passengers and cycle facilities will be substantially improved with segregated cycle tracks provided along the links and protected junctions with enhanced signalling for cyclists provided at junctions.

Moreover, pedestrian facilities will be upgraded, and additional signalised crossings will be provided. In addition, urban realm works will be undertaken at key locations with higher quality materials, planting and street furniture provided to enhance the pedestrian experience. An example of this is the proposed landscape design is at the Long Mile Road / Walkinstown Road junction where the proposed upgrade to the junction will create an enhanced public open space. This is a significant improvement on what is currently a very wide junction dominated by traffic. Redefining the junction as open space with significant tree planting and seating areas will provide a local landmark when journeying through Walkinstown.

Table 4.1 summarises the changes that will be made to the existing corridor as a result of the Proposed Scheme.

Table 4.1: Summary of Changes as a result of the Proposed Scheme

Total Length of Proposed Scheme	15.5km (+3.9km offline cycling facility)	
Features	Existing (km)	Proposed Scheme (km)
Bus Lanes		
Inbound	5.4	14.2
Outbound	4.5	13.8
Bus Priority through Traffic Management		
Inbound	0.3	0.6
Outbound	0.3	0.6
Total Bus Priority (both directions)	10.5	29.2 (+176%)
Bus Measures		
Proportion of Route with Bus Priority Measures	34% (Core Bus Corridor)	94% (Core Bus Corridor)
Cycle Facilities – Segregated		
Inbound	2.1	16.6
Outbound	1.7	17.4
Cyclist Facilities – Non-segregated (not including un-segregated Bus Lanes)		
Inbound	8.8	0.8
Outbound	9.1	0.8
Cyclist Facilities – Overall		
Total Cyclist Facilities (both directions)	21.7	38.5
Proportion Segregated	17.2%	93%
Other Features		
Number of Pedestrian Signal Crossings	135	181
Number of Residential Properties with Land Acquisition	n/a	55

The description of the Proposed Scheme is supported by a series of drawings (listed in Table 4.2 below), which are contained in Volume 3 of this EIAR, and these should be read in conjunction with this chapter.

Table 4.2: List of Relevant Drawings

Drawing Series Number	Description
BCIDA-ACM-SPW_ZZ-0809_XX_00-DR-CR-9001	Site Location Map and Site Location Plan
BCIDA-ACM-GEO_HV-0809_ML_00-DR-CR-9001	Mainline Plan and Profile
BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-9001	General Arrangement
BCIDA-ACM-GEO_CS-0809_XX_00-DR-CR-9001	Typical Cross Sections
BCIDA-ACM-ENV_LA-0809_XX_00-DR-LL-9001	Landscaping General Arrangement
BCIDA-ACM-PAV_PV-0809_XX_00-DR-CR-9001	Pavement Treatment Plans
BCIDA-ACM-SPW_BW-0809_XX_00-DR-CR-9001	Fencing and Boundary Treatment
BCIDA-ACM-TSM_GA-0809_XX_00-DR-CR-9001	Traffic Signs and Road Markings
BCIDA-ACM-LHT_RL-0809_XX_00-DR-EO-9001	Street Lighting
BCIDA-ACM-TSM_SJ-0809_XX_00-DR-TR-9001	Junction Systems Design
BCIDA-ACM-DNG_RD-0809_XX_00-DR-CD-9001	Proposed Surface Water Drainage Works
BCIDA-ACM-UTL_UD-0809_XX_00-DR-CU-9001	IW Foul Sewer Asset Alterations
BCIDA-ACM-UTL_UE-0809_XX_00-DR-CU-9001	ESB Asset Alterations
BCIDA-ACM-UTL_UL-0809_XX_00-DR-CU-9001	Telecommunications Asset Alterations
BCIDA-ACM-UTL_UG-0809_XX_00-DR-CU-9001	GNI Asset Alterations
BCIDA-ACM-UTL_UW-0809_XX_00-DR-CU-9001	IW Water Asset Alterations
BCIDA-ACM-UTL_UC-0809_XX_00-DR-CU-9001	Combined Existing Utilities Records
BCIDA-ACM-STR_GA-0809_XX_00-DR-CB-9001	Bridges and Retaining Structures
BCIDA-ACM-BLD_AR-0809_IN_00-DR-AA-9001	Bus Interchange

4.3 Design Iteration

The design of the Proposed Scheme has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts where practicable, whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme, described in Chapter 1 (Introduction), undertaken throughout the option selection and design development process have been incorporated, where appropriate.

Examples of how the design evolved are as follows:

- A bus interchange is proposed on Belgard Square West to facilitate interchange between bus, Luas and the town centre;
- On Belgard Square North, it is proposed to provide a segregated cycle lane in each direction. This will provide improved cycle access to the hospital from Belgard Road;
- The route of the Proposed Scheme has been altered and now passes through Tallaght Village rather than the Technological University Dublin (TUD), Tallaght. This will require the reopening of Old Greenhills Road to form a new bus-only junction with R819 Greenhills Road;
- At Parkview, the proposed alignment has been altered to allow general traffic to remain on the existing R819 Greenhills Road with a sustainable bus / cycle link road proposed in the green area parallel to Birchview Avenue and Treepark Road for both inbound and outbound bus services;
- Over the M50, two new single span pedestrian / cycle bridges are proposed to provide continuous bus lanes and higher quality cycle lanes on R819 Greenhills Road;
- At Ballymount, the new link road connecting Ballymount Avenue and R819 Greenhills Road will be provided with a junction on the southern end of Ballymount Avenue which will allow direct access to the eastern section of R819 Greenhills Road from Ballymount Avenue;
- The proposals for Walkinstown Roundabout have been altered to include a segregated two-way cycle track around the junction. This will reduce conflicts with pedestrians and allow the cyclists to take the shortest route around;
- A three-lane option with signal-controlled priority is proposed along R110 Crumlin Road between Raphoe Road and the Health Centre, to reduce the impact on properties. To facilitate this arrangement, it is

proposed to restrict access at the Crumlin Road junctions with both Clonard Road and Bangor Drive to one-way only southbound. Urban Realm improvements will be provided along this section;

- On R137 Patrick Street, the design has been altered to retain the tree-lined median. In addition, the junction of R137 Nicholas Street and R810 High Street is to be remodelled to provide improved facilities for buses, cyclists and pedestrians;
- The proposed alternative cycle route on Kildare Road is now redirected towards the Grand Canal via Clogher Road along which cycle lanes are to be provided;
- The corridor routing via the Kylemore Luas Station (R810 Naas Road and R112 Walkinstown Avenue) has been confirmed;
- A grade-separated pedestrian and cyclist crossing at the R134 New Nangor Road / R110 Long Mile Road / R810 Naas Road junction has been provided in order to reduce conflicts with vehicular traffic;
- A number of bus stops along the route have been redesigned as island bus stops where space allows; and
- Bus stop locations have been modified – some bus stops have been relocated or removed to achieve a better spacing between stops, while also ensuring that each stop is sited in the best location to serve surrounding neighbourhoods. These proposals will also ensure a more efficient bus network operation.

4.4 Design Principles

The design of the Proposed Scheme was developed with reference to the Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors (PDGB) (NTA 2021) – refer to Appendix A4.1 in Volume 4 of this EIAR. This guidance document was prepared to ensure that a consistent design approach for the Core Bus Corridor Infrastructure Works was adopted based on the objectives of the Proposed Scheme. The project objectives are described in full in Chapter 2 (Need for the Proposed Scheme).

The purpose of the PDGB is to complement existing guidance documents / design standards relating to the design of urban streets, bus facilities, cycle facilities and urban realm, which include the following:

- The Design Manual for Urban Roads and Streets (DMURS) (Government of Ireland 2013);
- The National Cycle Manual (NCM) (NTA 2011);
- TII National Road Design Standards;
- The Traffic Signs Manual (TSM) (DoT 2019);
- Guidance on the use of Tactile Paving (UK DfT 2007);
- Building for Everyone: A Universal Design Approach (NDA 2020), and
- Greater Dublin Strategic Drainage Study (GSDSDS) (Irish Water 2005).

An example of the application of the design principles for the Proposed Scheme can be seen at the proposed consolidation of the R110 Crumlin Road / Herberton Road / Sundrive Road junction into single pedestrian crossings on Sundrive Road and Herberton Road. The existing layout with left-turn slip lanes westbound on Sundrive Road and eastbound on Herberton Road facilitates the movement of vehicles but provides poor facilities for pedestrians. Pedestrians have to walk a significant distance off their desired line to cross the road at a signalised crossing, resulting in unsafe conditions for these vulnerable road users.

Having considered the objectives for the Proposed Scheme and using the principles set out in the PDGB a traffic signal-controlled junction arrangement was developed to address the issues outlined above. This layout could be used to control the flow of traffic and provides a high level of priority for buses. In addition, high quality signal-controlled pedestrian crossing facilities will be provided on all arms of the junction, close to the pedestrian desire lines. For cyclists, taking into account the high traffic volumes and speeds, a fully segregated facility is provided where cyclists are segregated in both space and time from moving vehicles, which significantly enhances the safety of these vulnerable road users. The revised layout is typical of junctions along the corridor that have been developed to meet the objectives of the Proposed Scheme.

The assessment of the existing street infrastructure and its ability to support access for disabled users has been based mainly on the Irish Wheelchair Association [IWA] 'Best Practice Guidelines, Designing Accessible Environments' and The National Disability Authority's [NDA] 'Building for Everyone: A Universal Design Approach'.

In addition, the Bus Interchange has been designed in accordance with BS8300:2009 +A1:2010 Design of buildings and their approaches to meet the needs of disabled people – Code of practice.

Accessibility for mobility impaired users is a core element of the Proposed Scheme design and it has been informed by the principles of Best Practice Guidelines, Designing Accessible Environments (Irish Wheelchair Association 2020) and Building for Everyone: A Universal Design Approach (NDA 2020). Accessibility is also addressed in Chapter 12 of the PGDB. Further detail on accessibility for mobility impaired users is given in Section 4.6.5.

The Proposed Scheme, which has been developed after the consideration of reasonable alternatives and which achieves its aim and objectives, is described in detail in Section 4.5. Further detail on the key infrastructure elements that comprise the Proposed Scheme is provided in Section 4.6.

4.5 Description of the Proposed Scheme

The Proposed Scheme consists of two main alignments, running from Tallaght to the City Centre and from Clondalkin to Drimnagh. The Proposed Scheme is described in the following geographical sections:

- Section 1: Tallaght to Ballymount;
- Section 2: Ballymount to Crumlin;
- Section 3: Crumlin to Grand Canal;
- Section 4: Grand Canal to Christchurch;
- Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction; and
- Section 6: Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction to Drimnagh.

4.5.1 Section 1: Tallaght to Ballymount

4.5.1.1 General overview of the Proposed Scheme

The Proposed Scheme commences at the junction of Old Blessington Road / Cookstown Way to facilitate access to the proposed Bus Interchange on Belgard Square West. General traffic will also be permitted to access the Square Shopping Centre from this junction via Belgard Square South due to Belgard Square West being restricted to buses, cyclists and other authorised vehicles. Bus traffic across Old Blessington Road will be controlled by signal-controlled priority maintaining a similar arrangement to the existing scenario for orbital services heading towards the bus interchange.

It is proposed to change the existing Belgard Square South roundabout to a fully signalised junction with improved pedestrian facilities. The section of Belgard Square West from Belgard South to Old Blessington Road and immediately north of Old Blessington Road is proposed to be a bus only route and will no longer be a through route for general traffic. A Bus Interchange will be developed on Belgard Square West which will allow for interchange with the red line Luas and serve as the terminus for several buses including the A3, F1, D5 spine routes, W2, W4, W6, S6 orbital routes and 71, 85, L44 local routes. This will also act as the focal point for other through bus routes in the area. Access to Tallaght Cross West / Broadfield Hall and neighbouring developments will still be permitted from via Belgard Square North and the northern section of Belgard Square West.

The proposed Tallaght Bus Interchange will greatly improve transport links to the area and cater for greater public access. It will become an important new focal point in the community. The interchange is an “island” type layout with four sedum green roofs to soften the view from local apartments above. It will have eight independently usable alighting / boarding bays with an inbound bus layby for buses passing through the interchange. Pedestrian movement by passengers and shoppers is accommodated within and across the interchange island. The Bus Interchange design will require land take and will integrate with the adjacent shopping centre, the proposed South Dublin County Council (SDCC) public realm development and the wider Tallaght area.

It is proposed to change the roundabout junction on Belgard Square North at the Tallaght Hospital Entrance to a fully signalised junction to accommodate new bus, cycle and pedestrian facilities. The roundabout junctions at

Belgard Square East will also be replaced with new signalised junction arrangements. It is proposed to upgrade the existing cycle facilities and associated junctions on Belgard Square North to provide segregated cycle tracks to and from Tallaght Hospital. This proposed amendment may impact on the existing trees and shrubs along Belgard Square North and require localised land acquisition on a currently undeveloped site. The recently constructed signalised junction at the Cookstown Link Road and right-turn filter lane on Belgard Square North will be accommodated in the Proposed Scheme.

From Belgard Square East the route continues via Blessington Road and Main Street to Greenhills Road. To avoid traffic congestion on Greenhills Road it is proposed for buses to use the Old Greenhills Road alignment and create a new bus only junction at the location of the existing cul-de-sac opposite Bancroft Park Road, to facilitate bus only turn movements to Greenhills Road (R819). This will aid the bus in avoiding congestion at the Main Street / Greenhills Road (R819) junction. Stone paving will be used in the area and localised planting will be implemented to retain the character of the existing cul-de-sac treatment.

Between the Old Greenhills Road and the junction with Mayberry Road, along the Greenhills Road (R819), it is intended to provide one bus lane, one traffic lane and a cycle track in each direction. Raised table side entry treatments and protected junctions have been proposed along this section where practical to improve pedestrian and cycle facilities. To accommodate this road cross section, it is proposed to acquire additional land on both the west and east side of the existing Greenhills Road (R819). A bus gate has been proposed along this section to minimise impacts to the existing mature trees and the stone wall on the western verge north of the TUD entrance on Greenhills Road (R819). The Airton Road / Greenhills Road (R819) junction has been upgraded to provide improved facilities for buses, cyclists and pedestrians.

To improve the operation of the existing junction and minimise land take, it is proposed to introduce a southbound right turn ban from the Greenhills Road (R819) to the entrance to Harvey Norman / Costa carpark and a northbound right turn ban from the Greenhills Road (R819) to Hibernian Industrial Estate. Southbound access to Harvey Norman / Costa car park via Greenhills Road (R819) will be maintained via the entrance off Airton Road. Northbound access to Hibernian Industrial Estate will be achieved via the entrance opposite Broomhill Road.

A low height retaining wall will be required to the south of Broomhill Road to accommodate the proposed road boundary cross section.

Between Mayberry Road and Tymon Lane, it is proposed to reconfigure the local road network. SDCC had previously identified this section of Greenhills Road for upgrade through the provision of new roads under their County Development Plan and received Part 8 Planning Approval in 2007. The Proposed Scheme seeks to align with the principles of the Part 8 scheme with a significantly reduced cross section that caters for sustainable modes only (i.e., bus / cycling / pedestrian) to minimise impacts on the adjacent properties and surrounding environment. General traffic will remain on the existing Greenhills Road. Bus Priority signalling will be used to prioritise bus movements in the outbound direction via the new approximately 620m long sustainable link road that will run parallel to Birchview Avenue and Treepark Road. Inbound D5 spine services and X47 services from Castletymon Road will also be provided with a priority bus only link that adjoins the new link road. As part of the proposal, improved cycling facilities including new two-way cycling and pedestrian links will be incorporated to improve access to Tymon Park and surrounding amenities. Significant new landscaping and Sustainable Drainage Systems enhancements will also be provided in these areas.

As outlined in the Greater Dublin Area (GDA) Cycle Network Plan, this Section of the corridor will provide access with the proposed secondary routes SO6 and 9C at Belgard Square South / Belgard Square West and aligns with primary route SO5 on the Blessington Road and primary route 8B on Greenhills Road (R819). The proposed Dodder Greenway can be accessed at Tymon Park south of the R819 / M50 overbridge.

4.5.1.2 Deviations from Standard Cross Sections

The Proposed Scheme has been designed in accordance with the PDGB and the TII publications referenced within the PDGB. However, at a number of constrained locations across the Proposed Scheme, the width of the cross-sectional elements has been designed below the desirable minimum identified in the PDGB guidance (Section 4.6.1). The deviations within Section 1 are detailed in Table 4.3.

Table 4.3: Reduced Standard Cross Sections on Section 1

Chainage	Design Element	Desirable Minimum	Design	Justification
A1970	Cycle track (inbound)	2.0m	1.5m	Bus Gate signal controlled junction, left turn ban. Single file cycling minimum width provided (PDGB).
A1970	Cycle track (outbound)	2.0m	1.5m	Bus Gate signal controlled junction, left turn ban. Single file cycling minimum width provided (PDGB).
A1970 – A2080	Off-road cycle track (inbound and outbound)	2.0m	1.5m	Existing off-road cycle track width utilised. Single file cycling minimum width provided (PDGB).
A2200 – A2210	Cycle track (inbound and outbound)	2.0m	1.5m	Localised narrowing (10m) to avoid reconstruction of existing culvert headwalls. Single file cycling minimum width provided (PDGB).
A2748 – A2766	Road alignment horizontal radius	R = 82m	R = 65m	Moderate speed zone (40-60km/h), adoption of Manual for Streets 2 (2010) criteria.

4.5.1.3 Bus Lane Provision

An overview of the bus lane provisions as part of the Proposed Scheme is provided in Section 4.6.4. As outlined within that section, full bus priority through the use of dedicated bus lanes is not possible at all locations, and Signal Controlled Priority is used in Section 1 of the Proposed Scheme as listed in Table 4.4.

Table 4.4: Proposed Signal Controlled Priority Junctions within Section 1

Junction Location	Priority Type	Note
Cookstown Way / Belgard Square South	Bus priority is proposed on Old Blessington Road / Alderpark Court, to facilitate bus priority towards the new bus interchange	The existing left turn slip from Cookstown Way onto Blessington Road / Alderpark Court is proposed to be omitted to introduce a more compact junction.
Belgard Square South / Belgard Square West	Bus priority is proposed along Belgard Square West up to the stop line along Belgard Square West.	The proposed bus interchange will be located on Belgard Square West, and is the commencement point for buses into the City Centre. It is proposed to provide a shared bus and cycle facility along Belgard Square West.
Belgard Square West / Old Blessington Road	Dedicated bus lane infrastructure is proposed along Belgard Square West to facilitate buses accessing the proposed Interchange.	Due to constraints at this location, segregated cycle tracks are not proposed. Cyclists are proposed to utilise the bus lane.
Belgard Square North / Belgard Square West	Due to constraints at this location, it is proposed that buses will share with general traffic along Belgard Square West. For outbound buses along Belgard Square North, a junction type 3 is proposed, whereby the bus lane is curtailed approximately 20m prior to facilitate a left turning pocket. Traffic volumes at this location will be low and therefore the impact upon buses will be minimal.	A protected style junction is proposed, where physical kerb build-outs will assist to give cyclists greater protection from left turning vehicles.
Belgard Square North / Cookstown Link Road	For the inbound direction along Belgard Square North, a junction type 3 is proposed where the bus lane is curtailed approximately 20m prior to the stop line. Left turning volumes will be low at this location and, therefore, any left turning vehicles will not have a detrimental impact upon bus priority. For the outbound direction, due to physical constraints along this section of Belgard Square North, buses will share with general traffic.	Cyclist entry and exit lanes are proposed on all arms of the junction.
Belgard Square North / Belgard Square East	Bus priority as per junction type 1 is proposed for both inbound and outbound directions along Belgard Square North and Belgard Square East, respectively.	The proposed junction upgrade will introduce physical build outs on all four corners to reduce vehicular turning speeds whilst offering cyclists with greater protection from left turning vehicles.

Junction Location	Priority Type	Note
	Along Belgard Square East, a bus gate is proposed to provide buses with priority along this section.	
Blessington Road / Belgard Square East	For the outbound direction, a bus lane is proposed up to the stop line as per junction type 1 along Blessington Road. It is envisaged that traffic volumes along Belgard Square East will be relatively low due to the proposed bus gate along Belgard Square East.	The proposal will introduce cycle tracks along Belgard Square East.
Blessington Road / Belgard Road	For the inbound direction, a bus lane is proposed up to the stop line along Blessington Road. Future traffic data indicates that traffic volumes will be relatively low and will have minimal impact upon bus journey times.	The existing junction is proposing to upgrade the existing cycling infrastructure at the junction. The proposal will introduce toucan crossings to cater for cyclists crossing at the respective junction.
Blessington Road / Main Road	For the inbound direction along Blessington Road, existing carriageway width constraints restrict the ability to introduce a bus lane at this location. For the outbound direction along Main Road, it is proposed to introduce a bus lane to accommodate right turning buses towards Tallaght Interchange.	Due to width constraints, cycle infrastructure is not feasible and has not been included at this junction.
Old Greenhills Road / Main Road	Due to the carriageway constraints, it was not feasible to introduce a bus lane at this junction. Inbound buses are proposed to travel along Main Road and turn left towards Old Greenhills Road where a bus gate is proposed. The proposed bus gate along Old Greenhills Road will assist to reduce general traffic volumes to minimise delay to buses.	The existing junction is proposed to be upgraded to introduce controlled pedestrian crossings across Old Greenhills Road and Main Road.
Old Greenhills Road / Greenhills Road	A bus lane is proposed up to the stop line for both inbound and outbound directions. A bus gate is proposed at the existing cul-de-sac end, to provide a route for buses to travel along Old Greenhills Road, to avoid Greenhills Road / Main Street junction. Bus priority is proposed in the outbound direction, with a dedicated right turning lane.	Advisory cycle symbols are proposed along Old Greenhills Road to denote the advisory cycle route.
Greenhills Road / Airton Road	It is proposed to introduce a bus lane up to the stop line to ensure bus priority at both inbound and outbound directions. For the inbound direction, a break is proposed to the bus lane to facilitate a new left turning lane inside the bus lane. This is proposed to facilitate additional capacity for traffic turning left.	The proposal is to upgrade the junction to cater for cycle tracks on all arms entering and exiting the junction. It is proposed to introduce physical build-outs to offer cyclists greater protection crossing the junction.
Greenhills Road / Hibernian Industrial Estate / Harvey Norman Retail	It is proposed to introduce a bus lane up to the stop line to ensure bus priority at both inbound and outbound directions.	The proposal is to upgrade the junction to cater for cycle tracks on all arms entering and exiting the junction. It is proposed to introduce physical build-outs to offer cyclists greater protection crossing the junction.
Greenhills Road / Mayberry Road	It is proposed to introduce a bus lane up to the stop line to ensure bus priority at both inbound and outbound directions. For the inbound direction, a break is proposed to the bus lane to facilitate a new left turning lane inside the bus lane. This is proposed to facilitate additional capacity for traffic turning left.	The proposal is to upgrade the junction to cater for cycle tracks on all arms entering and exiting the junction. It is proposed to introduce physical build-outs to offer cyclists greater protection crossing the junction.
Greenhills Road / Castletymon Road	Due to the carriageway constraints, it was not feasible to introduce a bus lane at this junction. Exclusive bus lane is proposed parallel to the Greenhills Road in both inbound and outbound directions. This proposal reduces the delay to buses caused by the high general traffic volumes	The proposal will assist to upgrade the existing cycling infrastructure at the junction.

Junction Location	Priority Type	Note
Greenhills Road / Tymon Lane	It is proposed to provide junction priority as per Junction Type 1, where the bus lane is proposed up to the stop line in inbound direction along Greenhills Road.	Cycle tracks are proposed along Greenhills Road, for both inbound and outbound directions.

4.5.1.4 Bus Stops

The different types of bus stop (island, shared landing, inline and lay-by bus stops) are described in Section 4.6.4.5. The bus stop locations and types on Section 1 of the Proposed Scheme are outlined in Table 4.5 and shown in the General Arrangement series of drawings (BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-9001) in Volume 3 of this EIAR. Further details of bus stop design are included in the PDGB (NTA 2021) – Appendix A4.1 in Volume 4 of this EIAR.

Table 4.5: Proposed Bus Stop Locations within Section 1

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Inbound	Old Blessington Road, The Square	4348	A105	Layby Bus Stop	Proposed: Yes Existing: Yes
Inbound	Old Blessington Road, Tallaght Hospital	4606	A490	Island Bus Stop	Proposed: Yes Existing: Yes
Inbound	Belgard Square East	New	A820	Shared landing Bus Stop	Proposed: Yes New location
Inbound	Tallaght Road, Tallaght Village	4435	A1400	Inline Bus Stop	Proposed: Yes Existing: Yes
Inbound	Old Greenhills Road, Tallaght	New	A1935	Inline Bus Stop	Proposed: Yes New location
Inbound	Greenhills Road, Airton Road	2633	A2470	Island Bus Stop	Proposed: Yes Existing: No
Inbound	Greenhills Road, Airton Road	2369	A3000	Island Bus Stop	Proposed: Yes Existing: Yes
Inbound	Greenhills Road, Parkview	New	A3370	Inline Bus Stop	Proposed: Yes New location
Outbound	Old Blessington Road, Tallaght Hospital	4640	A520	Shared landing Bus Stop	Proposed: Yes Existing: No
Outbound	Belgard Square East	New	A820	Shared landing Bus Stop	Proposed: Yes New location
Outbound	Blessington Road, Institute of Technology (TUD)	4436	A1130	Inline Bus Stop	Proposed: Yes Existing: No
Outbound	Tallaght Village, Old Bawn Road	2557	A1440	Inline Bus Stop	Proposed: Yes Existing: No
Outbound	Old Greenhills Road, Tallaght	New	A1910	Inline Bus Stop	Proposed: Yes New location
Outbound	Greenhills Road, Airton Road	4446	A2360	Island Bus Stop	Proposed: Yes New location
Outbound	Greenhills Road, Mayberry Road	2601	A2850	Shared landing Bus Stop	Proposed: Yes Existing: No
Outbound	Greenhills Road, Tymonville	New	A3310	Inline Bus Stop	Proposed: Yes New location

4.5.1.5 Cycling Provision

The specific proposals for cycling facilities in Section 1 of the Proposed Scheme are described below. Provision for cyclists at the signal-controlled junctions are described in Section 4.6.3.5.

Where the scheme starts, on Belgard Square West, cyclists will share bus lanes inbound and outbound. New segregated cycle tracks will be provided on Belgard Square North and the existing cycle tracks on Belgard Square East will be upgraded as far as the junction with Blessington Road. On Blessington Road, the existing cycle 'Zipway' will remain in place (Primary Route SO5 of the GDA Cycle Network Plan). On R819 Greenhills Road, the existing off-road cycle track between Bancroft Park and the TUD Tallaght entrance will remain in place. A new segregated cycle track will continue along R819 Greenhills Road (Primary Route 8B of the GDA Cycle Network Plan) after the TUD Tallaght entrance as far as the M50 overbridge.

4.5.1.6 Junction Information

An overview of the approach to junction review and design is provided in Section 4.6.7. The major and moderate junctions (signalised) within Section 1 of the Proposed Scheme are outlined in Table 4.6.

Table 4.6: Major and Moderate Junctions (Signalised) within Section 1 of the Proposed Scheme

Junction Location	Note
Major Junctions	
Belgard Square South / Belgard Square West	Existing roundabout junction proposed to be removed. Introduction of Bus only restriction for Belgard Square West to facilitate Tallaght Bus Interchange.
Belgard Square West / Belgard Square North	Signal-controlled junction on Belgard Square North. Existing roundabout junction proposed to be removed with dedicated pedestrian and cycle crossings.
Belgard Square North / Belgard Square East	Signal-controlled junction layout. Existing roundabout junction proposed to be removed with dedicated pedestrian and cycle crossings. Bus only access to Belgard Square East.
Greenhills Road / Airton Road	Signal-controlled junction layout with dedicated pedestrian and cycle crossings. Bus priority inbound and outbound along corridor proposed.
Greenhills Road / Hibernian Industrial Estate / Harvey Norman Access	Signal-controlled junction layout with dedicated pedestrian and cycle crossings. Bus priority inbound and outbound along corridor proposed.
Greenhills Road / Mayberry Road	Signal-controlled layout with dedicated pedestrian and cycle crossings. Bus priority inbound and outbound along corridor proposed.
Moderate Junctions / Priority Junctions	
Cookstown Way / Belgard Square South	Right-turn vehicular access proposed to be permitted from Cookstown Way to Belgard Square South to facilitate access to The Square Shopping Centre, replacing existing right-turn ban at this location
Belgard Square West / Old Blessington Road	Existing signalised junction reconfigured for proposed bus only access onto Belgard Square West inbound and outbound.
Belgard Square North / Cookstown Link Road	Junction reconfigured to accommodate recently constructed Cookstown Link Road
Belgard Square East / Blessington Road	Proposed bus priority outbound on Blessington Road.
Blessington Road / Belgard Road	Proposed bus priority inbound on Blessington Road. Proposed Toucan road crossing linking cycle tracks on Belgard Road and Blessington Road.
Blessington Road / Main Road Tallaght	Existing signalised junction reconfigured to provide proposed bus only right turn on Main Road.
Main Road Tallaght / Old Greenhills Road	No current pedestrian crossing facilities. Proposed signalised priority junction with pedestrian crossing on Old Greenhills Road.
Greenhills Road / Old Greenhills Road / Bancroft Park	Proposed opening of junction at Old Greenhills Road / Greenhills Road to bus only movements. Raised table side entry treatment proposed and no right turn onto Greenhills Road, no right turn onto Bancroft Park.
Greenhills Road / TUD Access Road / St. Mary's National School	Junction reconfigured to accommodate recently constructed TUD Tallaght Access junction.
Greenhills Road / Broomhill Road	No current pedestrian crossing facilities, raised table side entry treatment proposed.

Junction Location	Note
Greenhills Road / Hibernian Industrial Estate	No current pedestrian crossing facilities, raised table side entry treatment proposed.
Old Greenhills Road / Castletymon Road	Existing signalised priority junction. Proposed junction reconfiguration to include new cycle tracks and Toucan crossing.
Old Greenhills Road / Temple Woods	Existing dropped kerb pedestrian crossing facilities, raised table side entry treatment proposed.

4.5.1.7 Structures

4.5.1.7.1 Bridges

There are no bridge works proposed along Section 1 of the Proposed Scheme.

4.5.1.7.2 Retaining Walls

There are no principal retaining walls proposed along Section 1 of the Proposed Scheme.

4.5.1.8 Parking and Loading Bays

Changes to the parking provisions along Section 1 as a result of the Proposed Scheme are shown in Table 4.7. There are no changes to loading provision along Section 1 of the Proposed Scheme.

Table 4.7: Section 1: On-Street Parking Spaces Change Impact Summary

Location	Type of Parking	Existing	Proposed	Proposed Change
Belgard Square	Adjacent Parking	6000 approx.	5935 approx.	-65
	Loading Bay	0	3	3
Main Road / Old Greenhills Road	Designated Paid Parking	34	14	-20
	Disabled permit Parking	2	1	-1
	Illegal Parking	2 approx.	0	-2 approx.
Greenhills Road – West of M50 Bridge	Commercial vehicles parked for display (car sales)	345 approx.	345 approx.	0
	Adjacent Parking	920 approx.	908 approx.	-12
Total		7303 approx.	7206 approx.	-97 approx.

4.5.1.9 Landscape and Urban Realm

For an overview of the landscape design principles and approach, reference should be made to Section 4.6.11. The following sections provide a description of specific landscape and urban realm design works in Section 1 of the Proposed Scheme.

This section of the Proposed Scheme commences at the existing roundabout junction on Belgard Square South. The main landscaping intervention along this section of the route is the proposed Tallaght Bus Interchange. The proposals include a new plaza space with bus shelters incorporated into sculptural canopies. The new plaza and interchange open space will greatly improve transport links to the area and cater for greater public access. It will become an important new connecting space within the local urban realm. Tree and shrub planting will increase biodiversity in the area while creating a pleasant interface with the surrounding context – refer to Image 4.1.

The route from Belgard Square will utilise existing road infrastructure, allowing for retention of existing tree planting and public realm enhancements in the form of replacement planting at some areas along the route.

Between the Old Greenhills Road and the junction with Mayberry Road, and along the R819 Greenhills Road, it is proposed to utilise land take on both the west and east side of the existing R819 Greenhills Road. This will require replacement tree planting but also gives opportunity to introduce potential Sustainable Drainage Systems (SuDS) interventions along this section of the route – refer to Image 4.2.

An extensive tree planting scheme is proposed along the entire route to provide a more consistent level of tree cover that will enhance the visual appearance of the route and increase the local biodiversity values. Key enhancements will include the new sustainable transport link road at Parkview and the creation of new public realm links, SuDS interventions and enhancement of the green infrastructure through new tree planting and development of meadow grass areas.

An extensive SuDS attenuation area is proposed at Tymonville Crescent. It will be planted with native species adaptable to wetland conditions and surrounded by native woodland trees in small clusters to provide a new landscaped parkland that will resemble the existing tree belt retained on the eastern side of Greenhills Road.



Image 4.1: Tallaght Bus Interchange

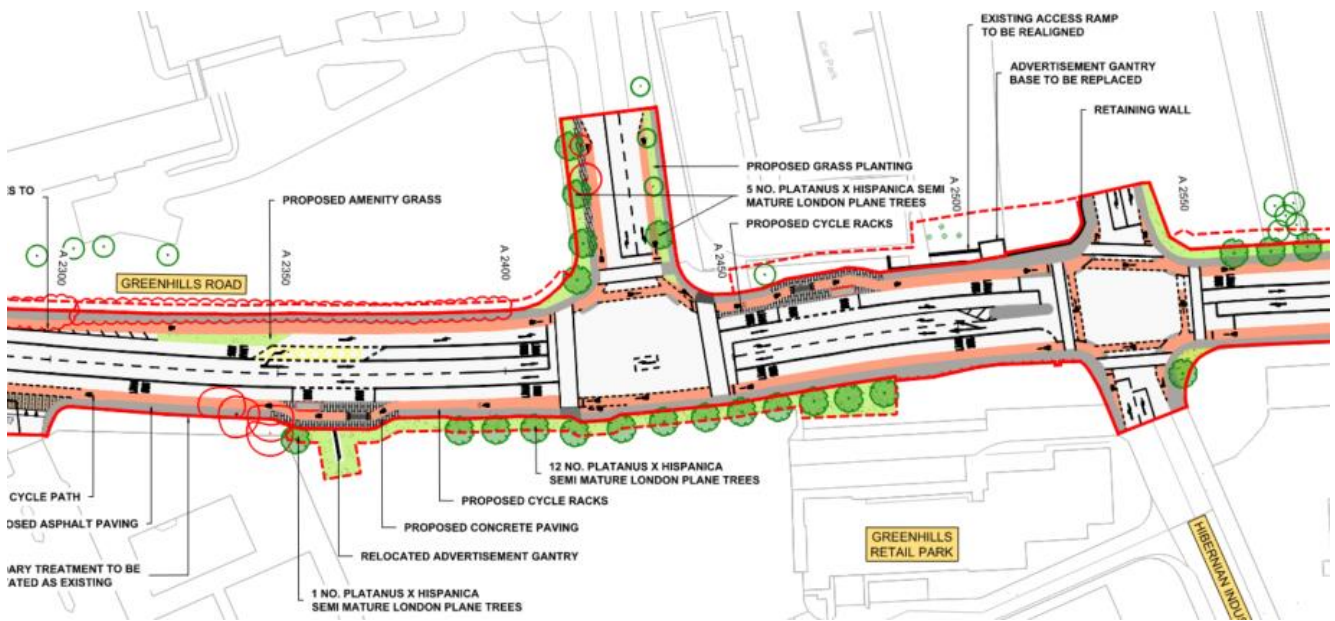


Image 4.2: Greenhills Road proposed tree planting and amenity grass areas

4.5.1.10 Land Acquisition and Use

Land acquisition will be required through this section to facilitate the Proposed Scheme, including junction configuration, a new Bus Interchange, widening of carriageway on Belgard Square North and on R819 Greenhills Road between St. Mary’s Secondary School and Mayberry Road.

Temporary land take is required within this section to facilitate:

- A site construction compound at Alderpark Court / Old Blessington Road/ N81 Tallaght;
- The construction of the Tallaght Bus Interchange;
- Provision of a bus and cycle lane on north side of Belgard Square North, east of the recently constructed Cookstown Link Road (Ch A565 to Ch A625), as shown in General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0003 in Volume 3 of this EIAR;
- A site construction compound at Bancroft Park / Greenhills Road (Ch A1950);
- Widening of R819 Greenhills Road carriageway between St. Mary’s Secondary School and Mayberry Road junction (Ch A2140 to Ch A2950), see General Arrangement drawings BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0007 to BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0009 in Volume 3 of this EIAR;
- A site construction compound at Greenhills Road / Birchview Avenue / Tymonville Crescent (Ch A2960 to Ch A3200); and
- A site construction compound at Greenhills Road / Tymon Lane (Ch A3650 to Ch 3710).

The impacts on residential amenity arising from land acquisition in Section 1 of the Proposed Scheme and are addressed in Chapter 10 (Population). Similarly, the impacts on landscape amenity arising from land acquisition in Section 1 of the Proposed Scheme are addressed in Chapter 17 (Landscape (Townscape) & Visual).

4.5.1.11 Rights of Way

Table 4.8 outlines the location in Section 1 where existing rights of way which will be affected by the Proposed Scheme.

Table 4.8: Section 1: Existing Rights of Way Affected

Location	Chainage	Existing Situation	Proposed Change
The Square Shopping Centre Tallaght	A150	Direct access to Shopping Centre car park from Old Blessington Road.	Direct access to car park from Old Blessington Road to be closed off to facilitate construction of Tallaght Bus Interchange, alternative access to car park available via Belgard Square South.

4.5.2 Section 2: Ballymount to Crumlin

4.5.2.1 General overview of the Proposed Scheme

The existing M50 bridge crossing will be retained. Two new single span pedestrian / cycle bridges are proposed to be located adjacent to the existing bridge to maintain priority for buses on the existing bridge and to provide high quality cycle / pedestrian facilities over the M50 in both directions. The pedestrian / cycle bridges will be steel warren truss type structures and will be positioned immediately parallel to the existing structure. Additional land acquisition on both sides of the M50 will be required to facilitate the construction of the pedestrian / cycle bridges.

Two sustainable link roads will be constructed in the Ballymount area due to the existing width constraints within the existing Greenhills Road (R819) to the east of the M50. The existing Ballymount Road Upper connection to Greenhills Road will be closed to vehicular traffic and a new 220m long link road to the south of Ballymount Avenue will provide a connection to Greenhills Road (R819). New retaining walls and earth embankments will be required at this location to facilitate the new road construction. It is proposed to widen the existing Ballymount Avenue and Calmount Road for dedicated bus and cycle tracks and connect Calmount Road to Greenhills Road. The existing Greenhills Road (R819) will be retained for local access and cycling facilities with a cul-de-sac treatment to the northern end where a new approximately 250m long sustainable transport link road will be constructed in the green area to the east of Calmount Road. New retaining walls and earth embankments will be required at this location to facilitate the new road construction. To maintain access for local businesses along the Greenhills Road (R819) in this area a small roundabout will be constructed with a new approximately 90m long link road to connect Greenhills Road with Calmount Avenue which generally aligns to the principles of the SDCC Part 8 schemes for the area. Accessible ramps and stairs will be provided to mitigate against the steep gradient on Calmount Avenue where it joins to Greenhills Road.

Between Calmount Road and Walkinstown Roundabout, it is proposed to maintain one bus lane, one traffic lane and a cycle track inbound with one traffic lane and a cycle track outbound along the Greenhills Road (R819).

The layout of Walkinstown Roundabout has been designed to provide enhanced cycle and pedestrian connectivity around this busy junction as well as improving safety for pedestrians, cyclists, bus and general traffic. A two-way segregated cycle track has been proposed around the junction to allow cyclists to adopt the most direct route around the roundabout (i.e., both directions) and to reduce interactions with motor vehicles. Parallel pedestrian / cyclist raised table crossings have been implemented on all arms to improve pedestrian and cyclist safety. Set back crossings have been used on all arms to promote pedestrian / cyclist desire lines with consideration for vehicle exit lane storage off the roundabout. Cycle detection loops have also been implemented on the two-way segments on approach to the crossings to help promote cycling journey time efficiencies and minimise delays for cyclists crossing multiple arms of the junction. The number of general traffic entry lanes / flares, circulation lanes and angle of entry have been reconfigured to promote safer vehicle movements. Landscaping proposals and revised parking arrangements are also proposed to enhance the area. City bound cyclists will be directed to the offline cycle route along Bunting Road and St. Mary's Road, providing a more direct route linking Walkinstown Roundabout with Kildare Road.

As outlined in the GDA Cycle Network Plan, this Section of the corridor will align with primary route 8B on the R819 M50 overbridge as far as Tymon Park entrance and secondary route 8A on Ballymount Avenue, Calmount Road and Greenhills Road (R819) to Walkinstown Roundabout.

4.5.2.2 Deviations from Standard Cross Sections

The Proposed Scheme has been designed in accordance with the PDGB and the TII publications referenced within the PDGB. However, at a number of constrained locations across the Proposed Scheme, the width of the cross-sectional elements has been designed below the desirable minimum identified in the PDGB guidance (Section 4.6.1). The deviations within Section 2 are detailed in Table 4.9.

Table 4.9: Reduced Standard Cross Sections on Section 2

Chainage / Location	Design Element	Desirable Minimum	Design	Justification
A3710 – A3780	Greenhills Road M50 overbridge carriageway width (inbound and outbound)	3.0m	2.9m	DMURS – standard lane width on Arterial and Link Streets should lie in the range of 2.75m to 3.5m. Within this range the preferred values are 3.0m and 3.25m.
A4670 – A4750	Cycle track (outbound)	2.0m	1.5m	Narrowing due to available road cross-section and to consider pedestrian footway widths. Single file cycling minimum width provided (PDGB).
A4680 – A4750	Right-turn lane width	3.0m	2.75m	DMURS – standard lane width on arterial and link streets should lie in the range of 2.75m to 3.5m. Within this range the preferred values are 3.0m and 3.25m.
A4830 – A4890	Cycle track (inbound)	2.0m	1.5m	Narrowing due to available road cross-section and to consider pedestrian footway widths. Single file cycling minimum width provided (PDGB).
A5580 – A5620	Cycle track and footway (inbound and outbound)	2.0m	1.5m cycle track and 1.8m footway	Narrowing due to available road cross-section and to consider retaining wall construction adjacent to existing building. Single file cycling minimum width provided (PDGB).
A5625 – A5630	Cycle track (outbound)	2.0m	1.25m	Narrowing to allow for proposed retaining wall without impacting on existing Chadwicks shed. Localised narrowing of the cycle track below 1.5m minimum may be necessary over very short distances to cater for local constraints (PDGB).
C20 – C893	Cycle track (inbound and outbound)	2.0m	1.5m	Matching existing. Single file cycling minimum width provided (PDGB).

4.5.2.3 Bus Lane Provision

An overview of the bus lane provisions as part of the Proposed Scheme is provided in Section 4.6.4. As outlined within that section, full bus priority through the use of dedicated bus lanes is not possible at all locations, and Signal Controlled Priority is used in Section 2 of the Proposed Scheme as listed in Table 4.10.

Table 4.10: Proposed Signal Controlled Priority Junctions within Section 2

Junction Location	Priority Type	Note
Ballymount Avenue / Calmount Road	For bus priority at the junction, a bus lane is proposed along both the inbound (Ballymount Ave) and outbound (Calmount Road) directions up to the stop line at the junction. This will assist to provide bus priority in both directions. Separate bus stages on the mainline corridor inbound only. Bus lanes up to stop lines on the mainline corridor inbound only.	A junction type 4 arrangement is proposed where an orbital cycle track is to be introduced at the junction. This will offer cyclists greater protection, as the cyclist crossings will be segregated to the vehicular movement phases. Onset of receiving bus lane in inbound direction delayed to avoid impact to existing private properties, including buildings.
Calmount Avenue / Calmount Road	Bus priority is proposed for the inbound direction along Calmount Road, with the bus lane proposed up to the stop line, which is akin to junction type 1. For the outbound direction, the bus lane is proposed to be curtailed prior to the stop line to facilitate a left turn pocket, akin to junction type 3. Left turning volumes will be low and will not have a detrimental impact upon bus priority at this location.	It is proposed to introduce new cycle tracks on both sides of Calmount Road to facilitate both inbound and outbound cyclists. A toucan crossing is proposed across Calmount Road.
Walkinstown Roundabout	It is proposed to provide a junction type 3, whereby the bus lane is curtailed prior to the stop line to facilitate left turning vehicles.	Controlled cyclist crossings are proposed on all respective arms of the junction. The proposed cycle track will travel along Greenhills Road on both sides of the

Junction Location	Priority Type	Note
		carriageway, connecting onto Walkinstown Roundabout. At the roundabout, a two-way cycle track is proposed to cater for cyclists crossing the respective arms of the junction. The cycle route is proposed to continue towards Dublin City Centre via Bunting Road along new proposed cycle tracks.

4.5.2.4 Bus Stops

The different types of bus stop (island, shared landing, inline and lay-by bus stops) are described in Section 4.6.4.5. The bus stop locations and types on Section 2 of the Proposed Scheme are outlined in Table 4.11 and shown in the General Arrangement series of drawings (BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-9001) in Volume 3 of this EIAR. Further details of bus stop design are included in the PDGB (NTA 2021) – Appendix A4.1 in Volume 4 of this EIAR.

Table 4.11: Proposed Bus Stop Locations within Section 2

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Inbound	Ballymount Avenue	New	A4250	Island Bus Stop	Proposed: Yes New location
Inbound	Calmount Road	New	A4765	Shared landing Bus Stop	Proposed: Yes New location
Inbound	Calmount Road, Calmount Avenue	New	A5010	Shared landing Bus Stop	Proposed: Yes New location
Inbound	Calmount Road, Ballymount Court	New	A5370	Island Bus Stop	Proposed: Yes New location
Inbound	Greenhills Road, Walkinstown Roundabout	2377	A5765	Island Bus Stop	Proposed: Yes Existing: Yes
Outbound	Greenhills Road, Tibbradden Drive	New	A4130	Island Bus Stop	Proposed: Yes New location
Outbound	Ballymount Avenue	New	A4600	Shared landing Bus Stop	Proposed: Yes New location
Outbound	Calmount Road, Calmount Avenue	New	A4900	Shared landing Bus Stop	Proposed: Yes New location
Outbound	Calmount Road, Ballymount Court	New	A5440	Island Bus Stop	Proposed: Yes New location
Outbound	Greenhills Road, Mulcahy Keane	2334	A5690	Shared landing Bus Stop	Proposed: Yes Existing: No

4.5.2.5 Cycling Provision

The specific proposals for cycling facilities in Section 2 of the Proposed Scheme are described below. Provision for cyclists at the signal-controlled junctions are described in Section 4.6.3.5.

Segregated cycle tracks are provided over the M50 with two new cycle / pedestrian bridges adjacent to the existing R819 Greenhills Road M50 overbridge (Primary Route 8B of the GDA Cycle Network Plan) and continue to Tymon Park / Ballymount Road Upper where the Primary Route 8B heads east through Tymon Park. Segregated cycle tracks continue along R819 Greenhills Road onto Ballymount Avenue via the new link road connecting R819 Greenhills Road to Ballymount Avenue. From Ballymount Avenue the cycle tracks head east onto Calmount Road (Secondary Route 8A of the GDA Cycle Network Plan) and link back onto R819 Greenhills Road as far as Walkinstown Roundabout via a new link road extension to the existing Calmount Road. New cycle tracks are provided along Calmount Avenue between Calmount Road and the new small roundabout proposed on the existing Greenhills Road. At Walkinstown Roundabout, a two-way segregated cycle track is proposed around the

junction to allow cyclists to adopt the most direct route around the roundabout in both directions and to reduce interactions with motor vehicles. City bound cyclists will have an alternative segregated cycle route along Bunting Road (GDA Secondary Cycle Route 8A), St. Mary's Road, Kildare Road (GDA Secondary Route 8C) and Clogher Road to R111 Parnell Road (Grand Canal Greenway).

4.5.2.6 Junction Information

An overview of the approach to junction review and design is provided in Section 4.6.7. The major and moderate junctions (signalised) within Section 2 of the Proposed Scheme are outlined in Table 4.12.

Table 4.12: Major and Moderate Junctions (Signalised) within Section 2 of the Proposed Scheme

Junction Location	Note
Major Junctions	
Ballymount Avenue / Calmount Road	Signal-controlled junction layout with dedicated pedestrian and cycle crossings. Bus priority inbound and outbound along corridor proposed. Existing roundabout junction proposed to be removed with dedicated pedestrian and cycle crossings.
Walkinstown Roundabout	Existing junction upgraded with dedicated pedestrian and cycle crossings on all arms. Proposed 2 lane roundabout traffic to replace existing 3 lane roundabout layout.
Moderate Junctions / Priority Junctions	
Greenhills Road / Ballymount Road Upper	Junction closed, access to Ballymount Road Upper via proposed Ballymount Avenue link road.
Ballymount Avenue / Greenhills Road	Proposed side entry treatment at new Ballymount Avenue link road junction.
Ballymount Avenue / Ballymount Avenue Link Road	No current pedestrian crossing facilities, raised table side entry treatment proposed.
Calmount Road / Calmount Avenue	Priority junction. Proposed signalised junction with pedestrian and cycle facilities. Inbound and outbound bus lanes.

4.5.2.7 Structures

4.5.2.7.1 Bridges

Table 4.13 provides a description of the location and type of works to existing bridges along Section 2 of the Proposed Scheme.

Table 4.13: Summary of Major Structures in Section 2 of the Proposed Scheme

Identity	Co-ordinates	Chainage	Description
ST01 Greenhills Road Pedestrian and Cycle Bridges	709981.615 729536.932	A3750	Two bridges, one either side of the existing road bridge. Both bridges single span fully through warren trusses.

4.5.2.7.2 Retaining Walls

Table 4.14 sets out the proposed principal retaining walls along Section 2 of the Proposed Scheme.

Table 4.14: Summary of Principal Retaining Walls in Section 2 of the Proposed Scheme

Structure Ref.	Structure Type	Chainage Start – Chainage End (m)	Length (m)	Max. Retained Height (m)	Comment
RW01 Calmount Road	Reinforced earth retaining wall	A5340 – A5570	229	7.6	RW01 is required along the eastbound carriageway of the proposed alignment connecting the existing Calmount Road with

Structure Ref.	Structure Type	Chainage Start – Chainage End (m)	Length (m)	Max. Retained Height (m)	Comment
Retaining Wall					R819 Greenhills Road. The retaining wall will retain the earthworks embankment required as part of this proposed alignment.
RW02 Calmount Road Retaining Wall	Reinforced earth retaining wall	A5495 – A5645	152	3.3	RW02 is required along the westbound carriageway of the proposed alignment connecting the existing Calmount Road with R819 Greenhills Road. The retaining walls will retain the earthworks embankment required as part of this proposed alignment.

4.5.2.8 Parking and Loading Bays

Changes to the parking and loading provisions along Section 2 as a result of the Proposed Scheme are shown in Table 4.15. There are no changes to loading provision along Section 2 of the Proposed Scheme.

Table 4.15: Section 2: On-Street Parking Spaces Change Impact Summary

Location	Type of Parking	Existing	Proposed	Proposed Change
Calmount Road	Informal Parking	35	0	-35
Greenhills Road between Calmount Road and Walkinstown Roundabout	Illegal Parking	14 approx.	0	-14 approx.
	Adjacent Parking	450	389	-61
Walkinstown Roundabout	Illegal Parking	3	0	-3
	Informal Parking	30	28	-2
	Adjacent Parking	88	53	-35
	Taxi Parking	9	4	-5
Total		629 approx.	474	-155 approx.

4.5.2.9 Landscape and Urban Realm

For an overview of the landscape design principles and approach, reference should be made to Section 4.6.11. The following sections provide a description of specific landscape and urban realm design works in Section 2 of the Proposed Scheme.

The new connection to R819 Greenhills Road through Ballymount Industrial Estate provides an opportunity for public realm enhancement utilising SuDS features, new tree planting, shrub and meadow grass areas to enhance the local biodiversity value and create localised public open spaces along the route.

Walkinstown Roundabout will be enhanced with new planting, and a redefined public realm with cycle facilities.

4.5.2.10 Land Acquisition and Use

Land acquisition will be required through this section to facilitate the Proposed Scheme, including bridge construction (ST01), link road construction, carriageway widening, roundabout construction at Lidl store access, junction reconfiguration, retaining wall construction (RW01 and RW02) at the Calmount Road extension and link to R819 Greenhills Road and relocated access road for the Ballymount Court Business Centre.

Temporary land take is required within this section to facilitate:

- Construction of two pedestrian / cycle bridges (ST01) over the M50 (Ch A3700 to Ch A3780), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0012 in Volume 3 of this EIAR;

- Construction of link road between R819 Greenhills Road and Ballymount Avenue (Ch A4100 to A4380), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0013 in Volume 3 of this EIAR;
- Carriageway widening on Ballymount Avenue (Ch A4540 to Ch A4640), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0014 in Volume 3 of this EIAR;
- Construction of roundabout and link road between R819 Greenhills Road and Calmount Avenue (Ch C350 to C530), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0015 in Volume 3 of this EIAR;
- Junction reconfiguration at Calmount Road / Calmount Avenue junction (Ch A4960 to A4980), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0016 in Volume 3 of this EIAR;
- Construction of Calmount Road extension link to R819 Greenhills Road, associated retaining walls (RW01 and RW02) and new access road to Ballymount Court Business Centre (Ch A5250 to Ch A5650), see General Arrangement drawings BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0017 and BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0018 in Volume 3 of this EIAR;
- Widening of carriageway, provision of bus stop layby on R819 Greenhills Road (Ch A5560 to Ch A5725), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0018 in Volume 3 of this EIAR; and
- Removal of Traffic bollards for car park access at Walkinstown Roundabout / The Kestrel Public House (Ch A5960), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0019 in Volume 3 of this EIAR.

The impacts on residential amenity arising from land acquisition in Section 2 of the Proposed Scheme and are addressed in Chapter 10 (Population). Similarly, the impacts on landscape amenity arising from land acquisition in Section 2 of the Proposed Scheme are addressed in Chapter 17 (Landscape (Townscape) & Visual).

4.5.2.11 Rights of Way

Table 4.16 outlines the locations in Section 2 where existing rights of way which will be affected by the Proposed Scheme.

Table 4.16: Section 2: Existing Rights of Way Affected

Location	Chainage	Existing Situation	Proposed Change
Ballymount Road upper / R819 Greenhills Road junction north of M50 bridge	A3960	Priority junction road link between Ballymount Road Upper and R819 Greenhills Road	Section of Ballymount Road Upper taken up removing junction link to R819 Greenhills Road.
Green area between Ballymount Recycling Centre on Ballymount Avenue and R819 Greenhills Road	A4200	Southern section of Ballymount Avenue routes into the M50 Business Park opposite Ballymount Recycling Centre and R819 Greenhills Road continues south of Ballymount Recycling Centre	New link road through green area connecting R819 Greenhills Road with Ballymount Avenue with signalised junction connecting to existing R819 Greenhills Road east alignment.
Green area between Calmount Road Cul-de-Sac and Greenhills Road south of Ballymount Court Business Centre	A5400	Green area and woodland.	New Calmount Road Extension link road linking Calmount Road to R819 Greenhills Road
R819 Greenhills Road at Calmount Road Extension	A5550	R819 Greenhills Road continuous through this are opposite Ballymount Court Business Centre.	Section of R819 Greenhills Road taken up and new link road (Calmount Road Extension) constructed between Calmount Road and R819 Greenhills Road.
Access to Ballymount Court Business Centre, R819 Greenhills Road	A5575	Ballymount Court Business Centre access road	Existing Ballymount Court Business Centre access road a Taken up, new access road constructed approximately 240m west.
Kildare Road / Cashel Road junction	E600	Priority junction road link between Cashel Road and Kildare Road	Section of Cashel Road taken up removing priority junction link.
Kildare Road / Clogher Road junction	E1150	Straight through continuous eastbound link between Kildare Road and Clogher Road	Straight through continuous eastbound link between Kildare Road and Clogher Road removed and eastbound traffic onto Clogher Road via reconfigured Kildare Road / Clogher Road junction.

4.5.3 Section 3: Crumlin to Grand Canal

4.5.3.1 General overview of the Proposed Scheme

On Walkinstown Road (R819) between Walkinstown Roundabout and the Long Mile Road (R110), it is proposed to provide one bus lane and one general traffic lane in each direction with minimum land take impacting properties on Walkinstown Road (R819) maintaining sufficient front driveway boundary setback lengths for a car to be parked. To accommodate this cross section, land acquisition will be required along the Walkinstown Road (R819). Land acquisition is proposed on the western side of the Walkinstown Road (R819) between Walkinstown Roundabout and Kilnamanagh Road. Between Kilnamanagh Road and Long Mile Road (R110), land acquisition is proposed on the eastern side of Walkinstown Road (R819). It is proposed to introduce a southbound right turn ban for general traffic from Walkinstown Road (R819) to Kilnamanagh Road to improve the efficiency of the junction and minimise bus delays. Kilnamanagh Road will remain accessible from the Walkinstown Road (R819) via Walkinstown Drive. It is also proposed to introduce a right turn ban for northbound right turning traffic from the Walkinstown Road (R819) to the southern entrance of the SuperValu supermarket (Walkinstown Shopping centre) during peak hours to improve the operation of the junction and reduce bus delays. Entry to the shopping centre will be possible via the alternative car park entrance.

City-bound cyclists will have an alternative segregated cycle route along Bunting Road (GDA Cycle Route 8A) and St. Mary's Road providing a more direct route linking Walkinstown Roundabout with Kildare Road.

It is proposed to upgrade the junction at Drimnagh Road (R110) / Walkinstown Road (R819) to enhance pedestrian and cycling facilities. To improve the safety of cycle facilities and reduce vehicle speeds, the existing left turn slip lane to the Walkinstown Road (R819) has been removed and additional planting and urban realm enhancements have been proposed. Proposals for parking adjacent to shop frontage on the Long Mile Road (R110) has been revised, with the existing perpendicular parking converted to a parallel parking layout. To accommodate the proposed revised grading arrangements for the junction a retaining wall structure has been proposed to the northern side of the Drimnagh Road (R110) at the interface with Slieve Bloom Park cul-de-sac.

On Drimnagh Road (R110) it is proposed to maintain one bus lane, one general traffic lane and one cycle track in each direction. The junction at Kildare Road, Saint Mary's Road and Drimnagh Road has been revised to provide improved cycle and pedestrian facilities. This will provide improved cycle connectivity between the Drimnagh Road (R110) and the proposed offline cycle route via Kildare Road.

On Crumlin Road (R110) bus priority will be maintained by incorporating Signal Controlled Priority and managing the flow of traffic in both directions along the Crumlin Road (R110). Widening of the road corridor here for dedicated bus and traffic lanes in both directions is not feasible due to the size of the front gardens and gradient constraints between the road level and front doors. The proposed arrangement requires the closure of Clonard Road and Bangor Drive for direct access onto Crumlin Road to facilitate traffic management within this portion of the Crumlin Road (R110) such that bus priority can be maintained, one-way access from the Crumlin Road (R110) onto Clonard Road and Bangor Drive will be possible. Egress and access for Bangor Drive and Clonard Road can be achieved via Windmill Road and Old County Road.

Due to width restrictions in the area of Crumlin Road (R110) there is insufficient space to provide dedicated cycle facilities. Therefore, it is proposed to provide an alternative cycle route along Kildare Road and Clogher Road.

The alternative cycle route will include segregated cycle tracks over most of its length either through the addition of kerbs to the existing cycle lanes or the construction of new kerbed cycle tracks. On Clogher Road, between Sundrive Road and Kildare Road, the narrow cross-section prevents the provision of dedicated cycle facilities. Therefore, it is proposed to provide a bus / cycle gate at the junction of Clogher Road / Sundrive Road to reduce the amount of traffic on this road and making it suitable for designation as a Quiet Street.

At the Crumlin Road / Herberton Road / Sundrive Road junction, it is proposed to modify the existing layout and kerb alignments to provide improved pedestrian crossing facilities. On Crumlin Road (R110) between Herberton Road and Dolphin Road it is proposed to maintain one bus lane and one general traffic lane in each direction.

There is insufficient road width on this section to provide dedicated cycle tracks, with the proposed cycle route along Clogher Road providing an alternative route.

On Crumlin Road (R110) between Cooley Road and Dolphin Road the posted speed limit will be reduced to 30 kph from 50 kph with raised tables installed at side road junctions to improve pedestrian accessibility. At the Crumlin Road (R110) junction with Dolphin Road / Parnell Road (R111) on-road cycle lanes will be provided within the fully signalised junction and existing right turn bans will be maintained.

As outlined in the GDA Cycle Network Plan, this section of the corridor will provide access to secondary routes SO3 (R818 Cromwellsfort Road), SO4 (St. Peter's Road (R112) and Walkinstown Avenue (R112)) and 7E (Ballymount Road Lower). It will align with secondary route 8A on Bunting Road, secondary route 8C on Long Mile Road (R110), Drimnagh Road (R110), Kildare Road and Clogher Road as far as Parnell Road (R111) / Grand Canal primary route SO1 / N10. Junctions within this section will be upgraded to provide enhanced cycle facilities, where feasible.

4.5.3.2 Deviations from Standard Cross Sections

The Proposed Scheme has been designed in accordance with the PDGB and the TII publications referenced within the PDGB. However, at a number of constrained locations across the Proposed Scheme, the width of the cross-sectional elements has been designed below the desirable minimum identified in the PDGB guidance (Section 4.6.1). The deviations within Section 3 are detailed in Table 4.17.

Table 4.17: Reduced Standard Cross Sections on Section 3

Chainage / Location	Design Element	Desirable Minimum	Design	Justification
A7270 / Crumlin Road	Footway width	2.0m	1.7m over 5m length	Shared bus stop landing zone arrangement used to minimise extent of narrow footway.
A7630 – A7660 / Crumlin Road	Carriageway width – Right turn lane	3.0m	2.8m	DMURS – standard lane width on arterial and link streets should lie in the range of 2.75m to 3.5m. Within this range, the preferred values are 3.0m and 3.25m.
A7690 – A7710 / Crumlin Road	Footway width (northern)	2.0m	1.7m	Reduced locally due to addition of proposed inbound and outbound bus lanes.
A8815 – A8830 / Crumlin Road	Carriageway width	3.0m	2.75m – 3.0m	Limited road space available for short length (15m) right turn lane. DMURS – standard lane width on arterial and link streets should lie in the range of 2.75m to 3.5m. Within this range the preferred values are 3.0m and 3.25m.
A8850 – A8940 / Dolphin's Barn	Cycle track (inbound and outbound)	2.0m	1.5m	Narrowing due to available road cross-section. Single file cycling minimum width provided (PDGB).

4.5.3.3 Bus Lane Provision

An overview of the bus lane provisions as part of the Proposed Scheme is provided in Section 4.6.4. As outlined within that section, full bus priority through the use of dedicated bus lanes is not possible at all locations, and Signal Controlled Priority is used in Section 3 of the Proposed Scheme as listed in Table 4.18.

Table 4.18: Proposed Signal Controlled Priority Junctions within Section 3

Junction Location	Priority Type	Note
Kilnamanagh Road / Walkinstown Road	In both inbound and outbound directions, a junction type 3 is proposed, whereby the bus lane is curtailed prior to the stop line to facilitate left turning vehicles. Left turning volumes will be relatively low and can be accommodated within the respective left turning pockets. Separate bus stages on mainline corridor inbound only. Bus lanes up to stop lines on mainline corridor inbound only.	The proposed cycle route for the scheme is proposed offline along Bunting Road. Onset of receiving bus lane in inbound direction delayed to avoid impact to existing private properties, including buildings.

Junction Location	Priority Type	Note
Long Mile Road / Slievebloom Park	Inbound bus lane curtailed prior to the junction stop line to facilitate left turning vehicles. Left turning volumes are projected to be low and therefore any left turners will have a negligible impact upon bus priority at this location. Furthermore, the proposed junction design provides greater capacity at the junction for all modes in terms of people movement. For the outbound direction along Long Mile Road, the bus lane is proposed continuously up to the stop line.	The proposed cyclist infrastructure comprises of cycle tracks along Long Mile Road on both sides of the carriageway to facilitate inbound and outbound movements.
Long Mile Road / Walkinstown Road	It is proposed to introduce a bus lane up to the stop line to ensure bus priority at both inbound and outbound directions.	The proposed cyclist infrastructure comprises of cycle tracks along Long Mile Road / Drimnagh Road on both sides of the carriageway to facilitate inbound and outbound movements.
Drimnagh Road / Errigal Road	Inbound, it is proposed to provide bus lanes along Drimnagh Road, with a junction type 3 on the inbound direction, whereby the bus lane is curtailed prior to the stop line to facilitate left turning vehicles. Left turners are anticipated to be low and therefore, any delay to buses will be negligible. For the outbound direction along Drimnagh Road, a continuous bus lane is proposed up to the stop line.	It is proposed to remove the existing Advanced Stop Line (ASL) markings along Drimnagh Road to provide a safer arrangement for cyclists. The proposal will introduce cycle tracks along Drimnagh Road in both directions.
Drimnagh Road / St. Mary's Rd / Kildare Road	For both inbound and outbound directions, a bus lane is proposed continuously up to the junction stop line along Drimnagh Road. For the outbound direction, a junction type 2 is proposed, whereby a break is proposed on the bus lane to facilitate a left turn lane. This will assist to provide additional capacity at the junction to enhance capacity for all modes.	The proposed inbound and outbound cycle infrastructure will comprise of cycle tracks along Drimnagh Road. Furthermore, the design proposes an offline cycle route along Kildare Road towards Dublin City Centre, with cycle tracks proposed on both sides of the carriageway. An orbital cycle track is proposed across the junction to connect all arms. The segregated cycling infrastructure and cyclist crossings will facilitate cyclists crossing during the same stage as pedestrians, to maximise capacity at the junction.
Crumlin Road / Cooley Road	The bus priority will comprise of a junction type 3, whereby a bus lane is proposed on both inbound and outbound directions. It is proposed to curtail the bus lane prior to the stop lines to facilitate left turners into Cooley Road and Crumlin Park, respectively. This arrangement provides additional capacity at the junction for all modes of travel, The volume of left turners is anticipated to be low and unlikely to have a material impact upon bus priority.	The proposal comprises of cycle tracks on either side of the carriageway along Crumlin Road.
Sundrive Road / Crumlin Road	The proposed bus lane inbound along Crumlin Road is to comprise a junction type 1 arrangement whereby the bus lane extends up to the junction stop line. Left turning vehicles will be required to turn left from lane 2 on Crumlin Road into Herberton Road. For the outbound direction along Crumlin Road, the bus lane is proposed to be curtailed prior to the stop line to facilitate left turning vehicles into lane 1 to travel onto Sundrive Road.	The scheme proposes cycle lanes through the junction along Crumlin Road.
Crumlin Road / Dolphin Road	It is proposed to provide junction priority as per junction type 1, where the bus lane is proposed up to the stop line in both inbound and outbound directions along Dolphins Barn.	The proposal will assist to upgrade the existing cycling infrastructure at the junction. Cycle lanes are proposed on all arms entering and exiting the junction.
Sundrive Road / Clogher Road	A bus gate is proposed on Clogher Road (western arm) to provide buses with priority at this junction. Bus priority signals will also be introduced to enhance bus permeability at this location.	The proposal comprises of cycle infrastructure along Clogher Road through the junction. The proposed bus gate on Clogher Road will assist to provide a quiet route for cyclists, whilst cycle lanes are proposed to the east of the junction

Junction Location	Priority Type	Note
		along Clogher Road, continuing into the City Centre.

4.5.3.4 Bus Stops

The different types of bus stop (island, shared landing, inline and lay-by bus stops) are described in Section 4.6.4.5. The bus stop locations and types on Section 3 of the Proposed Scheme are outlined in Table 4.19 and shown in the General Arrangement series of drawings (BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-9001) in Volume 3 of this EIAR. Further details of bus stop design is included in the PDGB (NTA 2021) – Appendix A4.1 in Volume 4 of this EIAR.

Table 4.19: Proposed Bus Stop Locations within Section 3

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Inbound	Walkinstown Road, Walkinstown Drive	2378	A6030	Inline Bus Stop	Proposed: Yes Existing: Yes
Inbound	Walkinstown Road, Shopping Centre	2183	A6450	Inline Bus Stop	Proposed: Yes Existing: No
Inbound	Crumlin Hospital	1421	A7275	Shared landing Bus Stop	Proposed: Yes Existing: Yes
Inbound	Drimnagh Road, Crumlin Hospital	1424	A7550	Island Bus Stop	Proposed: Yes Existing: Yes
Inbound	Crumlin Road, Iveagh Grounds	2187	A8265	Inline Bus Stop	Proposed: Yes Existing: Yes
Inbound	Crumlin Road, Crumlin Shopping Centre	2189	A8710	Inline Bus Stop	Proposed: Yes Existing: Yes
Inbound	Crumlin Road, Herberton Road	1436	A9015	Inline Bus Stop	Proposed: Yes Existing: No
Inbound	Crumlin Road, Dolphin Road	3952	A9190	Inline Bus Stop	Proposed: Yes Existing: Yes
Inbound	Kildare Road, Pearse Park	1397	E230	Inline Bus Stop	Proposed: Yes Existing: Yes
Inbound	Kildare Road, Windmill Road	1398	E475	Inline Bus Stop	Proposed: Yes Existing: No
Inbound	Kildare Road, Clonard Road	1399	E795	Inline Bus Stop	Proposed: Yes Existing: No
Inbound	Kildare Road, Bangor Road	5148	E1070	Inline Bus Stop	Proposed: Yes Existing: No
Inbound	Clogher Road, Sundrive Road	1402	E1445	Inline Bus Stop	Proposed: Yes Existing: No
Inbound	Clogher Road, Rutland Avenue	1403	E1900	Inline Bus Stop	Proposed: Yes Existing: No
Inbound	Clogher Road, Aughavanagh Road	1404	E2130	Inline Bus Stop	Proposed: Yes Existing: No
Inbound	Clogher Road, Parnell Road	1405	E2370	Inline Bus Stop	Proposed: Yes Existing: No
Outbound	Walkinstown Road, Walkinstown Roundabout	2333	A6015	Inline Bus Stop	Proposed: Yes Existing: Yes
Outbound	Walkinstown Road, Kilnamanagh Road	2332	A6370	Inline Bus Stop	Proposed: Yes Existing: No
Outbound	Long Mile Road, Halfway House	New	F4180	Shared landing Bus Stop	Proposed: Yes New location

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Outbound	Walkinstown Road, Drimnagh Road	New	A6705	Inline Bus Stop	Proposed: Yes New location
Outbound	Drimnagh Road, St. Mary's Road	2101	A7440	Island Bus Stop	Proposed: Yes Existing: Yes
Outbound	Crumlin Road, Clonard Road	2096	A8250	Inline Bus Stop	Proposed: Yes Existing: No
Outbound	Crumlin Road, Crumlin Shopping Centre	New	A8735	Inline Bus Stop	Proposed: Yes New location
Outbound	Crumlin Road, Sundrive Road	1409	A8950	Inline Bus Stop	Proposed: Yes Existing: Yes
Outbound	Crumlin Road, Rutland Avenue	1407	A9180	Inline Bus Stop	Proposed: Yes Existing: Yes
Outbound	St. Mary's Road, Crumlin Bowling Club	2317	D1130	Shared landing Bus Stop	Proposed: Yes Existing: Yes
Outbound	Kildare Road, Pearse Park	1396	E160	Island Bus Stop	Proposed: Yes Existing: No
Outbound	Kildare Road, Windmill Road	7414	E415	Island Bus Stop	Proposed: Yes Existing: No
Outbound	Kildare Road, Clonard Road	1442	E680	Inline Bus Stop	Proposed: Yes Existing: No
Outbound	Kildare Road, Bangor Road	1441	E970	Inline Bus Stop	Proposed: Yes Existing: No
Outbound	Clogher Road, Bangor Road	3356	E1110	Inline Bus Stop	Proposed: Yes Existing: No
Outbound	Clogher Road, St. Bernadette's Church	1389	E1480	Inline Bus Stop	Proposed: Yes Existing: No
Outbound	Clogher Road, Goldstone Court	1388	E1780	Inline Bus Stop	Proposed: Yes Existing: No
Outbound	Clogher Road, Aughavanagh Road	1387	E2110	Inline Bus Stop	Proposed: Yes Existing: No
Outbound	Clogher Road, Parnell Road	1386	E2330	Inline Bus Stop	Proposed: Yes Existing: No

4.5.3.5 Cycling Provision

The specific proposals for cycling facilities in Section 3 of the Proposed Scheme are described below. Provision for cyclists at the signal-controlled junctions are described in Section 4.6.3.5.

Cyclists wishing to travel on R819 Walkinstown Road can share the proposed bus lane to connect with the proposed segregated cycle tracks on R110 Drimnagh Road (GDA Secondary Route 8C). Segregated cycle tracks are provided between R110 Long Mile Road / Drimnagh Road junction and Cooley Road junction on R110 Drimnagh Road (GDA Secondary Routes 8C and 8A). Cyclists wishing to travel along R110 Crumlin Road (GDA Secondary Route 8a and Primary Route 8) from this junction can share the bus lanes provided in both directions as far as Raphoe Road junction; outbound only between Raphoe Road junction and Clonard Road junction and inbound only between Clonard Road junction and the Crumlin Road HSE Health Centre. Cyclists can again share bus lanes in both directions on R110 Crumlin Road between the HSE Health Centre and the R111 Parnell Road (Grand Canal Greenway).

4.5.3.6 Junction Information

An overview of the approach to junction review and design is provided in Section 4.6.7. The major and moderate junctions (signalised) within Section 3 of the Proposed Scheme are outlined in Table 4.20.

Table 4.20: Major and Moderate Junctions (Signalised) within Section 3 of the Proposed Scheme

Junction Location	Note
Major Junctions	
Long Mile Road / Walkinstown Road	Existing junction upgraded with dedicated pedestrian and cycle crossings. Existing left-turn slip road removed, Bus priority inbound and outbound along corridor proposed.
Drimnagh Road / Kildare Road	Junction Type 4 with bus priority up to the stop line. Existing junction upgraded with dedicated pedestrian and cycle crossings. Bus priority inbound and outbound along corridor proposed.
Crumlin Road / Herberton Road / Sundrive Road	Existing junction upgraded with bus priority inbound. Left turn slip lanes removed.
Crumlin Road / Dolphin's Road / Parnell Road	Signalised junction with dedicated pedestrian and cycle facilities. Bus priority inbound and outbound along corridor proposed.
Moderate Junctions / Priority Junctions	
Walkinstown Road / Kilnamanagh Road	Signalised crossroad junction with pedestrian crossing facilities. Proposed peak hour right turn ban to Shopping Centre and 24hr right turn ban to Kilnamanagh Road except buses.
Long Mile Road / Slievebloom Park	Existing priority junction, no current pedestrian crossing facilities. Signalised junction with raised entry treatment proposed.
Drimnagh Road / Balfe Road	Existing signalised junction with pedestrian crossing, raised table side entry treatment with right turn bans onto Balfe Road (24hr) and Drimnagh Road (peak hour) proposed.
Drimnagh Road / Slievebloom Road	Existing signalised junction with pedestrian crossing, raised table side entry treatment with right turn ban onto Drimnagh Road (peak hour) proposed.
Crumlin Road / Errigal Road	Existing signalised junction with pedestrian crossing maintained.
Crumlin Road / Cooley Road	Existing signalised junction maintained.
Bunting Road / Cromwellsfort Road	Existing dropped kerb pedestrian crossing facilities. Signalised raised table pedestrian and cycle crossing with no right turn onto Bunting Road proposed.
Kildare Road / Windmill Road	Existing signalised junction. Raised table signalised junction proposed.
Kildare Road / Bangor Road	Existing signalised junction. Raised table signalised junction proposed.
Clogher Road / Sundrive Road	Existing signalised junction. Bus Only access to Clogher Road west proposed.

4.5.3.7 Structures

4.5.3.7.1 Bridges

There are no bridge works proposed along Section 3 of the Proposed Scheme.

4.5.3.7.2 Retaining Walls

Table 4.21 sets out the proposed principal retaining wall along Section 3 of the Proposed Scheme.

Table 4.21: Summary of Principal Retaining Wall in Section 3 of the Proposed Scheme

Structure Ref.	Structure Type	Chainage Start – Chainage End (m)	Length (m)	Max. Retained Height (m)	Comment
RW03 Long Mile Road Retaining Wall	Reinforced Concrete gravity retaining wall	F4170 – A6765	64	1.5	Long Mille Road Retaining Wall will be located along the eastbound carriageway of the road at the junction with Walkinstown Road and will create a new boundary line between the Slievebloom Park housing estate and Long Mile Road.

4.5.3.8 Parking and Loading Bays

Changes to the parking and loading provisions along Section 3 as a result of the Proposed Scheme are shown in Table 4.22. There are no changes to loading provision along Section 3 of the Proposed Scheme.

Table 4.22: Section 3: On-Street Parking Spaces Change Impact Summary

Location	Type of Parking	Existing	Proposed	Proposed Change
Walkinstown Road	Illegal Parking	7 approx.	0	-7
	Adjacent Parking	281	254	-27
Drimnagh Road	Illegal Parking	17 approx.	0	-17
	Informal Parking	63	18	-45
Crumlin Road	Taxi Parking (Taxi Rank)	12	5	-7
	Illegal Parking	16 approx.	0	-16
	Informal Parking	54	41	-13
Bunting Road / St. Mary's Road / Kildare Road / Clogher Road	Adjacent Parking	983	981	-2
	Illegal Parking	136 approx.	0	-136
Total	Informal parking	111 approx.	67	-44
		1680 approx.	1366	-314

4.5.3.9 Landscape and Urban Realm

For an overview of the landscape design principles and approach, reference should be made to Section 4.6.11. The following sections provide a description of specific landscape and urban realm design works in Section 3 of the Proposed Scheme.

Road widening to accommodate the bus lanes on Walkinstown Road will result in the loss of existing trees. The loss of trees will be limited to one side of the street in order to ensure trees on the opposite side are protected. Replacement planting will be provided in the local area at Walkinstown Roundabout and at the junction with Long Mile Road.

The upgrade to the junction at Long Mile Road and Walkinstown Road will create an enhanced public open space. This is a significant improvement on what is currently a very wide junction dominated by traffic. Redefining the junction as open space with significant tree planting, and seating areas will provide a local landmark when journeying through Walkinstown – refer to Image 4.3.



Image 4.3: Sketch Scheme for Design Intent – Long Mile Road / Walkinstown Road Junction

The increased tree planting with underplanting adds to the biodiversity of this area – refer to Image 4.4.

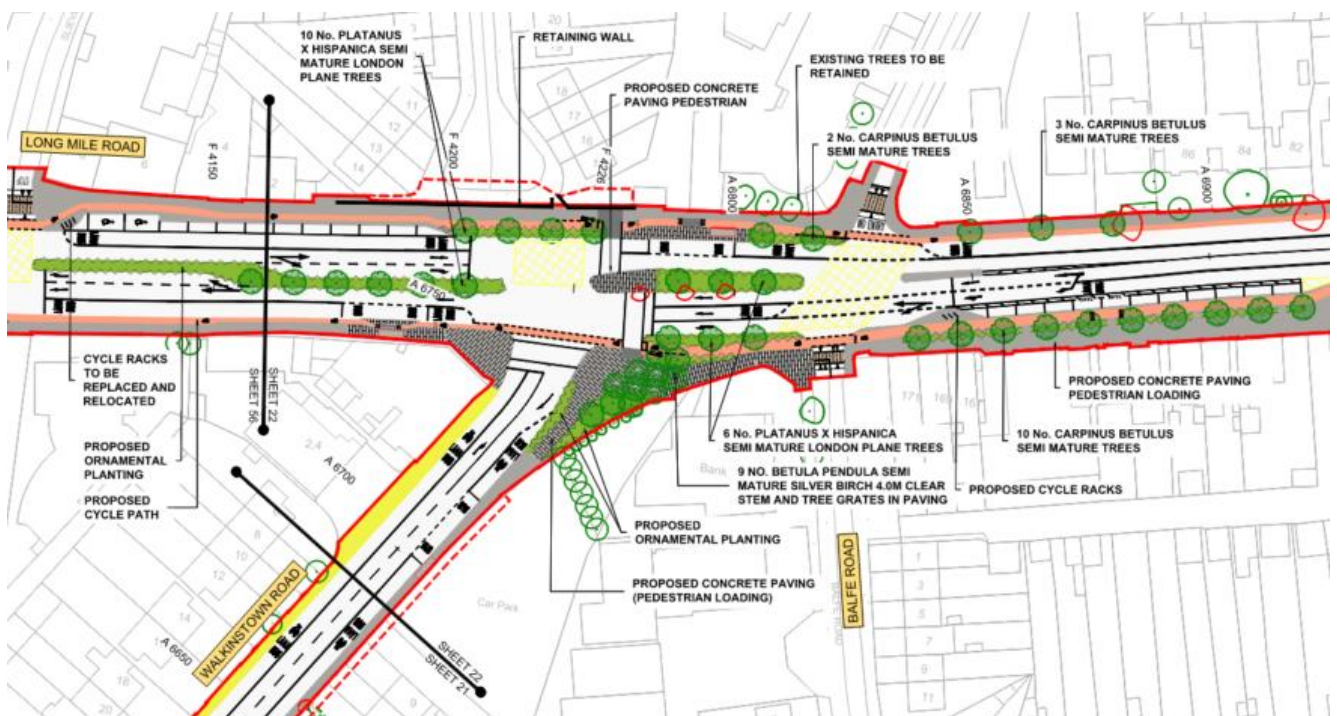


Image 4.4: Long Mile Road and Walkinstown Road Junction

Other than the hedge boundary at St. James GAA, there are almost no street trees along Crumlin Road. The opportunity to provide pedestrian spaces at the junctions of Bangor Drive and Clonard Road will create small interventions conveniently located at small retail clusters. It will enhance the wider area providing pedestrian focal points along the Crumlin Road with mature tree planting in an otherwise vehicle-dominated landscape. On the Crumlin Road between Herberton Road and the Grand Canal there are limited opportunities for public realm, with

street tree planting proposed at points to improve the streetscape at points taking advantage of existing green open space – refer to Image 4.5.

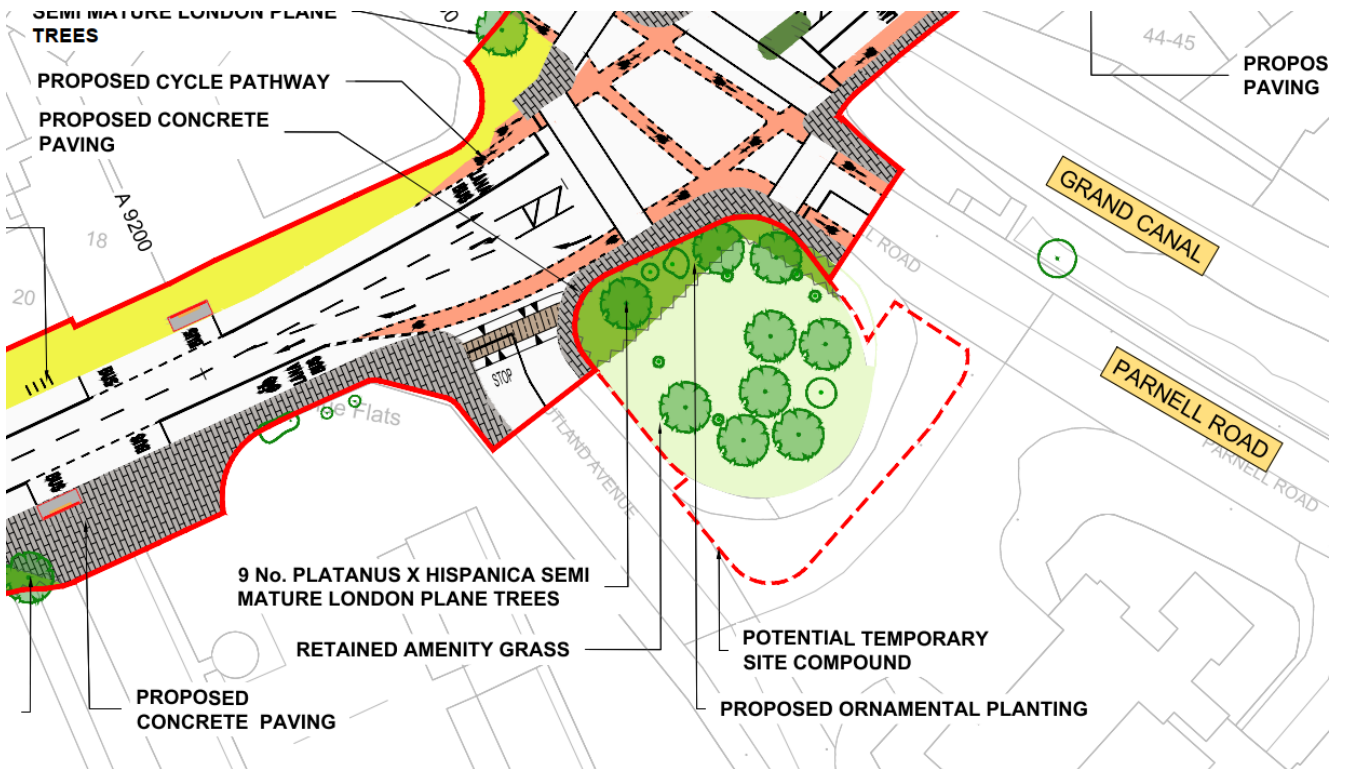


Image 4.5: Existing Green Area Enhancement at Rutland Avenue

Upgraded public space at Bangor Drive and Clonard Road will include public realm space. Tree planting will enhance the streetscape on Crumlin Road and define the streetscape. Understory planting will enhance biodiversity opportunities – refer to Image 4.6.



Image 4.6: Clonard Road and Bangor Drive

Along Bunting Road and St. Mary's Road the tree lined street will be preserved by using no dig methods to lay the cycle track under the tree canopies. On Kildare Road and Clogher Road, trees will be retained by using a no-dig technique to lay the cycle track below the tree canopies. While approximately 20 existing trees will be lost on Kildare Road, these will be replaced by offset planting at the new proposed green areas at Kildare Road / Cashel Road junction and Kildare Road / Clogher Road junction.

4.5.3.10 Land Acquisition and Use

Land acquisition will be required through this section to facilitate the Proposed Scheme, including carriageway widening along R819 Walkinstown Road and R110 Crumlin Road, and retaining wall (RW03) construction on the Long Mile Road.

Temporary land take is required within this section to facilitate:

- Carriageway widening to accommodate new bus lanes and reconstruction of property boundary walls on R819 Walkinstown Road (Ch A6020 to Ch A6725), see General Arrangement drawings BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0020 and BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0021 in Volume 3 of this EIAR;
- The construction of retaining wall RW03;
- A site construction compound at Green Park, Rafters Road (Ch A770 to Ch A7765)
- Carriageway widening / bus gate construction on Crumlin Road at Ardscoil Eanna (Ch A7815 to Ch A7865), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0025 in Volume 3 of this EIAR;
- Carriageway widening at Guinness Rugby Club (Ch A8235 to Ch A8340), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0026 in Volume 3 of this EIAR;
- Carriageway widening / bus gate construction on Crumlin Road at HSE Health Centre (Ch A8595 to Ch A8705), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0027 in Volume 3 of this EIAR; and
- A site construction compound at Crumlin Road / Parnell Road (Ch A9500).

The impacts on residential amenity arising from land acquisition in Section 3 of the Proposed Scheme and are addressed in Chapter 10 (Population). Similarly, the impacts on landscape amenity arising from land acquisition in Section 3 of the Proposed Scheme are addressed in Chapter 17 (Landscape (Townscape) & Visual).

4.5.3.11 Rights of Way

Table 4.23 outlines the locations in Section 3 where existing rights of way will be affected by the Proposed Scheme.

Table 4.23: Section 3: Existing Rights of Way Affected

Location	Chainage	Existing Situation	Proposed Change
Laneway between 122 and 124 Walkinstown Road	A6200	Laneway access from existing road edge on R819 Walkinstown Road	Laneway access from westward relocated road edge on R819 Walkinstown Road.
Laneway adjacent to 9 Walkinstown Road	A6675	Laneway access from existing road edge on R819 Walkinstown Road	Laneway access from eastward relocated road edge on R819 Walkinstown Road.
R110 Crumlin Road / Clonard Road junction	A8300	Two-way vehicular travel on Clonard Road at junction with R110 Crumlin Road	One-way vehicular travel southbound only for section of Clonard Road from R110 Crumlin Road.
R110 Crumlin Road / Bangor Drive junction	A8400	Two-way vehicular travel on Bangor Drive at junction with R110 Crumlin Road	One-way vehicular travel southbound only for section of Bangor Drive from R110 Crumlin Road.

4.5.4 Section 4: Grand Canal to Christchurch

4.5.4.1 General overview of the Proposed Scheme

Between Dolphin Road and South Circular Road (R811), it is intended to provide one bus lane, one general traffic lane and one cycle track in each direction along the R110. The proposed South Circular Road junction design

takes into account the Dolphins Barn Public Realm improvement plan that is being implemented by Dublin City Council (DCC).

Between South Circular Road (R110) and Ardee Street it is proposed to have one bus lane, one general traffic lane and one cycle track in each direction. It is also intended to upgrade the Ardee Street junction with improved pedestrian facilities. It is proposed to modify the Kevin Street / Dean Street junction to facilitate improved cycle facilities. Bus priority from St. Luke's Avenue will be maintained with through Signal Controlled Priority as there is insufficient road corridor width on Dean Street to provide continuous bus lanes.

The Dean Street / Patrick Street junction will be upgraded to provide enhanced cycling and pedestrian facilities with the conversion of the existing left turn slip lane on the north western corner of the junction to a cycle bypass facility to provide efficiencies for left turning cyclists on the corridor. A controlled crossing will be implemented to manage the pedestrian and cyclist interaction at the cycle bypass.

The future proposed Kimmage to City Centre Core Bus Corridor Scheme will also join the route here on the southern arm via New Street. The design proposals allow for connection to both the existing arrangement and the future proposed arrangement under the Kimmage to City Centre Core Bus Corridor Scheme.

Between Dean Street and Bride Road, it is proposed to have one bus lane, one general traffic lane and one cycle track in each direction. Between Bride Road and Christchurch Place it is proposed to have one bus lane and one cycle track in each direction with two traffic lanes inbound and one traffic lane outbound.

The Proposed Scheme terminates at the junction of Christchurch Place and Winetavern Street where the Proposed Scheme ties into the DCC contra flow bus lane arrangement, providing connectivity to and from the Quays.

The future proposed Liffey Valley to City Centre Core Bus Corridor Scheme will also join the route here on the western arm via High Street. The design proposals allow for connection to both the existing arrangement and the future proposed arrangement under the Liffey Valley Scheme.

As outlined in the GDA Cycle Network Plan, this Section of the corridor will align with primary route 8 on R110 Dolphin's Barn Street, Cork Street and St. Luke's Avenue and link with primary route 7 at R108 High Street and Christchurch Place. It will align with secondary route 9B on R137 Patrick Street and Nicholas Street. Junctions within this section will be upgraded to provide enhanced cycle facilities where feasible.

4.5.4.2 Deviations from Standard Cross Sections

The Proposed Scheme has been designed in accordance with the PDGB and the TII publications referenced within the PDGB. However, at a number of constrained locations across the Proposed Scheme, the width of the cross-sectional elements has been designed below the desirable minimum identified in the PDGB guidance (Section 4.6.1). The deviations within Section 4 are detailed in Table 4.24.

Table 4.24: Reduced Standard Cross Sections on Section 4

Chainage / Location	Design Element	Desirable Minimum	Design	Justification
A9270 – A9410 / Dolphin's Barn, Dolphin's Street	Cycle track (inbound) and footway	2.0m	1.5m (cycle track) and 1.8m (footway)	Narrowing due to available road cross-section maintaining existing median planting and Grand Canal bridge width. Single file cycling minimum width provided (PDGB).
A9400 – A9520 / Dolphin's Barn	Cycle track	2.0m	1.5m	Design to accommodate proposed Dolphin's Barn Public Realm Improvement Scheme.
A9650 – A9720 / Dolphin's Barn Street	Cycle track / parking bay buffer (inbound)	0.75m (buffer) and 2.0m (cycle track)	1.5m (cycle track)	Narrowing due to available road cross-section. Single file cycling minimum width provided (PDGB).
A9900 – A10000 / Cork Street	Cycle track / parking bay	0.75m (buffer)	0.50m (buffer) and	Narrowing to maintain existing parking bay kerb and road kerbs. Single file cycling minimum width provided (PDGB)

Chainage / Location	Design Element	Desirable Minimum	Design	Justification
	buffer (inbound)	and 2.0m (cycle track)	1.5m (cycle track)	
A9870 – A10850 / Cork Street, St. Luke's Avenue	Cycle track (outbound)	2.0m	1.5m	Narrowing to maintain existing road kerb where possible. Single file cycling minimum width provided (PDGB).
A10070 – A10100 / Cork Street	Cycle track / parking bay buffer (inbound)	0.75m (buffer) and 2.0m (cycle track)	0.50m (buffer) and 1.5m (cycle track)	Narrowing to maintain existing parking bay kerb. Single file cycling minimum width provided (PDGB).
A10190 – A10360 / Cork Street	Cycle track / parking bay buffer (inbound)	0.75m (buffer) and 2.0m (cycle track)	0.50m (buffer) and 1.5m (cycle track)	Narrowing to maintain existing parking bay kerb. Single file cycling minimum width provided (PDGB).
A10360 – A10850 / Cork Street, St. Luke's Avenue	Cycle track (inbound)	2.0m	1.5m – 1.8m	Narrowing to maintain existing road kerb where possible. Single file cycling minimum width provided (PDGB).
A10850 – A10940 / Dean Street	Cycle track (inbound)	2.0m	1.5m	Narrowing due to available road cross-section. Single file cycling minimum width provided (PDGB).
A10900 – A10920 / Dean Street	Cycle track (outbound)	2.0m	1.5m	Narrowing to allow for cycle buffer at layby
A11070/ Patrick Street	Cycle track (outbound)	2.0m	1.25m	Cycle track locally narrowed to accommodate existing heritage light pole
A11210 – A11280 / Patrick Street	Cycle track (inbound)	2.0m	0.50m (buffer) and 1.5m (cycle track)	Narrowing to maintain existing parking bay kerb. Single file cycling minimum width provided (PDGB).
A11320 / Nicholas Street	Cycle track (inbound and outbound)	2.0m	1.25m	Cycle track locally narrowed to accommodate existing heritage light poles
A11355 / Nicholas Street	Cycle track (inbound and outbound)	2.0m	1.25m	Cycle track locally narrowed to accommodate existing heritage light poles
A11320 – A11360 / Nicholas Street	Footway (inbound)	2.0m	1.5m – 1.65m	Existing road cross section with landscaped central island maintained and new bus lane.

4.5.4.3 Bus Lane Provision

An overview of the bus lane provisions as part of the Proposed Scheme is provided in Section 4.6.4. As outlined within that section, full bus priority through the use of dedicated bus lanes is not possible at all locations, and Signal Controlled Priority is used in Section 4 of the Proposed Scheme as listed in Table 4.25.

Table 4.25: Proposed Signal Controlled Priority Junctions within Section 4

Junction Location	Priority Type	Note
South Circular Road / Dolphin's Barn	In both inbound and outbound directions, a junction type 3 is proposed, whereby the bus lane is proposed to be curtailed prior to the stop line. This will assist to give greater capacity for all modes of transport, whilst the projected volume of left turners is envisaged to be low and will not materially impact upon bus priority. Separate bus stages on mainline corridor inbound only. Bus lanes up to stop lines on mainline corridor inbound only.	Cycle tracks are proposed along Dolphins Barn and along South Circular Road. It is proposed to introduce ASL road markings on the side roads to assist cyclists entering the junction. Furthermore, jug turns are proposed for right turning cyclists from Dolphins Barn onto the side roads. Onset of receiving bus lane in inbound direction delayed to avoid impact to existing private properties, including buildings.

Junction Location	Priority Type	Note
Cork St / Marrowbone Lane / Donore Avenue	In both inbound and outbound directions, a junction type 3 is proposed whereby the bus lane is proposed to be curtailed approximately 20m prior to the stop line. This will assist to give greater capacity for all modes of transport, whilst the projected volume of left turners is envisaged to be low and will not materially impact upon bus priority.	Cycle tracks are proposed along Cork Street and ASLs are introduced on the side roads to assist cyclists entering the junction. Furthermore, jug turns are proposed for right turning cyclists from Cork Street onto the side roads.
Ardee Street / St. Lukes Avenue	In both inbound and outbound directions, a junction type 3 is proposed whereby the bus lane is proposed to be curtailed prior to the stop line. This will assist to give greater capacity for all modes of transport, whilst the projected volume of left turners is envisaged to be low and will not materially impact upon bus priority.	Jug turns are proposed for right turning cyclists from Cork Street / St. Luke's Avenue onto the side roads. It is also proposed to introduce ASL road markings on the side roads to assist cyclists entering the junction.
Dean Street / St. Luke's Avenue	It is proposed to provide junction priority as per junction type 1, where the bus lane is proposed up to the stop line in inbound direction along St. Luke's Avenue.	The proposal will assist to upgrade the existing cycling infrastructure at the junction. Cycle tracks are proposed on all arms entering and exiting the junction.
Patrick Street / Dean Street	Bus priority pre-signal.	The proposal will assist to upgrade the existing cycling infrastructure at the junction. Cycle tracks are proposed on all arms entering and exiting the junction.
Patrick Street / Bride Road	It is proposed to provide junction priority as per junction type 1, where the bus lane is proposed up to the stop line in both inbound and outbound directions along Patrick Street / Nicholas Street.	Cycle tracks are proposed along Patrick Street / Nicholas Street both inbound and outbound directions.
Nicholas Street / Christchurch Place	Bus priority signal.	The proposal will assist to upgrade the existing cycling infrastructure at the junction. Cycle tracks are proposed on all arms entering and exiting the junction.

4.5.4.4 Bus Stops

The different types of bus stop (island, shared landing, inline and lay-by bus stops) are described in Section 4.6.4.5. The bus stop locations and types on Section 4 of the Proposed Scheme are outlined in Table 4.26 and shown in the General Arrangement series of drawings (BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-9001) in Volume 3 of this EIAR. Further details of bus stop design is included in the PDGB (NTA 2021) – Appendix A4.1 in Volume 4 of this EIAR.

Table 4.26: Proposed Bus Stop Locations within Section 4

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Inbound	Dolphin's Barn Street	New	A9525	Inline Bus Stop	Proposed: Yes New location
Inbound	Cork Street, Coombe Hospital	4434	A9780	Shared landing Bus Stop	Proposed: Yes Existing: Yes
Inbound	Cork Street, Marion Villas	2379	A10120	Island Bus Stop	Proposed: Yes Existing: Yes
Inbound	St. Luke's Avenue, Brabazon Row	2382	A10590	Shared landing Bus Stop	Proposed: Yes Existing: No
Inbound	St. Luke's Avenue, Newmarket Street	5099	A10750	Shared landing Bus Stop	Proposed: Yes Existing: No
Inbound	Patrick Street, St. Patrick's Cathedral	2383	A11050	Shared landing Bus Stop	Proposed: Yes Existing: Yes
Inbound	Nicholas Street, Ross Road	New	A11340	Shared landing Bus Stop	Proposed: Yes New location

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Outbound	Dolphin's Barn, South Circular Road	1406	A9420	Shared landing Bus Stop	Proposed: Yes Existing: Yes
Outbound	Cork Street, Coombe Hospital	2094	A9670	Inline Bus Stop	Proposed: Yes Existing: Yes
Outbound	Cork Street, Donore Avenue	2315	A10120	Shared landing Bus Stop	Proposed: Yes Existing: Yes
Outbound	St. Luke's Avenue, Ardee Court	2313	A10590	Shared landing Bus Stop	Proposed: Yes Existing: Yes
Outbound	St. Luke's Avenue, The Coombe	2312	A10810	Shared landing Bus Stop	Proposed: Yes Existing: No
Outbound	Patrick Street, St. Patrick's Cathedral	New	A11145	Shared landing Bus Stop	Proposed: Yes Existing: No
Outbound	Patrick Street, Back Avenue	2385	A11390	Island Bus Stop	Proposed: No New location

4.5.4.5 Cycling Provision

The specific proposals for cycling facilities in Section 4 of the Proposed Scheme are described below. Provision for cyclists at the signal-controlled junctions are described in Section 4.6.3.5.

Inbound and outbound segregated cycle tracks are provided on R110 Dolphin's Barn Street, R110 Cork Street (GDA Primary Route 8), R110 St. Luke's Avenue, Dean Street, R317 Patrick Street and R317 Nicholas Street (GDA Secondary Route 9B) between R111 Parnell Road and Christchurch Street.

4.5.4.6 Junction Information

An overview of the approach to junction review and design is provided in Section 4.6.7. The major and moderate junctions (signalised) within Section 4 of the Proposed Scheme are outlined in Table 4.27.

Table 4.27: Major and Moderate Junctions (Signalised) within Section 4 of the Proposed Scheme

Junction Location	Note
Major Junctions	
Dolphins Barn / South Circular Road	Existing junction upgraded to accommodate proposed Dolphin's Barn Public Realm Improvement Scheme.
St. Luke's Avenue / Dean Street	Signalised junction layout inbound with dedicated pedestrian and cycle facilities. Bus priority inbound along proposed CBC proposed.
Dean Street / Patrick Street	Existing junction upgraded with dedicated pedestrian and cycle crossings. Left-turn slip lane onto Patrick Street removed.
Nicholas Street / Christchurch Place	Existing junction upgraded with dedicated pedestrian and cycle crossings.
Moderate Junctions / Priority Junctions	
Cork Street / Marrowbone Lane	Signalised junction with pedestrian crossing, raised table side entry treatment proposed.
Cork Street / Donore Avenue	Signalised junction with pedestrian crossing, raised table side entry treatment proposed.
Cork Street / Ardee Street	Existing signalised junction. Junction reconfiguration with Toucan crossings and raised table side entry proposed.

Junction Location	Note
Patrick Street / Bull Alley Street	Existing signalised junction with dedicated outbound bus lane and improved cycle facilities proposed.
Patrick Street / Bride Road	Existing signalised junction with dedicated inbound and outbound bus lanes, improved cycle facilities and raised table side entry treatment proposed.

4.5.4.7 Structures

4.5.4.7.1 Bridges

There are no bridge works proposed along Section 4 of the Proposed Scheme.

4.5.4.7.2 Retaining Walls

There are no principal retaining walls proposed along Section 4 of the Proposed Scheme.

4.5.4.8 Parking and Loading Bays

Changes to the parking and loading provisions along Section 4 as a result of the Proposed Scheme are shown in Table 4.28 and Table 4.29, respectively.

Table 4.28: Section 4: On-Street Parking Spaces Change Impact Summary

Location	Type of Parking	Existing	Proposed	Change
Dolphin's Barn / Cork Street / St. Luke's Avenue	Designated Paid Parking	51	44	-7
	Illegal Parking	34 approx.	0	-34
	Adjacent Parking	317	305	-12
Total		402 approx.	349	-53

Table 4.29: Section 4: Existing and Proposed Loading Bays

Location	Type of Parking	Existing	Proposed	Change
Dean Street / Patrick Street / Christchurch	Loading Bay	10	9	-1
	Illegal Parking	4	0	-4
Total		14	9	-5

4.5.4.9 Landscape and Urban Realm

For an overview of the landscape design principles and approach, reference should be made to Section 4.6.11. The following sections provide a description of specific landscape and urban realm design works in Section 4 of the Proposed Scheme.

A new landscaped area is proposed on the south eastern corner of the junction with South Circular Road to improve the urban realm aspects of the junction area whilst also improving safety. Integrating new tree planting with existing planting within the median and a public realm space on the area currently used for car parking will give definition to the public realm and enhance the junction further.

Along Cork Street, new street tree planting is proposed to enhance the existing planting with understory planting also proposed to some existing trees. This will allow the trees along the street to create links with existing green spaces such as Weaver Park, giving a more connected public realm.

Between Dean Street Junction and Christchurch Place, it is proposed to maintain the central median and retain the existing trees, some of which are mature. Additional crossing points will be added to improve the permeability of this busy tourist area.

Realignment of the junction at Christchurch Place / Winetavern Street / High Street will increase pavement width and improve pedestrian accessibility and frontage at the Peace Park to the south, and Christchurch Cathedral to the north. Public realm proposals in this area will use high quality materials and will respond to the adjacent public realm of Christchurch and Peace Park.

Upgraded public space through expansion of the pedestrian areas gives more clarity to the overall space and use of high quality materials, in keeping with the heritage of the surrounding area. Integration of the area into the existing context defines the Christchurch Place junction within the city fabric. Paving interventions will link spaces surrounding the junction, such as at the Christchurch cathedral grounds and Peace Park, with better definition on crossing points for pedestrians creating a more unified feel to the overall junction – refer to Image 4.7.

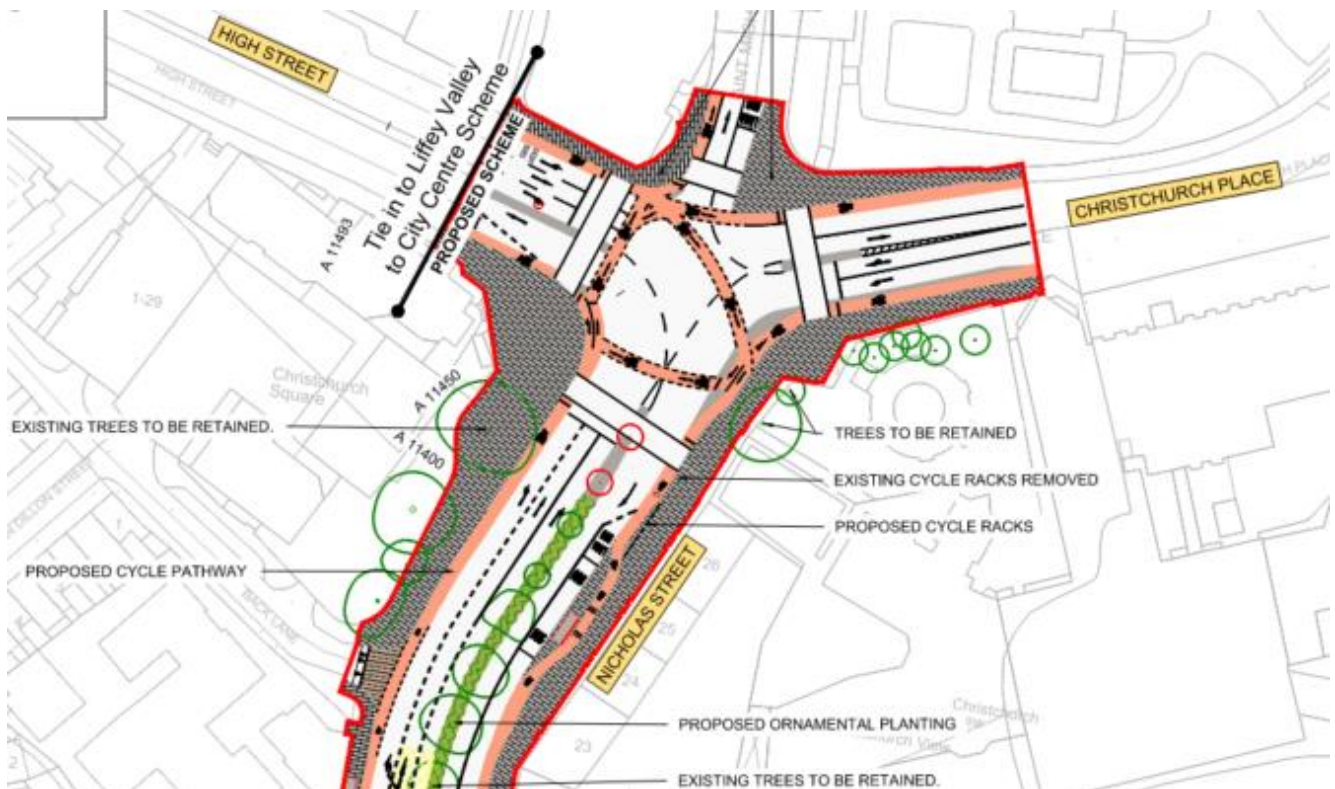


Image 4.7: Christchurch Place

4.5.4.10 Land Acquisition and Use

Land acquisition is not required within Section 4 of the Proposed Scheme.

4.5.4.11 Rights of Way

No rights of way will be affected within Section 4 of the Proposed Scheme.

4.5.5 Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction

4.5.5.1 General overview of the Proposed Scheme

The junction at Woodford Walk / New Nangor Road (R134) will be upgraded with removal of the existing left turn slip lanes, provision of enhanced cycling and pedestrian facilities and improved connectivity to the existing Grand Canal Greenway including the removal of the existing kissing gate.

Between Woodford Walk / New Nangor Road (R134) junction and the approach to the M50 overbridge, a bus lane, general traffic lane and cycle track will be provided in both directions. A continuous footway will be provided

along the outbound side of the New Nangor Road (R134). On the inbound side of the New Nangor Road (R134), no footway is proposed beyond the Woodford Walk junction as pedestrians will be directed to the parallel Grand Canal Greenway.

It is proposed to widen the existing R134 carriageway at the M50 bridge to provide a three-lane arrangement. A continuous inbound bus lane has been proposed to mitigate against any potential queuing that may occur from the upgraded Riverview Business Park junction. Bus priority on the outbound bus lane is facilitated by a bus priority signal on the approach to the M50 overbridge. The inbound footway on the New Nangor Road (R134) is re-introduced on the approach to the Nangor Road Business Park junction with a new pedestrian and cycle link connection to the Grand Canal Greenway to the east of the M50 overbridge.

Between the New Nangor Road (R134) / Riverview Business Park junction and New Nangor Road (R134) / Killeen Road junction it is proposed to widen the existing R134 carriageway to accommodate enhanced bus, cycle and pedestrian facilities along the corridor. This will require localised land acquisition on both the southern and northern boundaries to the existing carriageway. Localised modifications to the Cammock River headwall at the New Nangor Road (R134) / Oak Road junction will also be required.

The existing roundabouts and junctions along this portion of the New Nangor Road (R134) will be upgraded to cycle protected signalised junctions with the provision of large segregation islands proposed where practicable in consideration of the heavy goods vehicle movements in the area. Removal of left turn slip lanes and improved pedestrian crossing facilities are also proposed.

Raised table crossings are proposed at the interface of the existing HGV entrances (Diageo Baileys and Toyota Ireland) on the northern side of the New Nangor Road (R134) to improve the existing crossing arrangements.

At the Killeen Road junction the existing outbound bus bypass facility will be modified to accommodate the revised junction arrangements. A new two-way cycle facility will provide connection to the proposed cycle bridge at the New Nangor Road (R134) / Naas Road (R810) junction and also linking to the proposed two-way cycle track on the northern side of the Naas Road (R810), thus enhancing the accessibility of the existing Killeen Road cycle tracks that link to the Grand Canal Greenway and Park West whilst also reducing the need for cycle crossings on the R134. A proposed inbound right turn ban from the New Nangor Road (R134) towards Killeen Road will be implemented to facilitate bus priority in this section through lane reallocation. Alternative access to Killeen Road from the New Nangor Road (R134) is available via Willow Road / Knockmitten Lane. The existing peak hour right turn ban from Killeen Road to the New Nangor Road (R134) is proposed to be retained with the provision of inbound bus signals to allow for continuous bus priority during the right turn movements from Killeen Road.

Between Killeen Road junction and the Naas Road (R810) junction land acquisition and new retaining walls will be required along the northern boundary to facilitate enhanced bus, cycle, and pedestrian infrastructure.

At the New Nangor Road (R134) / Naas Road (R810) junction a new pedestrian and cycling bridge with accessible ramps and stairs on all approaches to the junction has been proposed to provide increased pedestrian and cycling safety, permeability and accessibility at this junction. This will require land acquisition and boundary treatment on the periphery of the existing road boundary to accommodate the proposed bridge and ancillary ramp structures. A proposed continuous inbound bus lane with dedicated left turn bypass facility will provide enhanced bus priority between the New Nangor Road (R134) and the Naas Road (R810). This will require land acquisition and boundary modifications including new retaining structures in conjunction with the new bridge access ramps and steps. A new bus lane is proposed within the junction for the outbound buses heading towards New Nangor Road (R134) to improve bus priority along the corridor. As a result, the general traffic lane allocation from the Long Mile Road (R110) will be revised to two straight ahead lanes towards the New Nangor Road (R134) and two left turn lanes towards the Naas Road (R810).

As outlined in the GDA Cycle Network Plan, this section of the corridor aligns with the proposed Primary Route 7B / N10 until cyclists re-join New Nangor Road beyond the M50 overbridge. The route also aligns with Secondary Route 8C2 along its extents.

4.5.5.2 Deviations from Standard Cross Sections

The Proposed Scheme has been designed in accordance with the PDGB and the TII publications referenced within the PDGB. No deviations from the desirable minimum width of the cross-sectional elements identified in the PDGB guidance (Section 4.6.1) will occur within Section 5 of the Proposed Scheme.

4.5.5.3 Bus Lane Provision

An overview of the bus lane provisions as part of the Proposed Scheme is provided in Section 4.6.4. As outlined within that section, full bus priority through the use of dedicated bus lanes is not possible at all locations, and Signal Controlled Priority is used in Section 5 of the Proposed Scheme as listed in Table 4.30.

Table 4.30: Proposed Signal Controlled Priority Junctions within Section 5

Junction Location	Priority Type	Note
New Nangor Road / Woodford Walk	The bus lane along New Nangor Road inbound is proposed up to the stop line. For the outbound bus service, a junction type 3 is proposed whereby the bus lane is curtailed to facilitate left turning vehicles. Separate bus stages on mainline corridor inbound only. Bus lanes up to stop lines on mainline corridor inbound only.	The proposal includes for cycle lanes on all arms of the junction, both entering and exiting the junction. Furthermore, dedicated cyclist crossings are proposed on all arms of the junction. Onset of receiving bus lane in inbound direction delayed to avoid impact to existing private properties, including buildings.
New Nangor Road / Riverview Business Park	Both inbound and outbound bus lanes along New Nangor Road. The bus lane is curtailed to facilitate left turning vehicles.	The proposal will introduce new cycle tracks along New Nangor Road in both directions. On the side arms, a cycle entry and exit lane is proposed. Dedicated cyclist signals are proposed, the junction type 4 arrangement will assist cyclists to cross two arms of the junction simultaneously.
New Nangor Road / Oak Road	A junction type 1 is proposed on the inbound direction where the bus lane is proposed up to the stop line. From this lane, buses can turn left or ahead. This design will ensure left turning traffic from New Nangor Road (inbound) does not compromise bus priority at the junction. For the outbound direction, a junction type 3 is proposed where the bus lane is curtailed prior to the stop line to facilitate a short left turn pocket. The left turning traffic volumes would have a minimal impact to bus priority at this location.	For cyclists, a junction type 4 arrangement is proposed where the junction accommodates an orbital cycle track across the junction.
New Nangor Road / Willow Road	A junction type 3 is provided for both inbound and outbound bus lanes which are curtailed prior to the stop line to facilitate left turning vehicles.	For cyclists, a junction type 4 arrangement is proposed where the junction accommodates an orbital cycle track across the junction.
New Nangor Road / Killeen Road (N)	Bus priority outbound along New Nangor Road will comprise of a continuous bus lane. The outbound bus lane bypasses the junction therefore offering greater green time for outbound buses. The inbound bus priority design is akin to junction type 2, with a proposed break in the bus lane to facilitate a left turning lane	The proposal will introduce cycle tracks with new cyclists signals to facilitate cyclists crossing New Nangor Road and Killeen Road.
New Nangor Road / Killeen Road (S)	For the inbound direction along New Nangor Road, a continuous bus lane is proposed as per junction type 1. For the outbound direction along New Nangor Road, a junction type 3 is proposed where the bus lane is curtailed prior to the stop line to facilitate left turning vehicular movements.	The proposal will significantly enhance cycle infrastructure by introducing a continuous two-way cycle track on the northern side of New Nangor Road. Furthermore, on the southern side of New Nangor Road, a single cycle track is proposed up to Killeen Road (S), with a two-way cycle track proposed after the Killeen Road (S) up to the Killeen Road (N) junction.

Junction Location	Priority Type	Note
Naas Road / Long Mile Road / New Nangor Road	<p>The proposed inbound bus lane along New Nangor Road will be continuous onto Naas Road towards the City Centre.</p> <p>For the outbound bus services, the bus lane is curtailed prior to the junction to facilitate left turning vehicular movements.</p>	<p>The proposal will significantly enhance cycle infrastructure by providing cycle tracks continuous through the junction, which will significantly enhance cyclist safety. A new bridge is proposed, which will cater for both pedestrians and cyclists crossing the junction.</p> <p>A two-way cycle track is proposed along the northern side of New Nangor Road onto Naas Road to provide a continuous cycle facility in both inbound and outbound directions.</p>

4.5.5.4 Bus Stops

The different types of bus stop (island, shared landing, inline and lay-by bus stops) are described in Section 4.6.4.5. The bus stop locations and types on Section 5 of the Proposed Scheme are outlined in Table 4.31 and shown in the General Arrangement series of drawings (BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-9001) in Volume 3 of this EIAR. Further details of bus stop design are included in the PDGB (NTA 2021) – Appendix A4.1 in Volume 4 of this EIAR.

Table 4.31: Proposed Bus Stop Locations within Section 5

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Inbound	Nangor Road, Woodford Walk	6152	F0	Shared landing Bus Stop	Proposed: Yes Existing: No
Inbound	Woodford Walk, New Nangor Road	New	Woodford Walk	Inline Bus Stop	Proposed: Yes New location
Inbound	Nangor Road Business Centre	New	F900	Island Bus Stop	Proposed: Yes New location
Inbound	Nangor Road, Willow Road	6243	F1335	Shared landing Bus Stop	Proposed: Yes Existing: No
Inbound	Nangor Road, Knockmitten Lane	6154	F1615	Shared landing Bus Stop	Proposed: Yes Existing: No
Inbound	Nangor Road, Killeen Road	6155	F2085	Shared landing Bus Stop	Proposed: Yes Existing: No
Outbound	New Nangor Road, Woodford Walk	New	F110	Shared landing Bus Stop	Proposed: Yes New location
Outbound	New Nangor Road, Riverview Business Centre	New	F900	Island Bus Stop	Proposed: Yes New location
Outbound	Nangor Road, Willow Road	6147	F1350	Shared landing Bus Stop	Proposed: Yes Existing: No
Outbound	Nangor Road, Knockmitten Lane	6146	F1650	Shared landing Bus Stop	Proposed: Yes Existing: No
Outbound	Nangor Road, Killeen Road	6145	F2150	Island Bus Stop	Proposed: Yes Existing: No

4.5.5.5 Cycling Provision

The specific proposals for cycling facilities in Section 5 of the Proposed Scheme are described below. Provision for cyclists at the signal-controlled junctions are described in Section 4.6.3.5.

On the R134 New Nangor Road (GDA Secondary Route 8C), from Woodford Walk, new segregated cycle tracks are provided to the end of Section 5 at the New Nangor Road / Naas Road junction. On the north side of R134 New Nangor Road, a two-way segregated cycle track is provided between Killeen Road north and New Nangor Road / Naas Road junction. On the south side of R134 New Nangor Road, a two-way segregated cycle track is

provided between Killeen Road north and Killeen Road south. At the New Nangor Road / Naas Road junction, cyclists can cross over this junction via a two-way cycle overbridge linking all four arms of the junction connecting both inbound and outbound cyclists on R134 New Nangor Road, R810 Naas Road and R110 Long Mile Road.

4.5.5.6 Junction Information

An overview of the approach to junction review and design is provided in Section 4.6.7. The major junctions (signalised) within Section 5 of the Proposed Scheme are outlined in Table 4.32.

Table 4.32: Major and Moderate Junctions (Signalised) within Section 5 of the Proposed Scheme

Junction Location	Note
Major Junctions	
New Nangor Road / Woodford Walk	Signalised junction with bus priority on New Nangor Road inbound and outbound. Removal of left-turn slip lane from Woodford Walk and protected cycle lanes.
New Nangor Road / Nangor Road Business Park / Riverview Business Park	Signalised junction with dedicated pedestrian and cycle crossings. Bus priority inbound and outbound along corridor proposed. Removal of existing roundabout junction.
New Nangor Road / Park West Avenue / Oak Road	Signalised junction with dedicated pedestrian and cycle crossings. Bus priority inbound and outbound along corridor proposed.
New Nangor Road / Willow Road	Signalised junction with dedicated pedestrian and cycle crossings. Bus priority inbound and outbound along corridor proposed.
New Nangor Road / Killeen Road	Signalised junction with dedicated pedestrian and cycle crossings. Bus priority inbound and outbound along corridor proposed.
Naas Road / New Nangor Road / Long Mile Road	Upgraded existing junction with dedicated cycle and pedestrian crossings via overbridge. Bus priority inbound and outbound along corridor proposed.
Moderate Junctions / Priority Junctions	
n/a	n/a

4.5.5.7 Structures

4.5.5.7.1 Bridges

Table 4.33 provides a description of the location and type of works to bridges along Section 5 of the Proposed Scheme.

Table 4.33: Summary of Major Structures in Section 5 of the Proposed Scheme

Identity	Co-ordinates	Chainage	Description
ST02 Naas Road Pedestrian and Cycle Bridge	709646.023 731736.535	F2250	Central span plus four arterial link span pedestrian and cycle bridge over the Naas Road Hamburger Junction. All spans are single span fully through warren trusses.

4.5.5.7.2 Retaining Walls

Table 4.34 sets out the proposed principal retaining walls along Section 5 of the Proposed Scheme.

Table 4.34: Summary of Principal Retaining Walls in Section 5 of the Proposed Scheme

Structure Ref.	Structure Type	Chainage Start – Chainage End (m)	Length (m)	Max. Retained Height (m)	Comment
RW04 Naas Road Retaining Wall	Reinforced concrete gravity retaining wall	F1955 – F2215	285	4.5	RW04 will be located along the southbound carriageways of New Nangor Road (R134) at its junction with the Naas Road (R810). The wall is required to retain widened fill material to accommodate the approach stairs and ramp to ST02 Naas Road Pedestrian and Cycle Bridge.
RW05 Naas Road Retaining Wall	Reinforced concrete gravity retaining wall	F2200	90	1.5	RW05 will be located along the eastbound carriageways of New Nangor Road (R134) at its junction with the Naas Road (R810). The wall is required to retain widened fill material to accommodate the approach stairs and ramp to ST02 Naas Road Pedestrian and Cycle Bridge.

4.5.5.8 Parking and Loading Bays

Changes to the parking and loading provisions along Section 5 as a result of the Proposed Scheme are shown in Table 4.35. There are no changes to loading provision along Section 5 of the Proposed Scheme.

Table 4.35: Section 5: On-Street Parking Spaces Change Impact Summary

Location	Type of Parking	Existing	Proposed	Change
New Nangor Road between Willow Road and Naas Road junction	Informal Parking	7	0	-7
	Adjacent Parking	831 and 35 HGV 41approx.	821 and 31 HGV41approx.	-14
New Nangor Road / Naas Road / Long mile Road junction	Adjacent Parking	857 and 157 HGV approx.	745 and 154 HGV	-115
Total		1695 and 192 HGV	1566 and 185 HGV	-136

4.5.5.9 Landscape and Urban Realm

For an overview of the landscape design principles and approach, reference should be made to Section 4.6.11. The following sections provide a description of specific landscape and urban realm design works in Section 5 of the Proposed Scheme.

Existing left turn slip lanes at the Woodford Walk / New Nangor Road junction are to be removed. This has provided additional space for a small urban realm intervention that incorporates a raised planter with new tree / shrub planting, seated walls and new concrete paving. The new paving areas will help strengthen the pedestrian connections between the new bus stop locations and the entrance to the N10 Grand Canal Greenway walkway.

New tree planting along R134 New Nangor Road will replace the existing boulders that align adjacent to the carriageway which will soften the character of the area whilst defining and protecting the existing boundaries.

Cycle tracks will be provided on both sides of the carriageway the length of R134 New Nangor Road, with cyclists able to join the cycle track at Woodford Walk from either the carriageway or the N10 Grand Canal Greenway. Additional cyclist connections to the Greenway from the north of R134 New Nangor Road are provided at the M50 overbridge. This route aligns with the proposed Primary Route 7B / N10 until cyclists re-join R134 New Nangor Road beyond the M50 overbridge. To accommodate these new connections their sections of trees will be removed. These will be substituted with new green verges and new tree planting where possible.

Junctions at the entrance to commercial properties along New Nangor Road will be improved, where practicable. Additional tree planting and new concrete paving will help formalise these entrances whilst softening their character. Potential for SuDS interventions has been identified within a number of green verges along this section of R134 New Nangor Road.

Due to the carriageway width being increased along the interface with Western Business Park there are a number of existing trees that will need to be removed. These will be replaced with new tree planting to re-define this boundary.

At the entrance to Diageo Baileys there will be a section of existing hedgerow removed to accommodate the new carriageway design. New hedgerow planting is proposed in addition to some additional tree planting to ensure this interface is maintained.

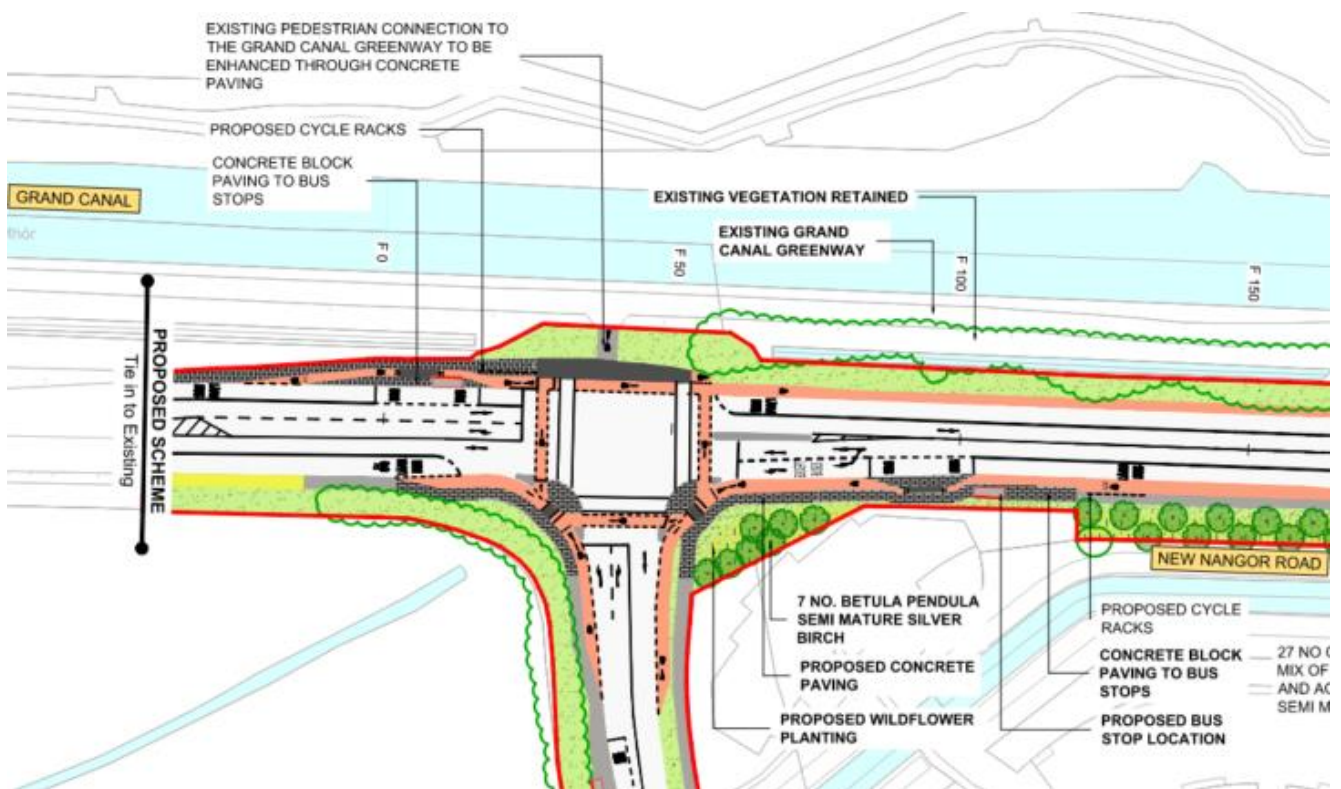


Image 4.8: Junction of Woodland Walk and New Nangor Road connecting with Grand Canal Greenway

4.5.5.10 Land Acquisition and Use

Land acquisition will be required through this section of the Proposed Scheme, including greenway connection links either side of the M50 overbridge, carriageway widening on the R134 New Nangor Road and installation of a pedestrian / cycle overbridge (ST02), with associated ramp structures and retaining walls (RW04 and RW05) at the New Nangor Road / Naas Road / Long Mile Road junction.

Temporary land take is required within this section to facilitate:

- Cycle track connection to Grand Canal Greenway (Ch F400 to F420 and F545 to F590), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0046 in Volume 3 of this EIAR;
- Carriageway widening on the southern side of R134 New Nangor Road between Oak Road culvert and Willow Road junction (Ch F930 to Ch F1380), see General Arrangement drawings BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0048 and BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0049 in Volume 3 of this EIAR;
- Carriageway widening on the northern side of R134 New Nangor Road between Diageo Baileys and Toyota Ireland (Ch F1280 to F1540), see General Arrangement drawings BCIDA-ACM-GEO_GA-

0809_XX_00-DR-CR-0048 and BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0049 in Volume 3 of this EIAR;

- Carriageway / junction widening at New Nangor Road / south Killeen Road junction (Ch F1770 to F1810), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0050;
- A site construction compound at lands south of New Nangor Road (Ch F1830 to Ch F2030)
- Low height retaining wall construction on the south side of the R134 New Nangor Road (Ch 1960 to F2035), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0050 in Volume 3 of this EIAR;
- Carriageway widening and low height retaining wall construction on the north side of the R134 New Nangor Road (Ch F1750 to F2100), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0050 in Volume 3 of this EIAR; and
- Carriageway widening and construction of pedestrian / cycle overbridge (ST02) and associated ramp structures and retaining walls (RW04 and RW05) at the New Nangor Road / Naas Road / Long Mile Road junction, see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0051 in Volume 3 of this EIAR.

The impacts on residential amenity arising from land acquisition in Section 5 of the Proposed Scheme and are addressed in Chapter 10 (Population). Similarly, the impacts on landscape amenity arising from land acquisition in Section 5 of the Proposed Scheme are addressed in Chapter 17 (Landscape (Townscape) & Visual).

4.5.5.11 Rights of Way

No rights of way will be affected within Section 5 of the Proposed Scheme.

4.5.6 Section 6: Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction to Drimnagh

4.5.6.1 General overview of the Proposed Scheme

The Proposed Scheme is routed along the Naas Road (R810) until the junction with Walkinstown Avenue (R112), generally maintaining the existing lane provision of one bus lane and two traffic lanes in each direction with a proposed segregated two-way cycle track on the inbound direction and segregated one way cycle track on the outbound direction. The existing left turn slip lane towards the Kylemore Road (R112) is to be removed and the inbound left turn movement will be banned, with traffic diverted via Old Naas Road / John F Kennedy Drive in order to access Kylemore Road (R112). This arrangement allows for improved bus facilities and passenger interchange with the Kylemore Luas Stop. Right turning buses from Naas Road (R810) towards Walkinstown Avenue (R112) will have a layby bus stop with a bus priority signal to complete the right turn movement through the junction. Through services / coaches along the Naas Road (R810) will have a layby bus stop adjacent to the Old Naas Road junction. An inline bus stop for the corridor spine services and offline layby bus stop for coaches is provided on the outbound section of the Naas Road (R810). Localised land acquisition and widening will be required to accommodate the arrangement for the outbound bus stops.

The junction of Naas Road (R810) / Walkinstown Avenue (R112) is being reconfigured to provide enhanced pedestrian and cyclist facilities. Existing pedestrian routes are maintained along Naas Road with raised table crossings at key entrances along this section of the corridor to improve pedestrian priority.

From the Naas Road (R810) the Proposed Scheme is routed along the Walkinstown Avenue (R112), with one bus lane, one general traffic lane, cycle track and footpath in each direction. A grass verge is provided to segregate the outbound cycle track from the carriageway and to retain the existing mature trees along this section of the corridor. Land acquisition will be required on the eastern boundary to accommodate the revised cross section.

The junction of Walkinstown Avenue (R112) / Long Mile Road (R110) is being reconfigured to provide enhanced pedestrian and cyclist facilities. The westbound approach to the junction on Long Mile Road is also being altered, with a bus gate being provided for improved priority for right turning buses into Walkinstown Avenue.

The existing bus and traffic lane provision is generally maintained along the Long Mile Road (R110) until the junction with Slieverbloom Park, at which point the Proposed Scheme joins the Tallaght section. The junction with

Slievebloom Park is proposed to be upgraded to a signalised junction with improved pedestrian and cycle facilities. Existing footway provisions have largely been maintained, with raised tables proposed at side roads and new raised crossing proposed adjacent to schools in order to improve pedestrian accessibility and safety. Cycle tracks are provided in both directions.

As outlined in the GDA Cycle Network Plan, this section of the corridor aligns with the proposed Secondary Route 7D, the proposed Secondary Route S04 and the proposed Secondary Route 8C.

4.5.6.2 Deviations from Standard Cross Sections

The Proposed Scheme has been designed in accordance with the PDGB and the TII publications referenced within the PDGB. However, at a number of constrained locations across the Proposed Scheme, the width of the cross-sectional elements has been designed below the desirable minimum identified in the PDGB guidance (see Section 4.6.1). The deviations within Section 6 of the Proposed Scheme are detailed in Table 4.36.

Table 4.36: Reduced Standard Cross Sections on Section 6

Chainage / Location	Design Element	Desirable Minimum	Design	Justification
F4150 – F4175	Cycle track (outbound)	2.0m	1.5m	Narrowing to allow for 2.0m footway. Single file cycling minimum width provided (PDGB).

4.5.6.3 Bus Lane Provision

An overview of the bus lane provisions as part of the Proposed Scheme is provided in Section 4.6.4. As outlined within that section, full bus priority through the use of dedicated bus lanes is not possible at all locations, and Signal Controlled Priority is used in Section 6 of the Proposed Scheme as listed in Table 4.37.

Table 4.37: Proposed Signal Controlled Priority Junctions within Section 6

Junction Location	Priority Type	Note
Old Naas Road / John F. Kennedy Drive / Naas Road	A junction type 2 is proposed where a bus lane is proposed up to the stop line, with a proposed break in the bus lane to facilitate a left turn lane inside of the bus lane. Separate bus stages on mainline corridor inbound only. Bus lanes up to stop lines on mainline corridor inbound only.	The proposal will introduce cycle track along the northern side of Naas Road. A crossing facility is proposed across the Old Naas Road arm. Onset of the receiving bus lane in the inbound direction delayed to avoid impact to existing private properties, including buildings.
Naas Road / Walkinstown Avenue / Kylemore Road	A junction type 1 is proposed for both inbound along Naas Road and in the outbound direction along Walkinstown Avenue. Along Naas Road inbound, a separate lane is proposed for right turning and ahead buses. A right turning bus lane is proposed in Lane 1.	The proposed design will comprise of cycle tracks on all arms of the junction. The design proposes an orbital cycle track across the junction akin to a junction type 4.
Walkinstown Avenue / Long Mile Road	Bus priority is proposed up to the stop line on both inbound and outbound directions along Walkinstown Avenue and Long Mile Road, respectively.	The proposal will introduce orbital cycle tracks across the junction and cycle tracks on all arms of the junction.
Walkinstown Parade / Long Mile Road	Bus priority is proposed for inbound as per junction type 1, with the bus lane up to the stop line. For the outbound direction, the bus lane is proposed to be curtailed prior to the stop line to facilitate left turning vehicles.	The existing on road cycle lanes along Long Mile Road are proposed to be upgraded to cycle tracks, to offer cyclists greater protection.

4.5.6.4 Bus Stops

The different types of bus stop (island, shared landing, inline and lay-by bus stops) are described in Section 4.6.4.5. The bus stop locations and types on Section 6 of the Proposed Scheme are outlined in Table 4.38 and shown in the General Arrangement series of drawings (BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-9001) in

Volume 3 of this EIAR. Further details of bus stop design are included in the PDGB (NTA 2021) – refer to Appendix A4.1 in Volume 4 of this EIAR.

Table 4.38: Proposed Bus Stop Locations within Section 6

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Inbound	Naas Road, Luas Kylemore	1981	F2845	Island Bus Stop	Proposed: Yes Existing: Yes
Inbound	Naas Road, Luas Kylemore	New	F2935	Island Bus Stop	Proposed: Yes New location
Inbound	Long Mile Road, Walkinstown Avenue	2181	F3400	Island Bus Stop	Proposed: Yes Existing: Yes
Inbound	Long Mile Road, Drimnagh Castle	2778	F3960	Island Bus Stop	Proposed: Yes Existing: Yes
Outbound	Naas Road, Luas Kylemore	1956	F2885	Island Bus Stop	Proposed: Yes Existing: Yes
Outbound	Naas Road, Luas Kylemore	New	F2920	Island Bus Stop	Proposed: Yes New location
Outbound	Walkinstown Avenue	New	F3285	Shared landing Bus Stop	Proposed: Yes New location
Outbound	Long Mile Road, Drimnagh Castle	2727	F3900	Island Bus Stop	Proposed: Yes Existing: Yes

4.5.6.5 Cycling Provision

The specific proposals for cycling facilities in Section 6 of the Proposed Scheme are described below. Provision for cyclists at the signal-controlled junctions are described in Section 4.6.3.5.

New segregated cycling tracks will be provided along the R810 Naas Road from the New Nangor Road / Naas Road junction to the Naas Road / Walkinstown Avenue junction (GDA Secondary Cycle Route 7D). A two-way cycle track will be provided on the north side of the R810 Naas Road between New Nangor Road / Naas Road junction and the Old Naas Road junction. From the Naas Road / Walkinstown Avenue junction, the new segregated cycle tracks will continue on R112 Walkinstown Avenue (GDA Secondary Cycle Route S04) as far as the Walkinstown Avenue / Long Mile Road junction. The new segregated cycle tracks will continue from this junction along the R110 Long Mile Road (GDA Secondary Route 8C) to the junction of Walkinstown Road and Drimnagh Road where it meets Section 1 of the Proposed Scheme.

4.5.6.6 Junction Information

An overview of the approach to junction review and design is provided in Section 4.6.7. The major and moderate junctions (signalised) within Section 6 of the Proposed Scheme are outlined in Table 4.39.

Table 4.39: Major and Moderate Junctions (Signalised) within Section 6 of the Proposed Scheme

Junction Location	Note
Major Junctions	
Naas Road / Kylemore Road / Walkinstown Avenue	Signalised junction with dedicated pedestrian and cycle crossings. Existing left-turn from Naas Road onto Kylemore Road removed. Bus priority inbound and outbound along corridor proposed.
Long Mile Road / Walkinstown Avenue	Signalised junction with dedicated pedestrian and cycle crossings. Bus priority inbound and outbound along corridor proposed.
Moderate Junctions / Priority Junctions	
Long Mile Road / Walkinstown Parade	Existing dropped kerb pedestrian crossing facilities proposed to be replaced with signalised junction.

4.5.6.7 Structures

4.5.6.7.1 Bridges

There are no bridge works proposed along Section 6 of the Proposed Scheme.

4.5.6.7.2 Retaining Walls

There are no principal retaining walls proposed along Section 6 of the Proposed Scheme.

4.5.6.8 Parking and Loading Bays

Changes to the parking provision along Section 6 as a result of the Proposed Scheme are shown in Table 4.40. There are no changes to loading provision along Section 6 of the Proposed Scheme.

Table 4.40: Section 6: On-Street Parking Spaces Change Impact Summary

Location	Type of Parking	Existing	Proposed	Change
Naas Road and Walkinstown Avenue between New Nangor Road junction and Long Mile Road junction	Illegal Parking	6 approx.	0	-6
	Informal Parking	9 approx.	0	-9
Long Mile Road between Walkinstown Avenue junction and Slievebloom Park junction	Illegal Parking	20 approx.	0	-20
	Informal Parking	26 approx.	9	-17 approx.
Total		61 approx.	9	-52 approx.

4.5.6.9 Landscape and Urban Realm

For an overview of the landscape design principles and approach, reference should be made to Section 4.6.11. The following sections provide a description of specific landscape and urban realm design works in Section 6 of the Proposed Scheme.

At the New Nangor Road / Naas Road / Long Mile junction a pedestrian and cyclist footbridge is proposed.

The existing left turn slip lane at R112 Kylemore Road is to be removed, with traffic diverted via Old Naas Road (a short distance upstream) in order to access R112 Kylemore Road. This arrangement allows for improved bus facilities, interchange with Kylemore Luas Station and opportunities for additional tree planting.

A two-way cycle track is provided along the north side of R810 Naas Road with a verge to segregate the cycle track from the carriageway provided where possible. A one-way westbound cycle track is provided along the south side of R810 Naas Road with a verge to segregate the cycle track from the carriageway provided where possible.

Along R112 Walkinstown Avenue, cycle tracks and footways are provided both north and southbound, with a verge provided to segregate the cycle track from the carriageway along the northbound carriageway from the MDL site entrance to the Naas Road junction. This verge allows for the retention of existing mature trees along R112 Walkinstown Avenue.



Image 4.9: Long Mile Road Cycle Lane and Enhanced Planting within Medians

The junction of Walkinstown Avenue is being reconfigured to provide enhanced pedestrian and cyclist facilities. Additional footway widths across the junction have created opportunities for new tree planting to help soften the character of the area and create a more pedestrian friendly environment.



Image 4.10: New Pedestrian Crossing along Long Mile Road

Proposed raised table crossing paved in concrete pavers to match adjacent footways will improve driver awareness and increase pedestrian safety and connectivity at key crossing locations.

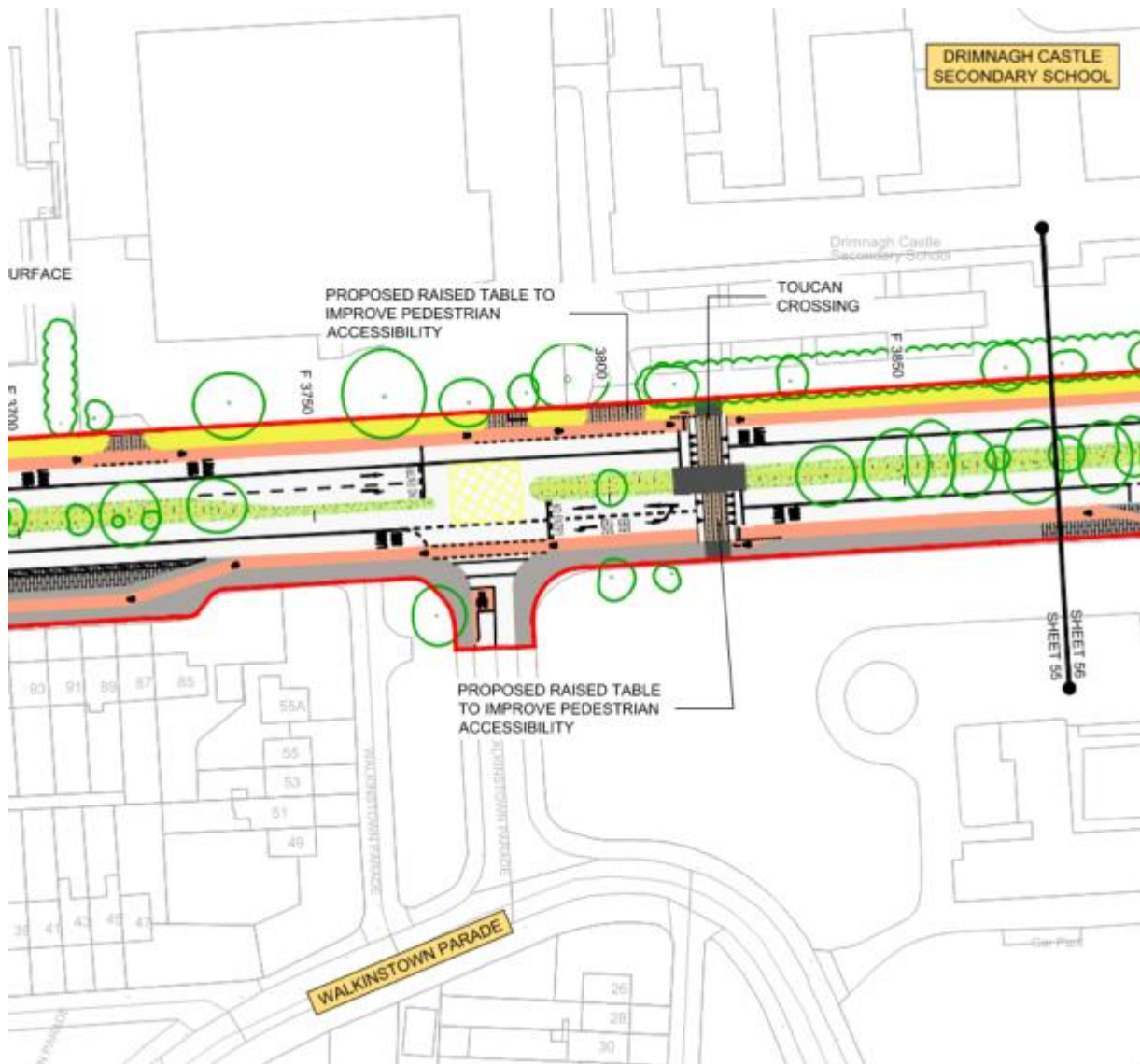


Image 4.11: Pedestrian Crossing Improvements at Schools located along Long Mile Road (West)

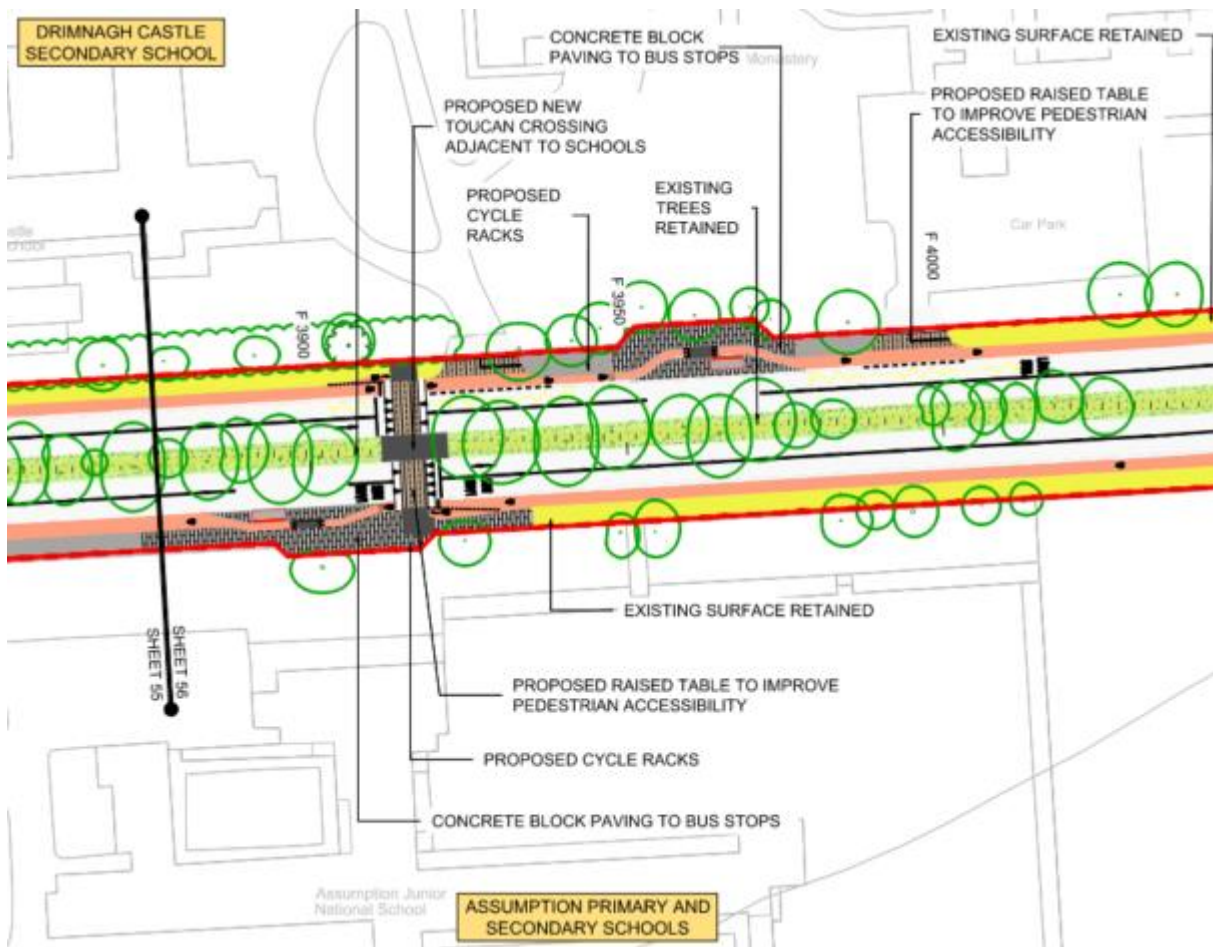


Image 4.12: Pedestrian Crossing Improvements at Schools located along Long Mile Road (East)

4.5.6.10 Land Acquisition and Use

Land acquisition will be required through this section to facilitate the Proposed Scheme for carriageway widening on the R810 Naas Road westbound near the R112 Walkinstown Avenue junction to construct a bus layby and south bound on R112 Walkinstown Avenue.

Temporary land take is required within this section to facilitate:

- Bus stop layby westbound on N810 Naas Road (Ch F2890 to F3020), see General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0053 in Volume 3 of this EIAR; and
- Carriageway widening on R112 Walkinstown Avenue (Ch F3010 to F3345), see General Arrangement drawings BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0053 and BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0054 in Volume 3 of this EIAR.

The impacts on residential amenity arising from land acquisition in Section 6 of the Proposed Scheme and are addressed in Chapter 10 (Population). Similarly, the impacts on landscape amenity arising from land acquisition in Section 6 of the Proposed Scheme are addressed in Chapter 17 (Landscape (Townscape) & Visual).

4.5.6.11 Rights of Way

Table 4.41 outlines the location in Section 6 where existing rights of way which will be affected by the Proposed Scheme.

Table 4.41: Section 6: Existing Rights of Way Affected

Location	Chainage	Existing Situation	Proposed Change
R810 Naas Road / Old Naas Road junction	F2800	Southbound bellmouth junction access road from Old Naas Road to R810 Naas Road	Southbound bellmouth junction access road from Old Naas Road to R810 Naas Road taken up, road link between R180 Naas Road and Old Naas Road northbound only.

4.6 Key Infrastructure Elements

The following sections provide a description of the main infrastructure elements of the Proposed Scheme. The Proposed Scheme has been designed following guidance relating to the design principles for urban streets, bus facilities, cycle facilities and public realm as outlined in Section 4.4.

4.6.1 Mainline Cross-section

Traffic lane widths (including bus lanes) will follow the guidance outlined in DMURS, with the preferred width of traffic lanes on the Proposed Scheme being:

- 3.0m in areas with a posted speed limit <60km/h; and
- 3.25m in areas with a posted speed limit >60km/h.

Traffic lane widths of 2.75m is permissible but not desirable and should only be permitted on straight road sections with very low Heavy Goods Vehicles (HGV) percentage and where all desirable minimum widths for footpaths, cycle tracks, parking, bus lanes are not achievable without impact on third-party lands, if appropriate, taking all design factors into account in the context of the Proposed Scheme objectives.

The desirable minimum width for a single direction, with flow, raised adjacent cycle track is 2.0m. Based on the National Cycle Manual (NCM) this allows for overtaking within the cycle track. The minimum width is 1.5m. The desirable width for a two-way cycle track is 3.25m with a 0.5m buffer between the cycle track and the carriageway.

2.0m is a desirable minimum width for footpaths with 1.2m being an absolute minimum width at pinch points.

An example of the typical BusConnects road layout (without multiple traffic lanes in each direction or median) is shown in Image 4.13.

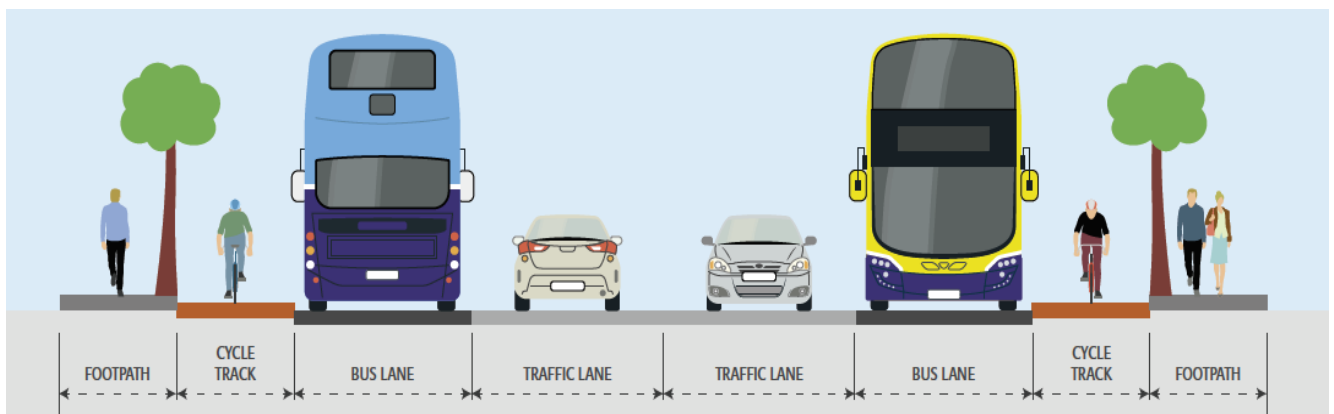


Image 4.13: Typical BusConnects Road Layout (PDGB)

The cross-sectional design of the mainline has been developed to achieve the desirable width criteria contained within the PDGB and TII Publications wherever reasonably practicable as outlined in Table 4.42, Table 4.43 and Table 4.44. Where these criteria are not achievable, for instance due to physical constraints at pinch points, deviations from standards are outlined for each section of the Proposed Scheme in Section 4.5.

Table 4.42: Cross-Sectional Design Parameters (PDGB)

Design Element	Desirable Minimum Standard	Minimum Width	Permitted Reductions at Constraints
Footpath	2.0m	1.8m	1.2m over a 2m length of path (2)
Cycle Track (one-way)	2.0m	1.5m	Local narrowing below 1.5m may be necessary short distances to cater for local constraints
Cycle Track (two-way)	3.25m+ 0.5m (buffer)	Refer to National Cycle Manual width calculator. 0.3m (buffer)	N/A
Bus Lane	3.0m	N/A	N/A
Traffic Lane	Preferred Width: 3.0m where speed ≤ 60 km/h 3.25m where speed limit > 60 km/h	2.75m (3)	N/A
(1) Deviations from standard, for each Section on the Proposed Scheme are presented in Section 4.5.			
(2) Building for everyone: A Universal Design Approach.			
(3) Traffic lane widths of 2.75m are permissible but not desirable and should only be permitted on straight road sections with very low HGV percentage and where all desirable minimum widths for footpaths, cycle tracks, parking, bus lanes are not achievable without impacting on third-party lands.			

Table 4.43: TII Publications Cross-Sectional Design Parameters – Footway

Design Element	Recommended limits (m)	Extreme Limits (m)	Design Standard
Footway	2.0m	1.3	DN-PAV-03026 - Footway Design Jan 2005

Table 4.44: TII Publications Cross-Sectional Design Parameters – Cycle tracks and vehicle lanes

Design Element	Desirable min (m)	One step below Desirable min (m)	Design Standard
Cycle Track (two-way high volume)	3.0	2.5	DN-GEO-03036 - Cross Sections and Headroom - May 2019
Traffic Lane (Urban All-Purpose Dual 2 / Dual 3 Lane)	3.65	N/A	DN-GEO-03036 - Cross Sections and Headroom - May 2019
Traffic Lane (Urban Dual Carriageway Relief Road)	3.5	N/A	DN-GEO-03036 - Cross Sections and Headroom - May 2019

4.6.2 Pedestrian Provision

4.6.2.1 Footpath Widths

As stated in Section 4.6.1, the desirable minimum width for a footpath is 2.0m. This width should be increased in areas catering for significant pedestrian volumes where space permits. DMURS defines the absolute minimum footpath width for road sections as 1.8m based on the width required for two wheelchairs to pass each other. Building for Everyone: A Universal Design Approach (NDA 2020), defines acceptable minimum footpath widths at specific pinch points as being 1.2m wide over a two-metre length of path.

In line with the Road User Hierarchy designated within DMURS, at pinch points the width of the general traffic lane should be reduced first, then the width of the cycle track should be reduced before the width of the footpath is reduced, where practicable.

Throughout the Proposed Scheme, footpath widths of two metres or wider have been proposed, however where this has not been achieved, deviations from standard have been required as outlined in Section 4.5.

4.6.2.2 Pedestrian Crossings

Pedestrian crossings have been designed to accommodate a moderate flow of foot traffic along the mainline desire line where possible, with a minimum width of 2.4m at both signalised junctions and zebra crossings. Pedestrians will share their manoeuvres with cyclists when using Toucan crossings, which are to be provided at signalised junctions which cannot accommodate segregated cycle crossings. To facilitate road users who cannot cross in a reasonable time, the desirable maximum crossing length without providing a refuge island is 19m. Where this is not possible, refuge islands at least 4m wide are to be used where possible to allow those who cannot cross in a reasonable time to make the journey in two phases.

At signalised junctions and standalone pedestrian crossings, the footpath will be ramped down to carriageway level to facilitate pedestrians. At minor junctions, raised tables are proposed to raise the road level up to footpath level and facilitate unimpeded crossing, where practicable Tactile paving will be provided at the mouth of each pedestrian crossing and will be designed in accordance with standards. Audio units will be provided on each traffic signal push button.

Formal crossing points will be provided at bus stop islands, consisting of an on-demand signalised pedestrian crossing with appropriate tactile paving, push button units and Light Emitting Diode (LED) warning studs. Pedestrian crossings are indicated in the Landscaping General Arrangement drawings (BCIDA-ACM-ENV_LA-0809_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

4.6.3 Cycling Provision

One of the objectives for the Proposed Scheme is to enhance the potential for cycling by providing safe infrastructure, segregated from general traffic wherever practicable. Physical segregation ensures that cyclists are protected from motorised traffic and can bypass vehicular congestion, thus improving cyclist safety and reliability of journey times. Physical segregation can be provided in the form of vertical segregation (e.g., raised kerbs), horizontal segregation (e.g., parking/verge protected cycle tracks), or both. Bike racks will generally be provided, where practicable, at Bus Stops and key additional locations as noted in the Landscaping General Arrangement drawings (BCIDA-ACM-ENV_LA-0809_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

The 'preferred cross-section template' developed for the Proposed Scheme includes protected cycle tracks, providing vertical segregation from the carriageway to the cycle track and vertical segregation from the cycle track to the footpath.

The principal source for guidance on the design of cycle facilities is the National Cycle Manual (NCM) (NTA 2011) and the PDGB.

The desirable minimum width for a single-direction, with-flow, raised-adjacent cycle track is two metres. This arrangement allows for two-abreast cycling, and based on the NCM Width Calculator, this also allows for overtaking within the cycle track. The minimum width is 1.5m, which based on the NCM Width Calculator, allows for single file cycling. Localised narrowing of the cycle track below 1.5m is also necessary over very short distances to cater for local constraints (e.g., exceptional mature trees).

The desirable minimum width for a two-way cycle track is 3.25m. In addition to this, a buffer of 0.5m should be provided between the two-way cycle track and the carriageway. Using the NCM Width Calculator, reduction of these desirable minimum widths can be considered on a case-by-case basis, with due cognisance of the volume of cyclists anticipated to use the route as well as the level of service required.

The Proposed Scheme is approximately 15.5km long and includes approximately 14km of segregated cycle track inbound and 13.3km outbound. The existing segregated cycle lane provision is approximately 1.3km inbound and 0.7km outbound (see Table 4.1). Details of the proposed cycle provision throughout the extent of the Proposed Scheme are provided in the following sections.

4.6.3.1 Cycle Tracks

A cycle track is a segregated lane dedicated to cycling which is physically separated from the adjacent traffic lane and/or bus lane horizontally and/or vertically, as shown in Image 4.14, taken from the PDGB.

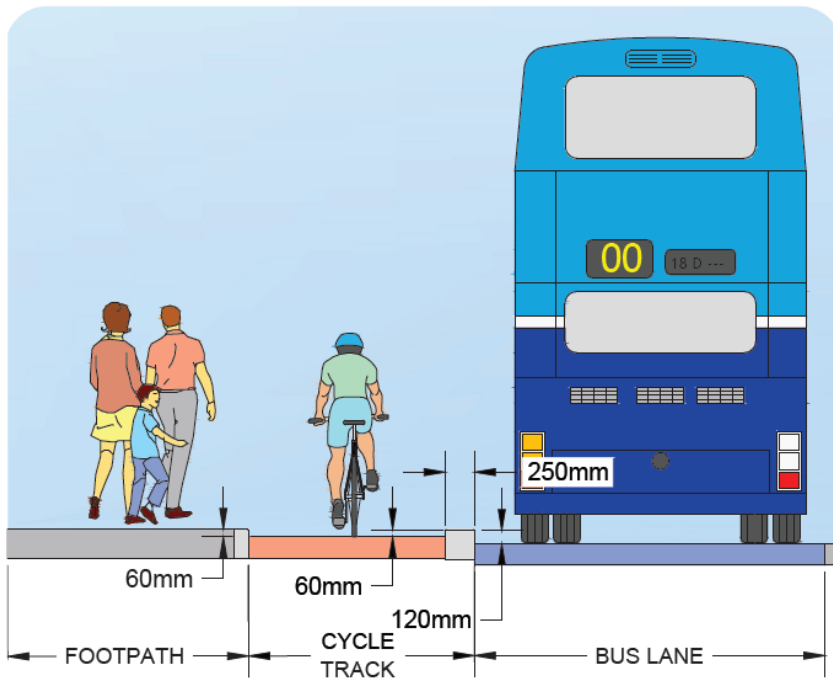


Image 4.14: Fully Segregated Cycle Track

Segregated cycle tracks have been provided where practicable, with the exception of a proposed quiet street along a short section of Clogher Road, west of Sundrive Road, where the road is very narrow for a distance of approximately 200m. Traffic will be controlled in this section through the use of a bus gate at the junction of Clogher Road / Sundrive Road. The remaining length of this alternative route includes a dedicated cycle lane (Bunting Road, St. Mary's Road, Kildare Road and the rest of Clogher Road) with a view to providing an alternative safe route for cyclists navigating between the Walkinstown Roundabout and the Grand Canal cycle route at R111 Parnell Road.

At-grade cycle tracks (as per NCM Section 4.3.4) may be used as an alternative where the appointed contractor (in liaison with the suitably qualified arborist engaged by them), deems that a no-dig technique is required following on-site inspection of a tree's root protection area (RPA). In these instances, the cycle tracks will be at carriageway level and segregated from general traffic using slip formed kerbing. Such assessments are likely to be required in areas where the existing kerbs are proposed to be retained due to the presence of existing trees at the road edge.

Existing bridge deck details necessitate the use of industry-standard cycle lane separators ('Armadillos') instead of kerbed segregation at:

- ST01 Greenhills Road Pedestrian and Cycle Bridges; and
- ST02 Naas Road Pedestrian and Cycle Bridge.

4.6.3.2 Cycle Lanes

Cycle lanes do not have vertical and / or horizontal separation from adjacent traffic lanes. Short sections of cycle lanes are proposed to match existing cycle lane provision on R819 Greenhills Road tie-ins at the new Ballymount Avenue / Greenhills Road link road and at the new roundabout junction at Lidl store access road.

4.6.3.3 Quiet Street Treatment

Offline options may include directing cyclists along streets with minimal general traffic other than car users who live on the street. Guidance in this regard has been provided within the PDGB, which states:

“Diversions of proposed cycle facilities on to quieter parallel routes, to avoid localised narrowing of cycle tracks on the main CBC route, is to be considered in the context of the CBC route being listed as a primary cycle route as per the Greater Dublin Area Cycle Network Plan. These diversions, however, may also be considered where appropriate cycle facilities cannot be provided along the CBC route without significant impact.”

These are called Quiet Streets due to the low volume of only local general traffic users travelling at low speed and are deemed suitable and safe for cyclists sharing the roadway with the general traffic without the need to construct segregated cycle tracks or painted cycle lanes. The Quiet Street Treatment would involve appropriate advisory signage for both the general road users and cyclists.

On the Proposed Scheme, a Quiet Street treatment is proposed along Bunting Road, St. Mary’s Road, Kildare Road and Clogher Road (see General Arrangement Drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-9001 Sheet 35 of 56 to Sheet 44 of 56 included in Volume 3 of this EIAR).

4.6.3.4 Treatment of Constrained Areas

The existing road corridor includes 9.4km inbound and 9.7km outbound of non-segregated cycle lanes. At some locations along the Proposed Scheme, standard width of cycleways cannot be achieved, and localised narrowing will be required. All locations where substandard widths are required have been recorded and presented in each of the sections of the Proposed Scheme as described in Section 4.5.

Due to the width available, cyclists share the carriageway at the following locations along the Proposed Scheme:

- Belgard Square West (Ch. A0 to Ch. A370 inbound and outbound, partially shared bus lane);
- Blessington Road, Main Road and Old Greenhills Road (Ch. A1280 to Ch. A1970 inbound and outbound);
- Calmount Avenue;
- R819 Walkinstown Road (shared bus lane);
- R110 Crumlin Road (inbound Ch. A7620 to Ch. A7850 and Ch. A8230 to Ch. A9250, shared bus lane);
- R110 Crumlin Road (inbound Ch. A7850 to Ch. A8230);
- R110 Crumlin Road (outbound Ch. A7680 to Ch. A8290 and Ch. A8600 to Ch. A9220, shared bus lane);
- and
- R110 Crumlin Road (outbound Ch. A8290 to Ch. A8600).

4.6.3.5 Cycle Provision through Junctions

Junctions have been designed to facilitate a high level of safety, comfort and priority for sustainable modes of travel (i.e., walking and cycling) and for public transport by prioritising the space and time allocated to these modes within the operation of a junction. This will also accommodate the forecast future year traffic volumes as safely and efficiently as possible within the remaining space and time. This has allowed the design to maximise the number of people moving through each junction and to prioritise these sustainable modes of travel. These locations are shown on the General Arrangement drawings (BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-9001) included in Volume 3 of this EIAR.

4.6.3.6 Cycle Parking Provision

Cycle stands will be provided, where practicable, at island bus stops and key additional locations as noted in the Landscaping General Arrangement Drawings (BCIDA-ACM-ENV_LA-0809_XX_00-DR-LL-9001) included in Volumes 3 of this EIAR.

4.6.4 Bus Priority Provision

One of the objectives of the Proposed Scheme is to enhance the capacity and potential of the public transport system by improving bus speeds, reliability and punctuality through the provision of bus lanes and other measures to provide priority to bus movement over general traffic movements. Several measures can be used to achieve this. This is described further in this section.

4.6.4.1 Bus Lanes

Bus Priority can be achieved by means of providing a dedicated lane within the carriageway for the bus to travel independently from the general traffic. This includes priority through junctions by bringing the bus lane to the junction stop line as per general traffic lanes. This means in some circumstances that left turning traffic cannot use the bus lane at junctions and instead will be provided with a dedicated left-turn traffic signal phase for the turn movement off the general traffic lane or will be provided with a separate left-turning lane.

Over the majority of the route, as per the guidance for traffic lane widths outlined in DMURS, a 3m lane will be provided for bus use only. This is as per the guidance for traffic lane widths outlined in DMURS. Larger lane widths are needed in some instances to enable buses to navigate corners, etc. ('swept path'). Bus lanes are shown on the General Arrangement drawings (BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-9001) included in Volume 3 of this EIAR.

4.6.4.2 Signal Controlled Priority

An alternative measure for achieving bus priority at locations where the provision of bus lanes is not possible is the use of Signal Control Priority (SCP). SCP facilitates bus priority by using traffic signals to give buses priority ahead of general traffic on sections of a route with significant physical constraints or pinch-points impacting on the provision of a bus lane. Typical pinch-points arise where the existing carriageway is narrow (no bus lane or segregated cycle track) due to existing buildings or structures that cannot be demolished or modified to widen the road to make space for a bus lane. While SCP is a good alternative to a physical bus lane it is only effective for short distances. It works through the use of traffic signal controls (typically at junctions) where the bus lane and general traffic lane must merge ahead and share the road space for a short distance until the bus lane recommences downstream. The general traffic will be stopped at the signal to allow the bus pass through the narrow section first. SCP will fail if downstream congestion blocks access to the downstream bus lane. Image 4.15 illustrates a schematic operation of SCP.



Image 4.15: Signal Controlled Priority Schematic Operation (Source: PDGB)

Locations within the Proposed Scheme where signal-controlled priority provisions will result in buses and general traffic sharing a lane are described below:

- On R819 Greenhills Road north of the TUD Tallaght access road junction (outbound) to provide for buses towards Tallaght village;
- On R819 Greenhills Road opposite Tymonville Crescent (outbound) to provide for buses towards Tallaght;
- On R819 Greenhills Road opposite Tymon Lane (outbound) to provide for buses towards Tallaght;
- On R110 Crumlin Road east of the Rafter's Road junction (inbound) to provide for buses to the City Centre, approximately 400m in length;
- On R110 Crumlin Road at the HSE Health Centre (outbound) to provide for buses to Tallaght and Clondalkin, approximately 300m in length;
- On R134 New Nangor Road at the M50 overbridge (outbound) to provide for buses to Clondalkin, approximately 150m in length; and
- On R110 Long Mile Road on approach to R112 Walkinstown Avenue junction (outbound) to provide for buses to Clondalkin, approximately 70m in length.

Sections of the Proposed Scheme where signal-controlled priority at multiple traffic signal junctions are proposed are described further in Section 4.5.

4.6.4.3 Bus Gates

A Bus Gate is a sign-posted short length of stand-alone bus lane. This short length of road is restricted exclusively to buses, taxis, cyclists and emergency vehicles. It facilitates bus priority by removing general through traffic along the overall road where the Bus Gate is located. General traffic is directed by signage to divert towards other roads before it arrives at the Bus Gate.

The hours of operation of the Bus Gates will be subject to on-going review based on prevailing traffic conditions and the goal of achieving the project objectives. The NTA and local authorities will co-operate in good faith to address any issues with the hours of operation that may arise during the lifetime of the Proposed Scheme.

Bus Gates are proposed along the Proposed Scheme at the following locations:

- Belgard Square West between Belgard Square South and Old Blessington Road (inbound and outbound);
- Belgard Square West between Old Blessington Road and access to Broadfield Hall (inbound and outbound);
- Belgard Square East between Belgard Square North and access to ABB Belgard Road (inbound and outbound);
- Existing Bus Gate retained on Blessington Road at TUD access (inbound and outbound);
- Old Greenhills Road at junction with R819 Greenhills Road / Bancroft Park (inbound and outbound); and
- Clogher Road at junction with Sundrive Road (inbound and outbound).

4.6.4.4 Treatment at Pinch Points

In line with the Road User Hierarchy designated within DMURS, at pinch points, the width of the general traffic lane should be reduced first, then the width of the cycle track should be reduced before the width of the pedestrian footpath is reduced. The Proposed Scheme design reflects this approach, where practicable.

4.6.4.5 Bus Stops

To improve the efficiency of the bus service along the Proposed Scheme the position and number of bus stops has been evaluated as part of a bus stop review. The main principles considered as part of the bus stop review were as follows:

- Aim to achieve a bus stop spacing of 400m in suburban locations, and 250m in urban centres;
- Locate bus stop as close as possible to nearest junction/pedestrian crossing;
- Locate bus stop downstream of junction rather than upstream;
- Consider space requirements to provide bus stop including shelter, waiting area, cycle lane and footpath provision and information displays;
- Review existing and proposed boarding and alighting volumes to determine the usage of the bus stop; and
- Consider the potential for interchange with orbital bus services proposed as part of the New Dublin Area Bus Network.

The above principles were considered to determine whether a bus stop should remain where it is, be relocated or be removed. The following bus stop designs were considered for use on the Proposed Scheme:

- Island Bus Stop;
- Shared Landing Zone;
- Inline Bus Stop; and
- Lay-by Bus Stop.

4.6.4.5.1 Island Bus Stops

Where sufficient space allows, Island Bus Stops are the preferred bus stop option for the Proposed Scheme.

This option will reduce conflict between cyclists and stopping buses by deflecting cyclists behind the bus stop. To address the pedestrian and cyclist conflict, pedestrian priority crossings accompanied by on-call signals will be provided, with narrowing of the cycle track from 2.0m to 1.5m to prevent cyclists overtaking through the bus stop.

Examples of island bus stop are shown on Image 4.16 (One-way Cycle Track) and Image 4.17 (Two-way Cycle Track).

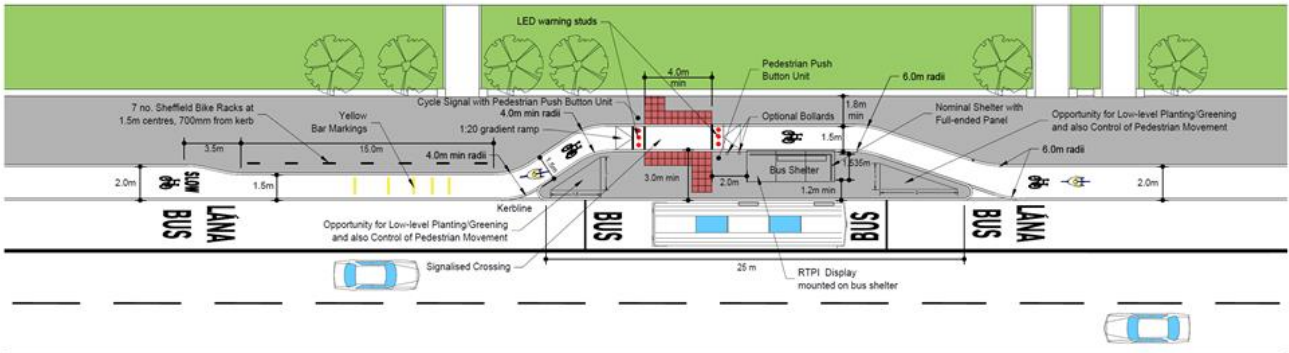


Image 4.16: Island Bus Stop – One-way Cycle Track

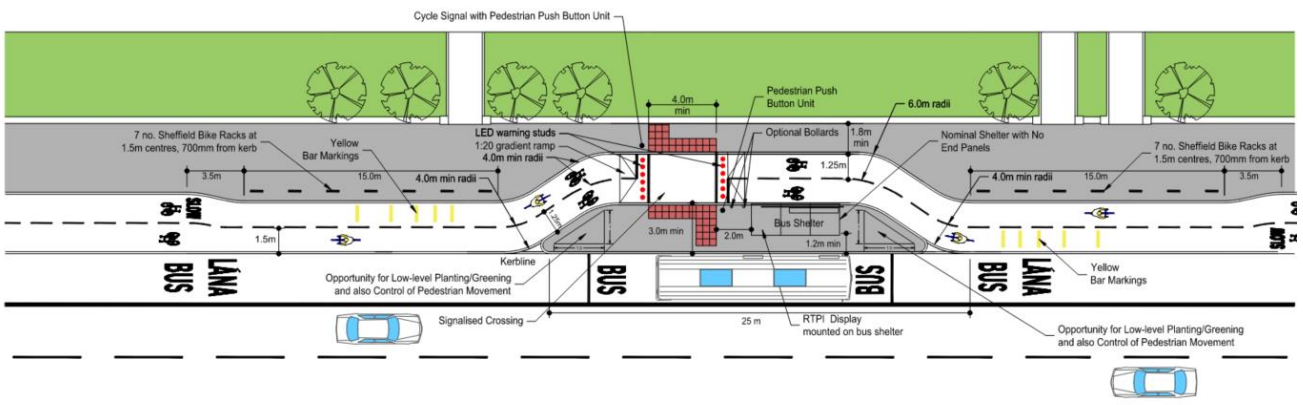


Image 4.17: Island Bus Stop – Two-way Cycle Track

4.6.4.5.2 Shared Landing Zone

Where space constraints do not allow for an island bus stop, an option consisting of a shared bus stop landing zone is proposed. It is designed to reduce conflict between cyclists and stopping buses by ramping cyclists up to footpath level where they continue through the stop. The cycle track will also be narrowed when level to the footpath and tactile paving provided to prevent pedestrian / cyclist conflict. An example of a shared landing zone bus stop is shown in Image 4.18.

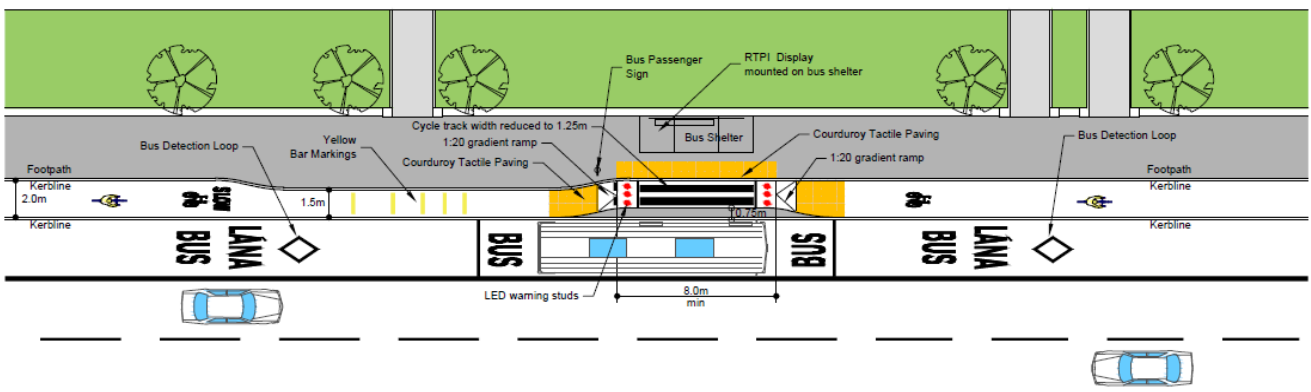


Image 4.18: Shared Landing Zone Bus Stop

4.6.4.5.3 Inline Bus Stop

Where there are no cycle tracks provided, inline bus stops are used, where the users departing the bus exit straight on the footpath. Inline bus stops are typically found in constrained sections of the Proposed Scheme.

4.6.4.5.4 Lay-by Bus Stop

Lay-by bus stops can provide an effective solution for coaches with long dwell times at bus stops, allowing other buses to pass the stopped bus. These are important on routes where the frequency of buses is high and where bunching can occur if inline bus stops are provided along the entire length of the Proposed Scheme.

An example of a Lay-by bus stop is shown in Image 4.19.

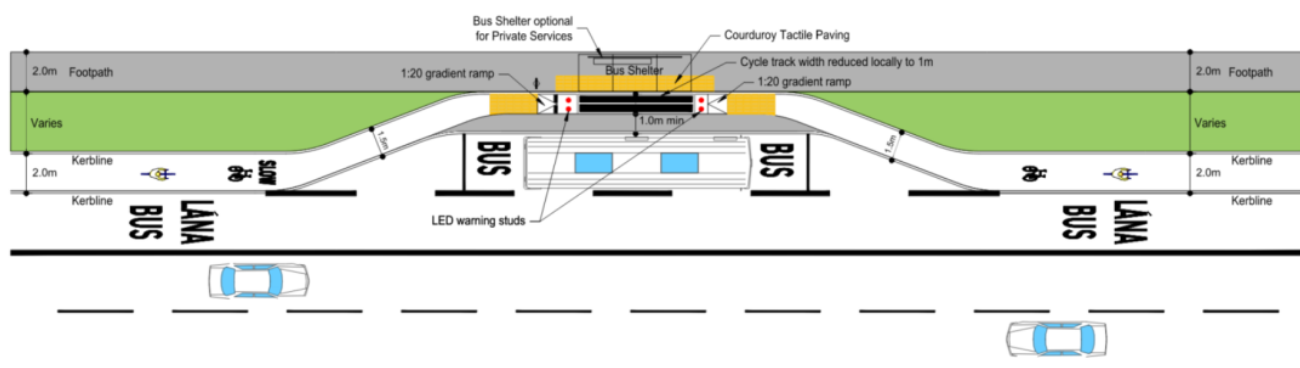


Image 4.19: Lay-by Bus Stop

4.6.4.6 Bus Stop Shelters

As a general policy, shelters will be provided at all bus stops on the Proposed Scheme. This will improve the comfort of passengers waiting for a bus during poor weather, as well as providing shade on sunny days. In some locations, such as those designated as Architectural Conservation Areas, it may however not be appropriate to provide a bus shelter in front of a building of heritage value to minimise visual impact. Such deviations from the standard arrangement are noted in Section 4.5.

4.6.5 Accessibility for Mobility Impaired Users

The aim of the Proposed Scheme is to provide enhanced walking, cycling and bus infrastructure. In achieving this aim, the Proposed Scheme has been developed using the PDGB and in accordance with the principles of DMURS and Building for Everyone: A Universal Design Approach (NDA 2020).

The following non-exhaustive list of relevant standards and guidelines have informed the approach to Universal Design in developing the Proposed Scheme:

- Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors (NTA 2020);
- Building for Everyone: A Universal Design Approach (NDA 2020);
- UK DfT Guidance on the use of tactile paving surfaces (UK DfT 2007); and
- BS8300:2009 +A1:2010 Design of buildings and their approaches to meet the needs of disabled people – Code of practice (BSI 2012).

The Disability Act 2005 (as amended) places a statutory obligation on public service providers to consider the needs of disabled people. An Accessibility Audit of the existing environment and proposed draft preliminary design for the corridor was undertaken. The Accessibility Audit provided a description of the key accessibility features and potential barriers to mobility impaired people based on the Universal Design standards of good practice. The Accessibility Audit was undertaken in the early design stages with the view to implementing any key measures identified as part of the design development process.

In achieving the enhanced pedestrian facilities there has been a concerted effort made to provide clear segregation of modes at key interaction points along the Proposed Scheme which was highlighted as a potential mobility constraint in the Accessibility Audit. In addressing one of the key aspects to segregation, the use of the 60mm set down kerb between the footway and the cycle track is of particular importance for guide dogs, whereby the use of white line segregation is not as effective for establishing a clear understanding of the change of pavement use and potential for cyclist/pedestrian interactions.

One of the other key areas that was focused on was the interaction between pedestrians, cyclists and buses at bus stops. The Proposed Scheme has implemented the use of island bus stops, including signal call button for crossing of cycle tracks, to manage the interaction between the various modes with the view to providing a balanced safe solution for all modes.

4.6.6 Integration

4.6.6.1 Integration with Existing and Proposed Public Transport Network

One of the objectives of the Proposed Scheme is to enhance interchange between the various modes of public transport operating in the city and wider metropolitan area. The Proposed Scheme facilitates improved existing and new interchange opportunities with other transport services including:

- GDA Cycle Network (Primary, Secondary and Feeder routes);
- Proposal for Bus Interchange facility at Tallaght (The Square Shopping Centre);
- The Luas Red Line at Kylemore station;
- The Luas Red Line Tallaght Park and Ride;
- Existing bus services at numerous locations along the route, for example: along Naas Road where the corridor shares bus stops with Bus Eireann routes to the south of the County, along Drimnagh Road where the corridor links to Tallaght via the 27 and 77a routes, orbital routes such as the 18 (Palmerstown to Sandymount) or other radial route such as the 13 (Harristown to Grangecastle);
- Future orbital bus routes: S4, UCD to Liffey Valley, the G1 branch line towards Ballyfermot and the F and G spine which this D Spine (east of Drimnagh Road) interfaces with as it approaches the City Centre;
- Existing bus services currently accessible from the Tallaght to City Centre route, including the following: 27, 77a, 76, 54a, 75, 56a from Tallaght. From Walkinstown Road, the following routes are also accessible: 123, 18 and 151;
- Future routes including the D spine from Citywest to the City Centre, the A and F spines, and future orbital bus routes S2, S4 and W2;
- The Kimmage to City Centre Core Bus Corridor Scheme at New Street South; and
- The Liffey Valley to City Centre Core Bus Corridor Scheme at High Street, The Liberties.

4.6.6.2 Integration with Other Road Users

Local access will generally be maintained along the Proposed Scheme corridor although there will be impacts on vehicle capacity along the route due to the reallocation of road space to bus priority and cycle tracks and the introduction of turning movement restrictions. The provision of bus priority and segregated cycling facilities will result in more efficient movement of increased numbers of people overall along the route, without removing the option for general traffic to use the majority of the corridor. It is recognised that there is dependence by some on cars or business vehicles. Through the provision of bus priority and improved cycling and pedestrian facilities all road users get better equitable choices and associated more efficient use of the road space for people movement. The improvement provided to more reliable sustainable travel options is being balanced against the general traffic flow impacts.

4.6.6.3 Integration with the Kimmage to City Centre Core Bus Corridor Scheme

The Kimmage to City Centre Core Bus Corridor Scheme proceeds along New Street South and interacts with the proposed implementation of traffic management measures for the Tallaght / Clondalkin to City Centre Core Bus Corridor scheme at the Kevin Street Upper junction.

Works proposed to the junction include the introduction of kerblines realignment, cyclist protection islands build-outs, footway paving, pedestrian crossings, cycle tracks and landscaping at Kevin Street Upper / New Street South / Patrick Street junction.

The design teams of both schemes have coordinated the respective scheme designs to provide flexibility in the proposals such that construction sequencing and physical works can be coordinated or delivered in sequence should both schemes be implemented.

The traffic management measures to be implemented by the Proposed Scheme are located at Kevin Street Upper / New Street South / Dean Street / Patrick Street junction as shown on General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0033 in Volume 3 of this EIAR. Once in place, both Core Bus Corridor Schemes will provide increased capacity, faster journey times and improved reliability for buses which should lead to considerable mode shift from car transport to public transport, which will reduce traffic levels generally across the road network in and around both corridors.

4.6.6.4 Integration with the Liffey Valley to City Centre Core Bus Corridor Scheme

The Liffey Valley to City Centre Core Bus Corridor Scheme proceeds along Cornmarket and High Street and interacts with proposed implementation of traffic management measures for the Tallaght / Clondalkin to City Centre Core Bus Corridor scheme at the Nicholas Street / Christchurch Place junction.

Works proposed to the junction include the introduction of kerblines realignment, cyclist protection islands build-outs, footway paving, pedestrian crossings, cycle tracks and landscaping at High Street / Nicholas Street / Christchurch Place / Winetavern Street junction.

The design teams of both schemes have coordinated the respective scheme designs to provide flexibility in the proposals such that construction sequencing and physical works can be coordinated or delivered in sequence should both schemes be implemented.

The traffic management measures to be implemented by the Proposed Scheme are located at High Street / Nicholas Street / Christchurch Place / Winetavern Street junction as shown on General Arrangement drawing BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-0034 in Volume 3 of this EIAR. Once in place, both Core Bus Corridor Schemes will provide increased capacity, faster journey times and improved reliability for buses which should lead to considerable mode shift from car transport to public transport, which will reduce traffic levels generally across the road network in and around both corridors.

4.6.6.5 Integration with Other Infrastructure Projects

The Proposed Scheme will interface with the following under construction or proposed developments:

- The Tallaght Bus Interchange Mobility Hub Pocket Park scheme where SDCC intend to construct a public realm pocket park on the Old Blessington Road between the proposed Tallaght Bus Interchange and the Square Shopping Centre Car Park. To facilitate this, the Proposed Scheme will provide a design to interface with this Pocket Park to maintain pedestrian access across the Pocket Park and to maintain vehicular access to the Square Shopping Centre car park from the Old Blessington Road;
- The Dolphin's Barn Public Realm Improvement Plan is being developed by DCC as one of a number of initiatives underway to revitalize the Dolphins Barn area of the Greater Dublin Area. The aim of the project is to create an enhanced public realm providing a sense of identity and a coherent vision for the environmental and physical development of Dolphin's Barn Village with the following objectives:
 - The creation of a pedestrian friendly public realm;
 - A material strategy that binds the diverse finishes together;
 - Architectural proposals which look to strengthen the sense of edge to the broad street of Dolphins Barn; and
 - A spatial strategy which looks to unify the existing linear pocket park and Church Park and in so doing make both more accessible.

To facilitate this, the proposed public realm improvement plan layout has been considered in the Proposed Scheme.

- Winetavern Street Contra-Flow Bus Lane has recently been constructed by DCC providing an inbound contra-flow bus lane on Winetavern Street / St. Michael's Hill. This contra-flow bus lane allows buses to travel directly from the Quays to Clanbrassil Street, which will provide a new, fast connection for buses travelling to the south west of the city, as well as providing another routing alternative for bus services currently using the Dame Street corridor. This contra-flow bus lane layout has been included in the Proposed Scheme.

4.6.7 Junctions

The design and modelling of junctions has been an iterative process to optimise the number of people (rather than vehicles) that can pass through each junction, with priority given to pedestrian, cycle and bus movements. The design for each junction within the Proposed Scheme was developed to meet the underlying objectives of the Proposed Scheme.

Junctions have been designed to ensure a high level of comfort and priority for sustainable modes of travel e.g., walking, cycling and public transport, by prioritising the space and time allocated to these modes within the operation of a junction, and subsequently to accommodate the forecasted future year traffic volumes as safely and efficiently as possible within the remaining space and time. This has allowed the design to maximise the number of people moving through each junction and to prioritise these sustainable modes of travel.

Junction design on the Proposed Scheme falls into the following categories, namely:

- Major Junctions;
- Moderate Junctions;
- Minor Junctions; and
- Priority Junctions.

The categorisations are based on;

- Size;
- The extent of physical work required to establish them; or
- The degree of change compared to the existing layout.

The junction locations along the Proposed Scheme and the layouts that will be implemented at these locations are presented in Section 4.5.

4.6.8 Structures

Where the route interfaces with an existing structure, a visual inspection has been carried out to identify the current condition of the structure and any repair/maintenance works required. Where alterations to the existing carriageway lines, kerbs lines and verge widths are proposed to the superstructure of an existing structure an assessment has been carried out to ensure the structural capacity is capable of withstanding the revised arrangement.

A number of new structures are proposed along the length of the Proposed Scheme as listed in Table 4.45. This table includes minor retaining walls with a retention less than 1.5m.

Table 4.45: Proposed Structures

Section of Proposed Scheme	Structure Reference	Structure Type	Name / Location / Chainage	Obstacle
Bridges and Bridge Sized Culverts – see section 4.6.8.1.1				
Section 2: Ballymount to Crumlin	ST01	Two pedestrian / cycle bridges. Both bridges single span	Greenhills Road Pedestrian & Cycle Bridges over the M50.	M50 Motorway

Section of Proposed Scheme	Structure Reference	Structure Type	Name / Location / Chainage	Obstacle
		fully through warren trusses.		
Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction	ST02	Central span plus four arterial link span pedestrian and cycle bridge. All spans are single span fully through warren trusses.	Naas Road Pedestrian & Cycle Bridge	Naas Road, Luas Red Line.
Pedestrian Ramps – see section 4.6.8.1.2				
Section 1: Tallaght to Ballymount	n/a	Ramp structure including retaining walls.	R819 Greenhills Road at Kilnamanagh Tymon Primary Care Centre. Ch. A2500	Bus Stop at Kilnamanagh Tymon Primary Care Centre.
Section 2: Ballymount to Crumlin	n/a	Stairs and ramps including retaining walls.	New roundabout at Calmount Avenue extension / R819 Greenhills Road junction. Ch. C450	n/a
Section 2: Ballymount to Crumlin	n/a	Ramp structure including retaining walls.	Link between R819 Greenhills Road and Calmount Road extension. Ch. A5440	Outbound Bus Stop opposite Ballymount Court Business Centre.
Section 3: Crumlin to Grand Canal	n/a	Ramp structure including retaining walls.	R110 Long Mile Road to Slievebloom Park link. Ch. F4180	Proposed car parking and private access.
Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction	n/a	Stairs and ramps including retaining walls.	North Ramp, Naas Road Pedestrian & Cycle Bridge	Harris Group Buildings
Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction	n/a	Stairs and ramps including retaining walls.	West Ramp, Naas Road Pedestrian & Cycle Bridge	Woodies Naas Road Store
Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction	n/a	Stairs and ramps including retaining walls.	South Ramp, Naas Road Pedestrian & Cycle Bridge	DHL / Hireco Buildings
Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction	n/a	Stairs and ramps including retaining walls.	East Ramp, Naas Road Pedestrian & Cycle Bridge	Maxol Service Station
Principal Retaining Walls – see section 4.6.8.1.3				
Section 2: Ballymount to Crumlin	RW01	Reinforced earth retaining wall	Calmount Road north side. Ch. A5340 – A5570	Existing 1200mm Dia Watermain, adjacent buildings
Section 2: Ballymount to Crumlin	RW02	Reinforced earth retaining wall	Calmount Road south side. Ch. A5495 – A5645	Existing 1200mm Dia Watermain, adjacent buildings
Section 3: Crumlin to Grand Canal	RW03	Gravity retaining wall	R110 Long Mile Road to Slievebloom Park link. Ch. F4180	Proposed car parking and private access.
Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road	RW04	Gravity retaining wall	North Ramp, Naas Road Pedestrian & Cycle Bridge	Harris Group Buildings

Section of Proposed Scheme	Structure Reference	Structure Type	Name / Location / Chainage	Obstacle
(R810) / New Nangor Road (R134) junction				
Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction	RW05	Gravity retaining wall	West Ramp, Naas Road Pedestrian & Cycle Bridge	Woodies Naas Road Store
Sign Gantries – see section 4.6.8.1.4				
Section 6: Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction to Drimnagh	n/a	Sign Gantry	Sign Gantry Existing retained Ch. F2518	R810 Naas Road
Section 6: Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction to Drimnagh	n/a	Signal Gantry	Signal Gantry Existing retained Ch. F2260	R134 New Nangor Road / R810 Naas Road
Minor Retaining Walls – see section 4.6.8.2.1				
Section 1: Tallaght to Ballymount	n/a	Minor retaining wall	Tallaght Bus Interchange Ch. A80 to Ch. A160	Retaining car park
Section 1: Tallaght to Ballymount	n/a	Minor retaining wall	R819 Greenhills Road at Kilnamanagh Tymon Primary Care Centre. Ch. A2500	Retaining ramp and footway
Section 1: Tallaght to Ballymount	n/a	Minor retaining wall	R819 Greenhills Road at Harvey Norman Retail Centre. Ch. A2520	Retaining embankment and advertising sign
Section 1: Tallaght to Ballymount	n/a	Minor retaining wall	R819 Greenhills Road at Valeo Foods Group. Ch. A2620 to Ch A2710	Retaining embankment and tree roots
Section 2: Ballymount to Crumlin	n/a	Two minor retaining walls	Calmount Road, new access road to Ballymount Court Business Centre. Ch A5340	Retaining road and embankment
Section 2: Ballymount to Crumlin	n/a	Minor retaining wall	R819 Greenhills Road at Mulcahy Keane Industrial Estate. Ch. A5650 to Ch A5720	Retaining road / footway
Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction	n/a	Minor retaining wall	R134 New Nangor Road, Knockmitten Close. Ch. F1160 to Ch. F1330	Retaining embankment
Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction	n/a	Minor retaining wall	R134 New Nangor Road, Harris Group Buildings Ch. F1905 to Ch F1955	Retaining road / footway
Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction	n/a	Minor retaining wall	R134 New Nangor Road, Green area Ch. F1965 to Ch F2030	Retaining road / footway
Section 5: Woodford Walk (R113) / New Nangor Road (R134) to Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction	n/a	Minor retaining wall	South Ramp, Naas Road Pedestrian & Cycle Bridge, DHL / Hireco. Ch F2250	Retaining embankment and ramp structure
Section 6: Long Mile Road (R110) / Naas Road (R810) / New Nangor Road (R134) junction to Drimnagh	n/a	Minor retaining wall	South-west of Naas Road / Walkinstown Avenue junction. Ch. F2890 to Ch. F3015	Retaining embankment

4.6.8.1 Major Structures

4.6.8.1.1 Bridges and Bridge Sized Culverts

There is one existing bridge structure impacted by this Proposed Scheme. This road bridge requires reconfiguration of the carriageway cross-section above the bridge deck and the installation of two pedestrian / cycle bridges adjacent to the main bridge structure as a result of the proposed carriageway works.

To provide improved pedestrian and cyclist crossing facilities at the Naas Road / Long Mile Road / New Nangor Road junction a new pedestrian /cycle bridge will be provided over the R810 Naas Road linking the four corners of the junction.

4.6.8.1.1.1 Existing ST01 Greenhills Road Pedestrian and Cycle Bridges

The existing bridge (TII ref. SD-M50-013.00) spans the M50 carriageway between Junctions 10 and 11, is 14m wide, and provides a designated traffic lane, cycle lane and footway in each direction. The proposed carriageway reconfiguration and additional two new single span pedestrian / cycle bridges adjacent to the existing Greenhills Bridge are required as the existing bridge cross-section fails to provide the project requirements for a 2m wide pedestrian footway, 2m wide cycle lane, 3m wide bus lane and 3m wide traffic lane in each direction.

The existing bridge structure, revised bridge carriageway cross section will be as follows: 0.6m raised verge, 3m bus lane, 2.9m traffic lane, 2.9m traffic lane, 3m bus lane and 0.6m raised verge. Each of the new pedestrian / cycle bridges will be 4.65m wide providing a 2.65m segregated cycle track and 2m pedestrian footpath. A minimum internal vertical clearance of 2.7m will be provided along the length of the bridges. Both new bridges will be supported on two reinforced concrete full height abutments constructed in-situ within the embankments on either side of the M50 carriageway.

4.6.8.1.1.2 Proposed ST02 Naas Road Pedestrian and Cycle Bridge

The bridge will be a five-span fully through warren truss structure. The bridge is formed of a central span (55.5m) over the R810 Naas Road and Red Line Luas and four arterial spans (ranging from 42m to 46m) spanning the outer corners of the junction. Where required, a steel mesh will be fitted to the vertical and horizontal bracing to create a fully enclosed superstructure.

The north and south supports of the central span will consist of three steel piers in a triangular arrangement, diagonally braced for lateral stiffness and supported on in-situ concrete piled foundations. The arterial spans will be supported at these central supports and span to end supports formed from a pair of braced steel columns.

Painted steel access ramps and stairs will be supported off landing structures at the end supports of each arterial span. Approach steps shall also be provided to arterial structure; these steps shall be formed in painted structural steel.

4.6.8.1.2 Pedestrian Ramps

Widening of the existing R810 Greenhills Road at Kilnamanagh Tymon Primary Care Centre and the reconfiguration of the adjacent inbound bus stop requires the relocation of the existing pedestrian access ramp at this location.

A new roundabout and extension to Calmount Avenue will necessitate the construction of new ramp and steps on the northern side of the proposed roundabout between Calmount Avenue and R819 Greenhills Road. This structure is required to maintain pedestrian access here due to the steep gradient of Calmount Avenue on approach to the roundabout.

Where the existing R819 Greenhills Road is closed off east of Calmount Business Park to facilitate the proposed extension of Calmount Road, linking to R819 Greenhills Road, pedestrian access between R819 Greenhills Road cul-de-sac and Calmount Road extension and bus stops will be via a new pedestrian ramp.

On the R110 Long Mile Road, west of the junction with R819 Walkinstown Road, the proposed inbound cycle track necessitated the removal of the existing pedestrian ramps at the existing pedestrian crossing. Footway access from R110 Long Mile Road to Slievebloom Park Cul-de-Sac will be via a new pedestrian ramp.

4.6.8.1.3 Principal Retaining Walls

Principal retaining walls with a retained height greater than 1.5m height are classed as principal structures. There is a requirement for five principal retaining walls, ranging from 1.5m to 4.5m in height throughout the Proposed Scheme.

4.6.8.1.4 Sign Gantries

As detailed in Table 4.45, there is one existing sign gantry and one existing signal gantry which will not be impacted (modified / replaced) as a part of the Proposed Scheme.

4.6.8.2 Miscellaneous Structures

4.6.8.2.1 Minor Retaining Walls

There are 11 minor retaining walls included in the Proposed Scheme. Minor retaining walls are less than 1.5m retained height and range between 0.3m to 1.5m in height throughout the Proposed Scheme. In addition, at a number of residential properties, where boundary walls are being relocated, these walls are likely to incorporate retention of private gardens / frontages.

4.6.8.2.2 Bus Interchange – Canopies

The Bus Interchange at Tallaght will require four upper curved roof canopies of between 4.36m and 7.15m in height, with lower horizontal canopies linking the upper curved canopies. Integrated LED downlighting will be fully integrated into the roof structure. A structure with inclined painted steel circular columns reaching up to curved glulam beams will support the upper canopy roofs. Drainage off each roof will be directed through the columns to a below ground rainwater drainage system. In addition, each upper canopy will be a sedum green roof type.

4.6.8.2.3 Digipoles / Digipanel

As part of the Proposed Scheme, road widening is required at locations where digital advertising panels are currently placed. The following panels or poles will be appropriately relocated to the adjacent footpath as part of the works:

- R819 Greenhills Road opposite Airton Road junction;
- R110 Drimnagh Road near outbound bus stop at Kildare Road junction; and
- R110 Crumlin Road outbound opposite Crumlin Shopping Centre.

4.6.9 Other Street Infrastructure

There are a number of other elements of street infrastructure included as part of the design of the Proposed Scheme. These elements include signage, road markings and communications infrastructure. Signage and road markings will be provided along the extents of the Proposed Scheme to clearly communicate information, both regulatory and safety messages, to the road user. In addition, the existing communication equipment along the Proposed Scheme has been reviewed and proposals developed to upgrade where necessary.

4.6.9.1 Traffic Signs and Road Markings

4.6.9.1.1 Traffic Signage Strategy

A preliminary Traffic Signage design has been undertaken to identify the requirements of the Proposed Scheme, whilst allowing for further design optimisation at the detailed design phase. A combination of Information, Regulatory, and Warning signs, have been assessed taking consideration of key destinations / centres;

intersections / decision points; built and natural environment; other modes of traffic; visibility of signs and viewing angles; space available for signs; existing street furniture infrastructure; and existing signs. In line with DMURS, the signage proposals have been '*kept to the minimum requirements of the [Traffic Signs Manual] TSM (DoT 2019), particularly where place values are very high*'.

On review of the existing traffic signage, it is determined that the main changes to regulatory signage will be the proposed introduction of turning bans from or to the Proposed Scheme as indicated within the Traffic Signs and Road Marking drawing series (BCIDA-ACM-TSM_GA-0809_XX_00-DR-CR-9001) in Volume 3 of this EIAR.

Additional directional signs are proposed at Walkinstown Roundabout, directing city bound cyclists to the offline cycle route on Bunting Road.

In addition to the signs identified above, the existing signs within the Proposed Scheme are being revised to accommodate the change in road cross-section, communicating the following:

- Information Signs to include geographical information signs, signs indicating facilities, road layout signs, traffic calming signs and cycle network signs;
- Regulatory signage – e.g., parking regulation signs, bus lanes, pedestrian and cycle facilities; and
- Warning signs – e.g., Stop and Yield Ahead.

As stated in TSM Chapter 1, in urban areas the obstruction caused by posts located in narrow pedestrian footpaths should be minimised. Therefore, where practicable, signs are to be placed on single poles, or larger signs will be cantilevered from a post at the back of the footpath using H-frames where necessary. Passively safe posts will be introduced where possible to eliminate the need for vehicle restraint systems.

4.6.9.1.2 Gantry Signage

No new gantry signage is included in the Proposed Scheme.

4.6.9.1.3 Road Markings

A preliminary design of road markings has been undertaken in accordance with TSM Chapter 7 (DoT 2019). This exercise also included the preliminary road marking design of the following items:

- Bus lanes;
- Cycle tracks: the pavement will be marked according to best practice guidelines such as DMURS (Government of Ireland 2013) and the NCM (NTA 2011) with particular attention given to junctions. Advance Stacking Locations (ASLs) have been designed where possible to provide a safer passage for cyclists at signal-controlled junction for straight ahead or right turn movements; and
- Pedestrian crossings have been incorporated throughout the design to connect the network of proposed and existing footpaths. Wider pedestrian crossings have been provided in locations expected to accommodate a relatively high number of pedestrians.

4.6.10 Pavement

Pavement assets along the Proposed Scheme comprise bus-lanes, general traffic lanes, cycle lanes and specific trafficked areas (e.g., off-line bus stops, bus terminals, off-line parking and loading bays).

For the purpose of design, the pavement assets are categorised into two networks. The primary network refers to the bus corridor under consideration, while the secondary network refers to the roads impacted by the re-routing of existing traffic from the Proposed Scheme to the nearby road network.

As part of the Proposed Scheme, varying pavement works will be undertaken. These works will comprise of the following:

- Widening and narrowing of the existing carriageways;
- Carriageway realignment;
- Rehabilitation and strengthening of the existing carriageways;

- Other specific trafficked areas (e.g., bus lay-bys, off-line parking and loading bays);
- New pedestrianised areas including footways; and
- New cycle facilities.

New pavements are designed and constructed in accordance with TII's publications, international standards and relevant Local Authority standards.

4.6.10.1 Design Requirements

The Proposed Scheme pavement design will include new pavement, pavement strengthening, or rehabilitation works where the existing pavement will be disturbed by construction works, as indicated in the Pavement Treatment Plans (BCIDA-ACM-PAV_PV-0809_XX_00-DR-CR-9001) included in Volume 3 of this EIAR. Special attention to addressing problems associated with wheel-track rutting and ensuring that ponding will not arise at bus-stops and pedestrian / cycle crossings will be a key focus.

The prevailing principle being followed by the Proposed Scheme pavement design is the provision of a high-quality pavement construction. Therefore, the Proposed Scheme pavement must provide sufficient durability, longevity, and strength, to be able to withstand repetitive wheel track loading on a frequent basis. The pavement design strategy includes for minimising ongoing maintenance requirements along the route to minimise impact on continuity of bus service operations.

The Proposed Scheme design for Kerbs, Footways and Paved Areas (KFPA) will include new improved pedestrian and cycle facilities including landscaped areas.

4.6.10.2 Design Standards

The preliminary design of pavement assets is based on the following standards:

- Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors (NTA 2021);
- TII AM-PAV-06050 Pavement Assessment, Repair and Renewal Principles (TII 2020a);
- TII AM-PAV-06045, Management of Skid Resistance (TII 2020b);
- Irish Pavement Asset Group (IPAG). Pavement Asset Management Guidance. (IPAG 2014);
- DN PAV-03021 Pavement & Foundation Design. Volume 7 Section 2 Part 2A. (TII 2010a);
- Construction Standards for Roads and Street Works in Dublin City Council (CSRSW);
- Urban Flexible Roads Manual – Pavement Surface Condition Index (DTTAS 2013a);
- Urban Concrete Roads Manual – Pavement Surface Condition Index (DTTAS 2013b);
- TII PE-SMG-02002 Traffic Assessment (HD 24/06) (TII 2010b);
- TRL Report 615. Development of a more versatile approach to flexible and flexible composite pavement design (TRL 2004);
- TRL Report LR1132, The structural design of bituminous roads (TRL 1984);
- TII road pavement standards details;
- DN-PAV-03026 (Jan. 2005) – Footway Design;
- TII footway standard details; and
- TII Specification for Roadworks Series 600, 700, 800, 900, 1000, 1100.

The preliminary design of KFPA assets is based on the following standards:

- DN-PAV-03021 (Dec. 2010) – Pavement and Foundation Design;
- DN-PAV-03026 (Jan. 2005) – Footway Design;
- Construction Standards for Road and Street Works in Dublin City Council (May 2016) – Revision 1;
- PE-SMG-02002 (Dec. 2010) – Traffic Assessment;
- CC-SPW-00600 (Mar. 2013) – Specification for Road Works Series 600 – Earthworks;
- CC-SPW-00700 (Jan. 2016) – Specification for Road Works Series 700 – Road Pavements – General;
- CC-SPW-00800 (Mar. 2013) – Specification for Road Works Series 800 – Road Pavements – Unbound and Cement Bound Mixtures;
- CC-SPW-00900 (Sep. 2017) – Specification for Road Works Series 900 – Road Pavements – Bituminous Materials;

- CC-SPW-01000 (Mar. 2013) – Specification for Road Works Series 1000 – Road Pavements – Concrete Materials;
- CC-SPW-01100 (Feb. 2012) – Specification for Road Works Series 1100 – Kerbs, Footways and Paved Areas; and
- BS 7533 series of standards (1999 – 2021) – Pavement Constructed with Clay, Natural Stone or Concrete Pavers.

4.6.10.3 New Pavement and Bus Interchange Strategy

A new section of carriageway alignment is proposed for the new bus lane route at Parkview between Mayberry Road junction on R819 Greenhills Road and the Greenhills Road M50 overbridge. The standard DCC flexible pavement design specification for Bus Corridors will be adopted to provide a robust pavement type for this new section of the route.

A bus interchange is proposed on Belgard Square West at The Square, Tallaght. This location will be trafficked by a large volume of buses. Slow moving, stationary, vibrating and manoeuvring buses are extremely damaging to both the pavement surface and the pavement structure. It is proposed for the pavement to be rigid (concrete) at this location. Rigid pavements do not rut, are highly resistant to scuffing and oil dropping, requiring limited maintenance.

4.6.10.4 Pavement Rehabilitation Strategy

At Specimen Design stage, different pavement strategies will be developed for:

- Areas to be widened or fully reconstructed; and
- Areas to be rehabilitated (do minimum, intermediary strategies, fully reconstruct).

Additional testing requirements in line with AM-PAV-06050 will be specified for the successful Contractor to complete the Detailed Pavement Design.

The risk of tar contaminated material presence in the existing pavement is expected to be mitigated at Specimen Design stage with the delivery of the ground-penetrating radar (GPR) survey through the testing of the calibrating cores for tar.

In order to estimate the waste quantities and the carbon emissions from the Proposed Scheme pavement works, the following assumptions were made:

- Where full depth reconstruction is anticipated (e.g., widening, traffic island relocation), a conservative fully flexible pavement design is assumed: 350mm of bituminous mixtures on top of 150mm of subbase material and 400mm of capping material; and
- Where the existing pavement is anticipated to only require rehabilitation, the assumed materials and associated depths depend on the PSCI for the pavement design:
 - Fully flexible carriageway;
 - PSCI \geq 7: no works;
 - PSCI = 5 or 6: 50mm bituminous inlay;
 - PSCI = 3 or 4: 200mm bituminous inlay;
 - PSCI = 1 or 2: 350mm bituminous inlay + 150mm subbase inlay + 400mm capping inlay;
 - Rigid carriageway;
 - PSCI \geq 5: no works; and
 - PSCI \leq 4: 200mm concrete inlay.

The appropriate pavement structures for footways and cycle tracks will be defined at Specimen Design stage.

4.6.10.5 Parking and Loading

As part of the design of the Proposed Scheme, an assessment has been carried out into the impact on existing parking and loading.

The number and type of parking spaces and loading were counted along the Proposed Scheme, and the proposed losses of these spaces has been quantified. Mitigation measures have been identified to reduce the impact of the Proposed Scheme in so far as is reasonably practicable, such as reducing reliance on private cars due to availability of an improved bus network with journey reliability, and by availability of improved cycling infrastructure. Improved compliance with parking and loading bay regulations, and management of loading activities will also assist in offsetting the reduction in on-street parking spaces.

Reference should be made to Chapter 6 (Traffic & Transport) for further information on the impacts on parking as a result of the Proposed Scheme.

4.6.11 Landscape and Urban Realm

Urban realm refers to the everyday street spaces that are used by people to shop, socialise, play, and use for activities such as walking, exercise or to commute to / from work. The urban realm encompasses all streets, public spaces, junctions and other rights-of-way, whether in residential, commercial or civic use. Well-designed urban realm contributes to the identity of localities and enhances the everyday lives of local communities and those passing through. It typically relates to the space between buildings to which the public has free access and may include seating, trees, planting and other features that enhance the experience for all.

Successful urban realms or public open space tend to have certain characteristics. These include:

- they have a distinct identity;
- they are safe and pleasant;
- they are easy to move through; and
- they are welcoming.

4.6.11.1 Landscape and Character Analysis

The landscape and urban realm proposals are derived from analysis of the existing urban realm, including existing street and public space character, heritage features, boundaries, tree planting and vegetation, and the range of contemporary and heritage materials in use that inform the quality and character of different parts of the overall route.

The analysis identified the range of character areas along different parts of the route informed by adjacent land uses fronting onto the route; the character and heritage of buildings including any protected structures and private gardens or grounds; the nature and presentation of any boundary walls, railings or hedgerows; existing street trees or vegetation and the nature and quality of streetscape materials. This analysis provided an understanding of the existing character areas along the route and facilitated detailed and iterative consideration as to the integration of the Proposed Scheme.

This analysis informed design changes to the initial proposals so as to avoid adverse impacts of existing streetscape character, and also identified opportunities for enhancement and creation of new spaces along the route. Character analysis also informed the development of mitigation proposals where public or private property would be directly impacted by the Proposed Scheme.

4.6.11.2 Hardscape

4.6.11.2.1 Typical Material Typologies

Throughout the design process, a palette of materials has been developed to create a consistent yet locally relevant design response appropriate to different locations along the route. The proposed materials are based on the existing materials and treatments along various parts of the route to match existing material treatments, while

also identifying areas of opportunity for enhancement through the use of higher quality materials. Material palettes are described by reference to different typologies appropriate to different sections of the route.

The Landscaping General Arrangement drawings (BCIDA-ACM-ENV_LA-0809_XX_00-DR-LL-9001) in Volume 3 of this EIAR illustrate these elements.

The material typologies employed in the preliminary design are:

- **Poured in situ concrete footpath** - Used extensively on existing footpaths. Concrete pavements can be laid with or without a kerb, can have neatly trowelled edges and textured surface for a clean, durable, slip resistant surface;
- **Asphalt footpath** - Used locally on existing footpaths and will tie in with other sections of public realm. Laid with a road kerb, asphalt footpaths can have a smooth finish or textured aggregate surface and provide a strong flexible slip resistant surface;
- **Precast concrete unit paving** - Concrete paving slabs and bricks available in a wide variety of sizes, colours and finishes to provide an enhanced public realm. Precast concrete unit paving can be used with matching concrete kerbs or with salvaged natural stone kerbs as appropriate;
- **Natural stone paving** - Employed for high quality urban realm areas, mostly in City Centre locations. This typology represents new or re-used natural stone paving and kerbs and is used to create enhanced public spaces for major urban realm interventions;
- **Stone or Concrete setts** - Proposed for distinguishing features such as pedestrian crossing points, raised tables and parking / set-down areas;
- **Self-binding gravel** - Proposed for pedestrian pathways that are off-road and leading through informal landscaped areas; and
- **No change** - At some locations, the Proposed Scheme does not necessitate any alteration to the alignment of the existing footpath or roadway. These include established and more recently constructed sections of streetscape.

Other design responses include:

- The re-use of existing high-quality and natural stone kerbs to maintain streetscape character, reduce construction costs and maximise sustainability;
- Pedestrian crossings at side streets will be raised where possible and will be distinguished using stone or concrete setts as appropriate to the locality;
- In some locations, existing street trees have disturbed or broken footpath surfaces. The footpath around such trees will be replaced where appropriate with self-binding gravel to improve the vitality of the trees and ensure accessible pedestrian facilities;
- Informal footpaths through landscaped areas that are set back from the main carriageway will be formed using self-binding gravel as an alternative to asphalt or concrete;
- Where private or commercial property boundaries are realigned, boundary walls and railings will be reinstated to match the existing and may be extended to other properties along the same street to enhance streetscape character;
- Existing street furniture such as seating will be relocated within the revised streetscape and new street furniture will be provided at locations where opportunity sites have been identified to establish or enhance public spaces; and
- SuDS will be incorporated within hardscape areas to locally manage surface water run-off and reduce demand for piped surface water drainage infrastructure.

4.6.11.3 Softscape

4.6.11.3.1 Planting Strategy

The planting strategy has been developed in response to the objectives set out in both the South Dublin County Development Plan 2022 – 2028 (SDCC 2021) and the Dublin City Development Plan 2022 – 2028 (DCC 2021). The planting strategy is also in response to landscape and urban realm opportunities arising from the Proposed Scheme to integrate new infrastructure within the existing local context and to enhance the visual and amenity value of streets and spaces.

The planting strategy includes replacement of street trees and groups of trees that may be impacted by the Proposed Scheme, but also the introduction of new tree planting and street trees within other spaces and along streets. Reinforcement of green infrastructure along the route will improve the overall amenity, character and appeal of the route corridor and localities along it, as well as enhancing biodiversity.

In addition to trees and street trees, other vegetation is also proposed along the route including hedgerows, ornamental planting and amenity grassland, shrub and meadow grass areas. These will be utilised to reinstate property boundaries altered by the Proposed Scheme.

The design process has sought to adopt SuDS to manage storm water run-off. SuDS features have been considered along the route and incorporated within suitable landscape areas in the form of rain gardens, bioretention areas, filter drains, swales, tree pits and permeable paving.

4.6.11.4 Arboricultural Survey

An Arboricultural Impact Assessment (AIA) Report (Appendix A17.1 in Volume 4 of this EIAR), identifies the likely direct and indirect impacts to trees of the Proposed Scheme along with suitable mitigation measures, as appropriate to allow for the successful retention of significant trees, or to compensate for trees to be removed.

4.6.11.5 Typical Planting Typologies

Several typologies were developed. These are discussed further below.

4.6.11.5.1 New Street Trees

As noted on the Landscaping General Arrangement (BCIDA-ACM-ENV_LA-0809_XX_00-DR-LL-9001) in Volume 3 of this EIAR, a range of urban street tree species (Image 4.20) have been incorporated into the design. The type of tree depends on the location and whether trees are to be planted in grass verges or in tree pits within paved urban environments as appropriate, and also to ensure diversity of species and provide habitats for urban wildlife. Typically, trees will be semi-mature and where appropriate, selected for having a clear stem height to facilitate visual permeability.

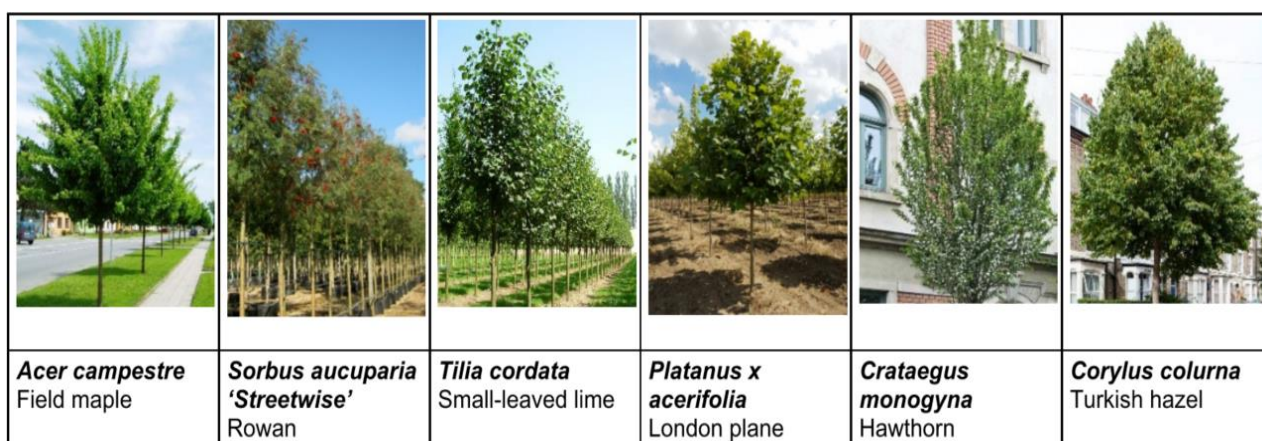


Image 4.20: Street tree species

4.6.11.5.2 New Woodland Areas and Tree Groups

The Proposed Scheme includes a range of existing mature and immature woodlands areas. Some of these will be impacted where the existing carriageway will be widened or cycling infrastructure will be provided. It is proposed to reinstate construction working areas and also to replant the edges of impacted woodland areas, so as to reinstate the streetscape or roadway character. Additionally, there are areas of land within the corridor that are presently in grass or scrub, and new woodlands areas will be established in these locations to offset the loss of woodlands elsewhere and to provide more consistent presentation along carriageway edges.

Woodland tree planting will typically comprise bare-root native tree species including *Alnus glutinosa* (Black Alder), *Salix aurita*, *Salix cinerea oleifolia*, *Salix caprea*, *Salix petrandra* (Willow sp.), *Betula pendula* (Silver Birch), *Pinus sylvestris* (Scots Pine), *Crataegus monogyna* (Hawthorn), *Quercus petraea* (Sessile Oak), *Prunus spinosa* (Blackthorn) and *Viburnum opulus* (Guelder Rose).

Elsewhere along the Proposed Scheme, there are smaller areas of existing and proposed woodlands and tree groups that will be retained, reinstated or established in order to provide appropriate landscaping connectivity and design interventions at a range of different spaces, including carriageway boundaries, new landscape spaces arising from junction reconfiguration, reinforcement of established vegetation areas, and also establishing new public realm and landscape opportunity areas. Tree species will be determined by location and will comprise either native woodland trees as set out above, or selected street trees. Additionally, understory planting, long grass and swathes of bulbs will be provided to reinforce the character of landscaped areas along the scheme corridor.

A number of different landscaped central median areas exist along the Proposed Scheme, including those within high-capacity dual carriageway and smaller scale medians within suburban and urban settings. Landscaping proposals respond to the different localities and may include grass planting, hedgerows and trees as appropriate in medians within the larger scale roadways, and grasses, ornamental planting, hedgerows and trees within the suburban and urban medians.

4.6.11.5.3 Boundary Planting

The Proposed Scheme is bounded by a wide range of established private, institutional, commercial and public land boundaries. While the design development has sought to avoid impacts on such boundaries, the Proposed Scheme will nonetheless require both temporary and permanent access to lands beyond the carriageway boundary.

Impacted property boundaries will be reinstated following construction. In some instances, boundaries will be re-built along their original alignments. In other cases, boundaries will be re-built on a new setback alignment. In general, property boundaries will be reinstated on a 'like for like' basis, including any walls, piers, fences, railings, gates, driveway finishes and private landscaping. Private grounds that are utilised in part for construction access will be reinstated following completion of the works to match the existing landscaping of the property. Where private grounds are reduced by permanent land take required for the Proposed Scheme, the remaining grounds will be reinstated to match the landscape and character of the existing grounds in consultation with the property owner.

4.6.12 Lighting

A review of the existing lighting provision along the extent of the route has been carried out to understand the impact of the Proposed Scheme on lighting columns and associated infrastructure. Where existing columns conflict with the Proposed Scheme, they will be relocated. In some areas which are currently artificially lit, new lighting columns will be provided as part of the Proposed Scheme. All relocated and new lighting columns are identified as proposed lighting columns as shown on the Street Lighting drawings (BCIDA-ACM-LHT_RL-0809_XX_00-DR-EO-9001) in Volume 3 of this EIAR.

Light Emitting Diode (LED) lanterns will be the light source for all lighting columns provided.

The lighting design involves works on functional, heritage and contemporary lighting installations, on a broad spectrum of lighting infrastructure along the Proposed Scheme. This will include, but not exclusively, luminaires supplied by underground and overhead cable installations and those located on ESB Infrastructure.

In locations where road widening and / or additional space in the road margin is required, it is proposed that the public lighting columns be replaced and relocated to the rear of the footpath, and the existing lighting columns removed once the new facility is operational.

Where significant alterations are proposed to the existing carriageways, the preliminary street lighting design ensures that the current standard of public lighting is maintained or improved.

For existing columns that have specific aesthetic requirements, the intent for the replacement of such columns will include:

- Replacing the existing heritage columns and brackets with identical replica columns and brackets;
- Replacing existing luminaires with approved LED heritage luminaires; and
- Ensuring the electrical installation is compliant with the latest version of the *National Rules for Electrical Installations, I.S. 10101*.

4.6.12.1 New Lighting

All lighting columns will be designed and installed in accordance with the specific lighting and electrical items set out the following National Standards and guides, including but not limited to:

- Local Authority Guidance Specifications;
- EN 13201: 2014 Road Lighting (all sections);
- ET211:2003 'Code of Practice for Public Lighting Installations in Residential Areas';
- BS 5489-1 'Code of practice for the design of road lighting';
- Volume 1 - NRA Specification for Road Works, Series 1300 & 1400;
- Volume 4 - NRA Road Construction Details, Series 1300 & 1400;
- IS EN 40 – Lighting Columns; and
- Institution of Lighting Professionals "GN01 Guidance Notes for Reduction of Obtrusive Light".

All lighting columns will aim to minimise the effects of obtrusive light at night and reduce visual impact during daylight. Lighting schemes will comply with the 'Guidance notes for the Reduction of Light Pollution' issued by the Institution of Lighting Professionals (ILP).

4.6.12.2 Lighting at Bus Stops

The design will include for the provision of lighting in covered areas, open areas and passenger waiting areas.

The location of the lighting column will be dictated by light spread of fittings to give the necessary level of illumination (the columns at bus stops provide clearance for buses).

4.6.13 Utilities

There are a number of measures proposed to protect existing utilities during the Construction Phase of the Proposed Scheme. These are specifically outlined in Chapter 5 (Construction) and Chapter 19 (Material Assets). Where there are clashes between the existing utility infrastructure, measures are proposed to either protect the infrastructure in place or divert the utility infrastructure as required.

The utility design strategy included the analysis of records provided by all utility providers associated with the Proposed Scheme corridor. The analysis included desktop reviews including review of topographic surveys together with site reconnaissance. In locations where critical assets were identified and the risk of interference was considered high, Ground Penetrating Radar surveys were undertaken to inform the design.

4.6.13.1 Utility Diversions

The construction of the Proposed Scheme will result in conflicts with several existing utility assets. Identified service conflicts and recommended diversions are described and assessed in Chapter 19 (Material Assets).

These conflicts have been identified, and preliminary consultation has been undertaken with the relevant service providers so that the conflict can be resolved by relocating or diverting the services, where necessary, and protecting in-situ where appropriate.

The principal statutory and other service providers affected are:

- ESB;
- Irish Water (Water & Public Sewer);
- GNI; and
- Telecommunication Services – Eir, Virgin Media, Enet & BT.

In addition to the above, it will be necessary to relocate and upgrade some of the existing public lighting and traffic signalling network and equipment along the extents of the scheme.

4.6.14 Drainage

4.6.14.1 Relevant Standards and Guidance

The design basis statement was developed whilst taking cognisance of the Greater Dublin Regional Code of Practice (GDRCoP), Greater Dublin Strategic Drainage Study (GDSDS), planning requirements of Local Authorities within the Dublin region, Transport Infrastructure Ireland (TII) requirements and international best practices such as CIRIA The SuDS Manual (C753) (CIRIA 2015). Agencies consulted included SDCC, DCC and Irish Water where applicable.

4.6.14.2 Existing Watercourses and Culverts

The location of existing watercourses and culverts has been identified from surveys. Table 4.46 shows where the Proposed Scheme crosses the existing watercourses and culverts.

Table 4.46: Existing Water Courses and Culverts

Watercourse	Chainage	Crossing Detail
Tymon River (Poddle River)	A2210	Culvert
Tributary of Robinhood Stream	A4480	Culvert
Tributary of Robinhood Stream	A4850	Culvert
Tributary of the River Camac	F0 - F50	Culvert
Tributary of the River Camac	F175	Culvert
River Camac	F950	Culvert
Walkinstown Stream	F2500	Box Culvert

4.6.14.3 Existing Drainage Description

Based on the information received from Irish Water / TII / SDCC / DCC, the Proposed Scheme is served by surface water and combined drainage networks. The surface water drainage system is managed by the Local Authorities, whilst combined sewer systems are managed by Irish Water. Flows are typically collected in standard gully grates and routed via a gravity network to outfall points. The design assumes that there are generally no SuDS / attenuation measures on the existing drainage networks to treat or attenuate runoff from the existing carriageway.

The existing drainage network along the Proposed Scheme can be split into 19 catchment areas based on topography and the existing pipe network supplied by Irish Water / TII / SDCC / DCC. The approximate catchment areas, existing sewer networks, outfalls and watercourses are shown on the existing catchment drawings within the Surface Water Drainage Design drawing series (BCIDA-ACM-DNG_RD-0809_XX_00-DR-CD-9001) in Volume 3 of this EIAR. The existing catchments are summarised below in Table 4.47.

Table 4.47: Summary of Existing Catchments

Existing Catchment Reference	Chainage	Approx. Drainage Catchment Area (km ²)	Existing Network Type	Existing Outfalls
9.12	A0 – A800	0.441	Surface Water (Storm)	Network outfalls to the Whitestown Stream
9.11	A800 – A2000	0.297	Surface Water (Storm)	Network outfalls to the Whitestown Stream
9.10	A2000 – A2210	0.260	Surface Water (Storm)	Network outfalls to the Poddle River
9.9	A2210 – A2550	0.241	Surface Water (Storm)	Network outfalls to the Poddle River
9.8	A2550 – A2770	0.589	Surface Water (Storm)	Network outfalls to the Poddle River
9.7	A2770 – A3630	0.759	Surface Water (Storm)	Unknown – assumed to be Poddle River
9.6	A3670 – A5335 & C75 – C914	1.10	Surface Water (Storm)	Network outfalls to Robinhood Stream – Cammock River - Liffey
9.5	A5335 – A7400 & D0 – D1060	3.02	Surface Water (Storm)	Network outfalls to the Poddle River
9.4	A7400 – A7800 & D1060 - D1346	0.253	Surface Water (Storm)	Network outfalls to the Poddle River
9.3	A8975 - A9275 & E0 - E2447	1.81	Surface Water (Storm) & Combined	Network outfalls to the Combined Sewer on Parnell Road
9.2	A7800 – A9275	1.48	Surface Water (Storm) & Combined	Network outfalls to the Combined Sewer on Dolphin Road
9.1	A9275 – A11438	2.39	Surface Water (Storm) & Combined	Network outfalls to the Combined Sewer on Dean Street
8.1	Not applicable for reporting as entirely upstream of proposal			
8.2	F0 – F615	0.867	Surface Water (Storm)	Network outfalls to the Cammock River - Liffey
8.3	F615 – F1500	0.636	Surface Water (Storm)	Network outfalls to the Cammock River - Liffey
8.4	F1500 – F1980	0.309	Surface Water (Storm)	Network outfalls to the Cammock River - Liffey
8.5	F1980 – F2750	0.643	Surface Water (Storm)	Network outfalls to the Cammock River - Liffey
8.6	F2750 – F3330	0.505	Surface Water (Storm)	Network outfalls to the Cammock River - Liffey
8.7	F2200 – F2350 (Long Mile Road)	0.134	Surface Water (Storm)	Network outfalls to the Cammock River - Liffey
9.5	F3330 – F4226	3.02	Surface Water (Storm)	Network outfalls to the Cammock River - Liffey

4.6.14.4 Proposed Drainage / Runoff

Whilst in some areas the Proposed Scheme will increase the impermeable areas, additional permeable areas are also provided by the softening of urban realm along the routes. The drainage design aims to sustain flow levels within the existing pipe network after a rainfall event by controlling the discharge rate within each catchment. Flows will be controlled by the implementation of SuDS techniques, where practicable. One of the principal objectives of the road drainage system is to minimise the impact of the runoff from the roadways on the surrounding environment via the position of: filter drains, swales, bio-retention areas, tree pits, silt traps and attenuation features if necessary.

Each catchment area has been broken down into sub-catchments to define the change in impermeable surface area as a result of the Proposed Scheme. Where there is a net increase in impermeable surface area, a form of attenuation will be required prior to discharge. Where there is no net change or net decrease, then no form of attenuation will be required prior to discharge.

A summary list of the sub-catchments, the associated chainage, and impermeable surface area differential is given in Table 4.48. The following table contains a column entitled “Net change” which takes account of the change of use from impermeable to permeable areas and vice versa.

Table 4.48: Summary of Increased Permeable and Impermeable Areas

Existing Catchment Reference	Chainage	Road Corridor Area (m ²)	Change of use to impermeable areas (m ²)	Change of use to permeable areas (m ²)	Net Change (m ²)	Percentage Change (%)
9.12	A0 – A800	8855	1668	570	1353	16.7%
9.11	A800 – A2000	24981	0	0	0	0%
9.10	A2000 – A2210	1736	0	0	0	0%
9.9	A2210 – A2550	5583	1654	154	1454	26%
9.8	A2550 – A2770	3672	1927	0	1427	38.9%
9.7	A2770 – A3630 & B0 – B520	9380	12296	2746	19847	211%
9.6	A3670 – A5535 & C75 – C914	47317	22020	2827	13555	28.6%
9.5	A5535 – A7400 & D0 – D1060	81327	1469	2292	-576	-0.7%
9.4	A7400 – A7800 & D1060 - D1346	16628	48	115	-47	-0.3%
9.3	A8975 - A9275 & E0 - E2447	63798	0	615	-431	-0.7%
9.2	A7800 – A9275	27632	435	403	22	-0.1%
9.1	A9275 – A11438	55364	55	277	155	0.28%
8.1	Not applicable for reporting as entirely upstream of proposal					
8.2	F0 – F615	13168	1344	390	668	5.1%
8.3	F615 – F1500	20979	4928	246	3277	15.6%
8.4	F1500 – F1980	11738	2189	107	1457	12.4%
8.5	F1980 – F2750	39188	5583	1864	3434	8.8%
8.6	F2750 – F3330	16743	2438	242	1537	9.2%
8.7	F2200 – F2350 (Long Mile Road)	2913	1189	0	833	28.6%
9.5	F3330 – F4226	24739	125	758	-443	-1.8%

4.6.14.5 Proposed Drainage System

The principal objectives of drainage design are as follows:

- All drainage structures for newly paved areas are designed with a minimum return period of no flooding in 1:30 years with a 20% climate change allowance.
- A SuDS drainage strategy has been developed for all newly paved areas in accordance with the SuDS hierarchy. SuDS are provided to ensure no increase on existing runoff rates from new paved areas will also provide a level of treatment before discharging into the existing network system; and
- Infiltration rates were assumed to be zero for calculating the required attenuation volumes for SuDS measures. This is a conservative approach and ensures SuDS measures are not knowingly undersized at this stage of the design. Where necessary, permeability tests will be completed so that infiltration rates can be considered in further design.

The following drainage types are proposed for the Proposed Scheme catchments where new paved areas are indicated on the Proposed Surface Water Drainage Works (BCIDA-ACM-DNG_RD-0809_XX_00-DR-CD-9001) in Volume 3 of this EIAR:

- Sealed Drainage (SD) comprised of gullies and sealed pipes will be located within the kerb line mostly between the cycle track and bus lane and / or the footpath and the cycle track depending on the highway profile;
- Grass Surface Water Channels, Swales and Bio Retention Areas/ Rain Gardens (SW / RG) are provided as road edge / footpath edge drainage collection systems. They will provide treatment and can provide attenuation if required;
- Filter Drains (FD) are provided as road edge channels and comprise of perforated pipes with granular surround which are designed to convey, attenuate, and treat runoff prior to discharge;
- Tree pits (TP) are provided near the road. These receive flows from the sealed pipe network and from footpaths are designed to convey, attenuate, and treat runoff prior to discharge;
- Attenuation Tanks / Oversized Pipes (AT / OSP) are provided where there is insufficient attenuation volume provided by the proposed SuDS drainage measures; and
- Green Roofs (GR) will be provided on the Bus Interchange roof canopy. These will discharge through columns to a below ground rainwater drainage system. The green roofs will provide a reduction in surface water runoff and also include visual benefit and ecological value

4.6.14.6 Runoff Attenuation & Sustainable Drainage Systems

SuDS measures and / or attenuation systems will be provided to ensure no increase in existing run off rates from newly paved areas and combined existing / newly paved catchment areas. The capacity of the proposed SuDS measures and / or attenuation systems was based on the incoming flows and existing discharge rates for each catchment.

A range of storm durations was tested for each catchment from 30-minutes to 24 hours to ensure that the proposed SuDS measures have sufficient capacity.

4.6.14.7 Pollution Control

One of the principal objectives of the road drainage system is to minimise the impact of the runoff from the roadways on the surrounding environment via the provision of SuDS. The proposed road drainage system is shown in the Proposed Surface Water Drainage Works drawings (BCIDA-ACM-DNG_RD-0809_XX_00-DR-CD-9001) in Volume 3 of this EIAR. The system incorporates a variety of pollution control measures which will provide interception and treatment as the types indicated below:

- Filter drains: Filter drains are shallow trenches filled with stone / gravel that create temporary subsurface storage for the attenuation, conveyance and filtration of surface water runoff. A perforated pipe is provided above the base of the filter drain to collect and convey water to the downstream drainage component. Filter drains can help reduce pollutant levels in runoff by filtering out sediments and biodegradation processes;
- Swales: Swales are shallow, flat bottomed, vegetated open channels designed to convey, treat and attenuate surface water runoff. They facilitate sedimentation and retention of pollutants, filtration through the root zone and soil matrix, evapotranspiration and infiltration into the underlying soil;
- Tree pits: Trees contribute to effective surface water management strategies. They also reduce annual building energy consumption by moderating the local climate, filter harmful pollutants from the air, and absorb and store atmospheric carbon dioxide (carbon sequestration). In the process of drawing water from the soil, trees also take up trace amounts of harmful chemicals, including metals, organic compounds, fuels and solvents that are present in the soil. Inside the tree, these chemicals can be transformed into less harmful substances, used as nutrients and /or stored in roots, stems and leaves; and
- Rain gardens and bio-retention systems: Bioretention systems, including rain gardens, are shallow landscaped depressions that can reduce runoff rates and volumes and treat pollution through the use of engineered soil and vegetation. They are particularly effective in delivering interception. Runoff is collected by the systems ponds temporarily on the surface and then filters through the vegetation and underlying soils.

4.6.15 Maintenance

All traffic signal, CCTV, and communications equipment are designed based on long-term maintenance requirements. All equipment will be accessible without significantly disrupting pedestrian, bicycle, or vehicle traffic.

Apparatus have been designed and located to allow for easy access and the safe maintenance of the Proposed Scheme into the future. This included provision, where practicable, of:

- Use of retention sockets, where applicable, for the erection of Traffic Signal, CCTV, Above Ground Detection, and other equipment mounting poles to allow for the ease of installation, maintenance and replacement;
- The use of lightweight equipment poles, where appropriate, such as cantilever signal poles. Products that allow for maintenance activities to be undertaken from ground level, where practicable, such as tilt down poles or poles with wind-down mechanisms;
- Placement of poles and retention sockets within 7m of chambers to provide ease of installation and replacement of cables;
- Location of chambers away from pedestrian desire lines, and areas of tactile paving;
- Chambers to be placed at 180m centres, where practicable, on longitudinal duct runs to allow for the ease of installation and replacement of cables;
- Safe areas for the access and parking of maintenance vehicles, where practicable; and
- Controller, and other, cabinets located in positions that allow for safe access and clear visibility of the operation of an adjacent road junction.

4.6.16 Safety and Security

The requirement for a pleasant, safe and secure environment for passengers waiting at Bus Stops and undertaking their journeys is a key component of the proposed public transport service. This is facilitated by the provision of:

- RTPI – Each stop will be provided with Real Time Passenger Information showing the estimated time of arrival of subsequent buses; and
- Public Lighting – each stop will have public lighting designed to ensure the safe operation of the stops in all lighting conditions and to enhance the sense of security at the stops.

4.6.17 Traffic Monitoring

In addition to public lighting, it is proposed to install traffic monitoring cameras at key locations, including junctions, to enable the monitoring of traffic flows along the Proposed Scheme and provide rapid identification of any events that are causing, or are likely to cause, disruption to bus services on the route and to road users in general. Junctions System Design information is included in the drawings BCIDA-ACM-TSM_SJ-0809_XX_00-DR-TR-9001 in Volume 3 of this EIAR.

4.6.18 Land Use and Accommodation Works

The Proposed Scheme has retained as far as practicable the existing horizontal and vertical layout along the route to minimise the amount of land acquisition required. However, in order to construct the Proposed Scheme, it is necessary to compulsorily acquire public and private plots of land along sections of the route.

The extent of permanent land acquisition and land required temporarily for the construction of the Proposed Scheme is shown on the General Arrangement Drawings (BCIDA-ACM-GEO_GA-0809_XX_00-DR-CR-9001) included in Volume 3 of this EIAR.

Construction of the Proposed Scheme requires land acquisition from several different parties, as outlined below:

- 55 residential properties; and
- 77 non-residential properties or land, including commercial, healthcare and educational institutes.

Mitigation accommodation works are proposed in the affected locations, including reconstruction of boundary walls and fences, as required, as outlined in Section 4.6.18.1.

4.6.18.1 Summary of Accommodation Works and Boundary Treatment

There are a number of areas along the extents of the route where the Proposed Scheme will result in the requirement for accommodation works and boundary treatments. Specific accommodation works are considered on a case-by-case basis.

To maintain the character and setting of the Proposed Scheme, the approach to undertaking the new boundary treatment works along the corridor is replacement on a 'like for like' basis in terms of material selection and general aesthetics, unless a section of street can benefit from urban improvement appropriate to the area.

Modifications to driveways and entrances will be guided by DCC's Parking Cars in Front Gardens Advisory Booklet (DCC 2011). Where driveways are proposed to be regraded, a maximum gradient of 5% in accordance with Recommendations for Site Development Works for Housing Areas, Department of the Environment and Local Government, 1998, has been adopted, where practicable.

Where cellar and private landings are affected by the Proposed Scheme pre-construction and post construction surveys will be performed by the appointed contractor. It will be determined during the detailed design stage if strengthening works are required to any existing structures.

Existing gates will be reused where practicable. However, considerations will be required for the use of bifold gates, or other appropriate alternatives to mitigate impacts on parking in driveways. All gates will be hung such that they will open inwards onto the property, where practicable.

4.7 References

- British Standards Institute (BSI) (2012). BS8300:2018. Volume 1 Design of an accessible and inclusive built environment. External Environment- code of practice.
- Construction Industry Research & Information Association (CIRIA) (2015). CIRIA C753 SUDS Manual.
- Department for Transport UK (2005) Inclusive Mobility.
- Department of the Environment, Transport and the Regions UK (2007). Guidance on the use of Tactile paving Surfaces, by the Department of Environment, Transport and the Regions.
- Department of Transport, Tourism and Sport (DTTAS) (2013a). Urban Flexible Roads Manual - Pavement Surface Condition Index. Department of Transport, Tourism and Sport (DTTAS) (2013b). Urban Concrete Roads Manual - Pavement Surface Condition Index.
- Department of Transport (DoT) (2019). Traffic Signs Manual. [Online] <https://www.trafficsigns.ie/current-traffic-signs-manual>
- Dublin City Council (DCC) (2011). Parking Cars in Front Gardens. [Online] Available from: https://www.dublincity.ie/sites/default/files/media/file-uploads/2018-05/Parking_Cars_in_Front_Gardens_Advisory_Booklet.pdf
- Dublin City Council (DCC) (2015a). Dublin City Biodiversity Action Plan 2015 – 2020.
- Dublin City Council (DCC) (2015b). Dublin City Tree Strategy 2016 – 2020.
- Dublin City Council (DCC) (2021). Dublin City Development Plan 2022 – 2028.
- Government of Ireland (2013). Design Manual for Urban Roads and Streets (DMURS).
- Institute of Hydrology (1994). Institute of Hydrology Report No. 124 Flood Estimation for Small Catchments Method.
- Irish Water (2005). The Greater Dublin Strategic Drainage Study (GSDSDS).
- Irish Wheelchair Association (IWA) (2020). Best Practice Guidelines, Designing Accessible Environments.
- National Disability Authority (NDA) (2012). Shared Space, Shared Surfaces and Home Zones from a Universal Design Approach for the Urban Environment in Ireland. National Disability Authority (NDA) (2015). How Walkable is Your Town?
- National Disability Authority (NDA) (2020). Building for Everyone: A Universal Design Approach.
- National Transport Authority (NTA) (2011). National Cycle Manual.
- National Transport Authority (NTA) (2013). Greater Dublin Area Cycling Network Plan.
- National Transport Authority (NTA) (2021). Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors.
- South Dublin County Council (SDCC) (2021). South Dublin County Council Development Plan 2022 – 2028.
- Transport Infrastructure Ireland (TII) (2010a). DN PAV-03021 Pavement & Foundation Design. Volume 7 Section 2 Part 2A. NRA HD 25-26/10. December 2010.
- Transport Infrastructure Ireland (TII) (2010b). TII PE-SMG-02002 Traffic Assessment (HD 24/06).

Transport Infrastructure Ireland (TII) (2015). Design Manual for Roads and Bridges (DMRB).

Transport Infrastructure Ireland (TII) (2020a). TII AM-PAV-06050 Pavement Assessment, Repair and Renewal Principles.

Transport Infrastructure Ireland (TII) (2020b). TII AM-PAV-06045, Management of Skid Resistance - June 2020 (TII 2020b).

Transportation Research Laboratory (TRL) (1984). TRL Report LR1132, The structural design of bituminous roads.

Transportation Research Laboratory (TRL) (1997). TRL Report 250: Design of long life flexible pavements for heavy traffic.

Transport Research Laboratory (TRL) (2004). TRL Report 615: Development of a more versatile approach to flexible and flexible composite pavement design.

United Kingdom Department for Transport (UK DfT) (2005). Inclusive Mobility.

United Kingdom Department for Transport (UK DfT) (2007). Guidance on the use of tactile paving surfaces.

Guidance and Legislation

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU.

S.I. No. 600/2001 – Planning and Development Regulations (2001).