The background is a vibrant yellow. It is decorated with several abstract geometric shapes in shades of blue, teal, and white. These include circles, semi-circles, and rounded rectangular shapes, some of which are layered or overlapping. The shapes are scattered across the page, creating a modern and dynamic visual effect.

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 Belfield / Blackrock 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 8.3km and will be comprised of two main alignments in terms of the route it follows, from Blackrock to the City Centre and along Nutley Lane.

The Blackrock to City Centre section will commence on the R113 at Temple Hill, approximately 80m to the north of the R827 Stradbroke Road, travel along the N31 Frascati Road, the R118 Rock Road / Merrion Road / Pembroke Road, the R816 Pembroke Road / Baggot Street Upper / Baggot Street Lower, turn onto Fitzwilliam Street Lower and terminate at the junction of Mount Street Upper / Merrion Square South / Merrion Square East. The Nutley Lane section of the Proposed Scheme will commence at the tie-in with the signalised junction on the R138 Stillorgan Road on the southern end of Nutley Lane, travel along Nutley Lane and terminate at the junction with the R118 Merrion Road. 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 pedestrians experience, an example of this can be seen in Ballsbridge, particularly at the Herbert Park / Pembroke Road junction.

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

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).

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

Features	Existing (km)	Proposed Scheme (km)
Bus Lanes		
Inbound	3.2	7.4
Outbound	2.9	7.3
Bus Priority through Traffic Management		
Inbound	0	0.9
Outbound	0	1.0
Total Bus Priority (both directions)	6.1	16.6 (+172%)
Bus Measures		
Proportion of Route with Bus Measures	37%	100%
Cycle Facilities - Segregated		
Inbound	0.4	8.3
Outbound	0.3	8.3
Cyclist Facilities – Non-segregated		
Inbound	3	0
Outbound	4.1	0
Cyclist Facilities - Overall		
Total Cyclist Facilities (both directions)	7.8	16.6 (+112%)
Proportion Segregated	4%	100%
Other Features		
Number of Pedestrian Signal Crossings	68	96 (+41%)
Number of Residential Properties with Land Acquisition	Not applicable	12

The description of the Proposed Scheme (Section 4.5) is supported by a series of drawings (listed in Table 4.2), 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
BCIDC-ARP-GEO_HV-1415_ML_00-DR-CR-9001	Mainline Plan and Profile
BCIDC-ARP-LHT_RL-1415_XX_00-DR-EO-9001	Street Lighting
BCIDC-ARP-DNG_RD-1415_XX_00-DR-CD-9001	Proposed Surface Water Drainage Works
BCIDC-ARP-ENV_LA-1415_XX_00-DR-LL-9001	Landscaping General Arrangement
BCIDC-ARP-STR_GA-1415_RW_01-DR-CB-9001	Bridges and Major Retaining Structures
BCIDC-ARP-UTL_UD-1415_XX_00-DR-CU-9001	IW Foul Sewer Asset Alterations
BCIDC-ARP-UTL_UE-1415_XX_00-DR-CU-9001	ESB Asset Alterations
BCIDC-ARP-UTL_UT-1415_XX_00-DR-CU-9001	Telecommunications Asset Alterations
BCIDC-ARP-UTL_UG-1415_XX_00-DR-CU-9001	GNI Asset Alterations
BCIDC-ARP-UTL_UW-1415_XX_00-DR-CU-9001	IW Water Asset Alterations
BCIDC-ARP-SPW_BW-1415_XX_00-DR-CR-9001	Fencing and Boundary Treatment
BCIDC-ARP-TSM_SJ-1415_XX_00-DR-TR-9001	Junction Systems Design
BCIDC-ARP-TSM_GA-1415_XX_00-DR-CR-9001	Traffic Signs and Road Markings
BCIDC-ARP-PAV-PV-1415_XX_00-DR-CR-9001	Pavement Treatment Plans
BCIDC-ARP-GEO_GA-1415_XX_01-DR-CR-9001	General Arrangement
BCIDC-ARP-SPW_ZZ-1415_XX_00-DR-CR-9001	Site Location Map and Site Location Plan
BCIDC-ARP-GEO_CS-1415_XX_01-DR-CR-9001	Typical Cross Sections
BCIDC-ARP-UTL_UC-1415_XX_00-DR-CU-9001	Combined Existing Utilities Records

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 process 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:

- The existing median along Baggot Street Lower is proposed to be retained to avoid the removal of the historical heritage public lighting columns;
- A new signalised Toucan crossing is proposed at a midpoint on Baggot Street Lower adjacent to Scoil Chaitríona to provide a controlled crossing for both pedestrians and cyclists;
- The cross-section of Baggot Street Upper is proposed to be adjusted to reduce the carriageway width and improve the urban realm;
- On Pembroke Road there is no longer any permanent land take required within the Proposed Scheme as a result of a proposed Bus Gate which allows the reduction of the cross-section from four vehicular lanes to two vehicular lanes – as such, tree loss on Pembroke Road is reduced and there is no permanent impact on boundary walls / railings nor trees within private lands;
- Offline traffic management measures are proposed as follows: to make the westernmost c. 70m of Clyde Lane one-way north/westbound on approach to Clyde Road, and to introduce a No Right turn onto Herbert Park from Pembroke Park, to mitigate traffic diversions as a result of the proposed bus gate on Pembroke Road;
- A large proportion of trees are to be retained between Northumberland Road and Ballsbridge by revising the alignment of the road and by reducing the length of the right turn lane being proposed onto Lansdowne Road;
- A left-turn entry only to Elgin Road from Ballsbridge is proposed to improve operational efficiency and safety at the Herbert Park / Pembroke Road junction;
- At the Herbert Park / Pembroke Road junction, the Herbert Park arm has been realigned in order to minimise the impact on adjacent properties and to retain a number of existing trees to the south-east of the junction;
- At the Anglesea Road / Merrion Road junction, the vehicular access into the City of Dublin Educational and Training Board (CDETB) premises has been relocated with the removal of the left-turn slip, and has been positioned to minimise the impact on historic railings;
- At the Anglesea Road / Merrion Road junction, the proposed right turn lane, which previously reflected the approximate length of the existing provision, is proposed to be reduced in length resulting in the reallocation of space to the adjacent footpaths;
- A revised access to Ballsbridge Avenue with an entry and exit to/from Ballsbridge Park is proposed to remove right turn movements to Beatty's Avenue from Ballsbridge Village;
- Land acquisition from the Clayton Hotel Ballsbridge, Merrion Road is proposed to ensure three large mature trees in the public footpath can be retained;
- A three-lane option with back-to-back bus lanes and signal-controlled bus priority is proposed on Merrion Road between Shrewsbury Road and Ailesbury Road to reduce the impacts on properties, resulting in a subsequent reduction in tree loss;
- A right turn lane from Nutley Lane into St. Vincent's University Hospital (SVUH) has been introduced into the design, with consideration for the planning permission for the development of the National Maternity Hospital (NMH) at SVUH (granted by An Bord Pleanála reference PA29S.PA0049) – which included provision of right-turn lane;
- A two-way cycle track and removal of footpath is proposed along Nutley Lane in front of Elm Park Golf & Sports Club. The two-way cycle track continues on Nutley Lane between SVUH and the R138 Stillorgan Road, which was previously proposed to cross over to the RTÉ side of the road via a Toucan crossing at Nutley Park. This avoids unnecessary crossings along Nutley Lane and ensures consistency with the Bray to City Centre CBC Scheme;

- At the access junction to SVUH from Merrion Road, the left-turn lane into SVUH and dedicated right-turn lane into Merrion Avenue have been removed in order to improve cyclist safety and reduce the necessary land acquisition;
- The cross-section in front of SVUH and Estate Avenue has been reduced generally with a reduction in land take;
- The cross-section from Elm Court Apartments to the Merrion Gates junction (junction of Merrion Road and Strand Road) has been reduced to a 3-lane arrangement with 2 no. general traffic lanes and an outbound only bus lane, to remove the need for land acquisition from 7 residential properties, the full demolition of another property and land acquisition from a commercial property;
- The Merrion Gates junction has been significantly altered to a consolidated T-junction with improved cycle facilities to improve the general safety of the junction;
- At the junction of the Elmpark Green Development on Merrion Road, the arrangement has been revised to remove the proposed traffic island on the inbound arm, which has removed the need for land take on Landaff Terrace to the south;
- The proposed right-turn lane from Rock Road to Booterstown DART station has been removed from the proposals to improve junction operation and maximise space available for pedestrians;
- Proposed right turn lanes have been removed along the Rock Road to reduce land acquisition from residential properties and Blackrock College;
- The rotation of the gates, railings, and piers forming the existing entrance to Blackrock College on the westernmost pier has been included in the design to accommodate the realigning of the adjacent boundary while preserving the symmetry of the protected entrance;
- The new right-turn lanes from Rock Road to Blackrock Clinic and Seafort Parade are no longer being proposed to reflect existing turning movements and operations, maximising space available for pedestrians and reducing landtake;
- The access and egress arrangements to the Frascati Centre have been amended in the design to reflect the existing, recently constructed, arrangement;
- The junction of the Rock Road and Mount Merrion Avenue has been reconfigured with the removal of the left-turn slip lanes and improved urban realm and cycle facilities;
- A controlled exit, for authorised vehicles only, is provided from George's Avenue (South) onto Frascati Road to address noise pollution concerns resulting from traffic modelling projections. The proposed exit will include restrictions to general traffic in the carriageway of the left turn from George's Avenue (South) to Frascati Road, making it a cul-de-sac north of Frascati Park, however, cyclists and pedestrians will be able to pass through;
- The cycle crossing infrastructure on Frascati Road at George's Avenue has been introduced into the design to reflect the existing, recently-constructed, arrangement;
- The previously proposed layby bus stop on Temple Hill, encroaching past the existing wall at St. Vincent's Park, has been relocated to the north and the requirement for widening at St. Vincent's Park has been removed from the design. Along with the relocation of the bus stop, a new pedestrian crossing has been introduced on the northern arm of the Temple Hill / Monkstown Road Junction;
- A number of bus stops along the route have been redesigned as island bus stops where space allows; and
- Bus stop locations have been modified in this revised proposal – some bus stops have been relocated or removed to achieve a better spacing between stops, while also ensuring that each stop is sited in the best location to serve surrounding neighbourhoods. These proposals will also ensure a more efficient bus network operation. In a number of locations, separate bus stop laybys have been provided which are envisaged to accommodate private coaches.

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 (GDSDS) (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 Pembroke Road / Herbert Park junction into a single crossroads. The existing layout with multiple slip lanes facilitates the movement of vehicles, but provides poor facilities for pedestrians, cyclist and buses. Pedestrians and cyclists have to walk a significant distance off their desire line to cross the road at a signalised crossing, which many are observed not to do, 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 consolidated traffic signal-controlled junction arrangement was developed to address the issues outlined above. This layout controls the flow of traffic and provides a high level of priority for buses on the main corridor arms of the junction. 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 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.

Accessibility for mobility impaired users is a core element of the Proposed Scheme design and it has been informed by the principles of DMURS, Building for Everyone: A Universal Design Approach (NDA 2020), How Walkable is Your Town (NDA 2015), Shared Space, Shared Surfaces and Home Zones from a Universal Design Approach for the Urban Environment in Ireland (NDA 2012), Best Practice Guidelines, Designing Accessible Environments (Irish Wheelchair Association 2020), Inclusive Mobility (UK Department for Transport 2005), Guidance on the Use of Tactile Paving Surfaces (UK DfT 2007), and BS8300:2018 Volume 1 Design of an accessible and inclusive built environment - External Environment – code of practice. 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 the aims and objectives for the Proposed Scheme, 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 and runs primarily from Blackrock to the City Centre, with Nutley Lane forming a secondary alignment in a south-to-north direction. The Proposed Scheme is described in the following geographical sections:

- Section 1: Stradbroom Road to Booterstown Avenue;
- Section 2: Booterstown Avenue to Nutley Lane;
- Section 3: Nutley Lane to Ballsbridge;
- Section 4: Ballsbridge to Merrion Square; and
- Section 5: Nutley Lane.

4.5.1 Section 1: Stradbroom Road to Booterstown Avenue

4.5.1.1 General overview of the Proposed Scheme

The Proposed Scheme commences to the south of the junction of Temple Hill / Monkstown Road, approximately 80m to the north of Stradbroom Road. Between the Monkstown Road and Booterstown Avenue junctions, it is proposed to provide a single bus lane, a single general traffic lane and a segregated cycle track arrangement in each direction, with the inbound bus lane commencing just south of the Monkstown Road junction.

Along with the relocation of an existing inbound bus stop to just north of the Temple Hill / Monkstown Road Junction, a new pedestrian crossing has been introduced on the northern arm of this junction. In the staging of this junction, a dedicated on-demand right turn phase (with detection from northbound general traffic lane), for buses only, onto Monkstown Road, will be provided.

A raised table treatment is proposed at the access road to St. Vincent's Park, including on the access lane from Temple Hill, in order to improve pedestrian safety on the inbound side of Temple Hill. At this junction the Temple Road approach arm has been reduced to a single all-movements lane to enable the provision of cycle facilities while also providing an appropriate swept path for left-turning vehicles from Frascati Road to Temple Road.

General alterations to junctions along this section are proposed to improve cyclist safety, including the removal of the left turn slip lane from Rock Road to Rock Hill, and the provision of protected cycle tracks at other junctions with a number of additional dedicated cycle crossings provided where practicable.

The Proposed Scheme includes for a controlled exit (for authorised vehicles only), to be provided from George's Avenue (South) onto Frascati Road which will make George's Avenue a cul-de-sac north of Frascati Park. The proposed exit will include restrictions to general traffic in the carriageway of the left turn from George's Avenue (South) to Frascati Road, however cyclists and pedestrians will be able to pass through. Dedicated cycle crossing infrastructure on Frascati Road at George's Avenue is included in the design to reflect the existing, recently-constructed, arrangement.

Similarly, it is noted that the access and egress arrangements to the Frascati Centre have been designed so as to reflect the existing, newly-constructed, arrangement.

The Proposed Scheme requires a widening of the carriageway along Rock Road, adjacent to Blackrock Park.

A portion of the existing wall of Blackrock Park currently supports the road embankment, and will be replaced with a new retaining wall at this location – between Ben Inagh Park and Castledawson residential development.

At the junction of Blackrock Clinic / Emmett Square on Rock Road, a new Toucan crossing is proposed across the eastern (outbound) arm with the existing pedestrian crossing on the western (inbound) arm converted to a Toucan crossing. It is noted that the existing time-plated turn ban from the outbound lane into Blackrock Clinic will be retained.

It is proposed to reverse the direction of Seafort Parade, including the separate entrance and exit from Rock Road. This intervention is proposed to improve visibility for vehicles exiting from Seafort Parade and remove the cross-road arrangement between Castledawson Avenue and Seafort Parade.

The proposed cross-section from Blackrock Clinic to Booterstown Avenue reduces the potential need for land acquisition along Willow Park School and reduces the extent of necessary land acquisition along Blackrock College and adjacent properties, while achieving the objectives of the Proposed Scheme.

The gates, railings, and piers forming the existing entrance to Blackrock College are to be rotated on the axis of the westernmost pier to accommodate the realigning of the adjacent boundary while preserving the symmetry of the protected entrance. A dedicated mid-block Toucan crossing is also proposed immediately west of the Blackrock College entrance.

4.5.1.2 Deviations from Standard Cross Sections

The width of the cross-sectional elements as outlined in Section 4.6.1 have been reduced (from published guidance, e.g., DMURS), at a number of constrained locations along the Proposed Scheme. The deviations within Section 1 - Stradbroke Road to Booterstown are detailed in Table 4.3.

Table 4.3: Reduced Standard Cross Sections on Section 1 – Stradbroke Road to Booterstown Avenue

Location	Design Element	DMURS / NCM	Type	Design	Justification
Ch. A0000 – A0020	Cycle track (outbound)	2.0m	Deviation	1.5m	Approximately 20m of narrowed cycle track due to transition to tie in with existing facilities.
Ch. A0260 – A0285	Footway (inbound)	2.0m	Deviation	1.8m	Approximately 25m of existing footpath retained.
Ch. A0625 – A0680	Footway (outbound)	2.0m	Deviation	1.8m	Approximately 55m of existing footpath retained.
Ch. A1580 – A1650	Cycle track (inbound)	2.0m	Deviation	1.5m	Approximately 70m of narrowed cycle track. Providing a standard width would require additional land acquisition, further impacting the adjacent private property (Blackrock Clinic).
Ch. A1700 – A1925	Cycle track (both directions)	2.0m	Deviation	1.5m	Approximately 225m of narrowed cycle track on both sides of the Rock Road. Providing a standard width would require additional land acquisition, further impacting the adjacent private property (Blackrock College) which would have a significant impact on the property and existing trees therein.

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. Full bus priority is proposed along the entire length of Section 1.

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. Seven out of the fifteen proposed bus stops within this Section of the Proposed Scheme are Island Bus Stops. The bus stop locations and types are outlined in Table 4.4 and shown in the General Arrangement series of drawings (BCIDC-ARP-GEO_GA-1415_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 4.4: Proposed Bus Stop Locations within Section 1 – Stradbroke Road to Booterstown Avenue

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Inbound	Mount Merrion Avenue	469 Relocated	A1550	Island Bus Stop	Proposed: Yes New location
Inbound	Blackrock College	471	A1975	Island Bus Stop	Proposed: Yes Existing: Yes
Inbound	Booterstown Ave	472	A2325	Island Bus Stop	Proposed: Yes

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
		Relocated			New location
Inbound	Temple Hill	3164 Relocated	A0150	Shared Landing Bus Stop	Proposed: Yes New location
Inbound	New Stop	N/A	A0600	Shared Landing Bus Stop	Proposed: Yes New location
Inbound	Frascati Centre	3084	A1050	Lay-by Bus Stop	Proposed: Yes Existing: Yes
Inbound	Mount Merrion Avenue	N/A	A1325	Lay-by Bus Stop	Proposed: Yes Existing: Yes
Inbound	Boosterstown Ave	N/A	A2275	Lay-by Bus Stop	Proposed: Yes Existing: Yes
Outbound	DART Station	427	A2300	Island Bus Stop	Proposed: Yes Existing: Yes
Outbound	Blackrock College	428	A1975	Island Bus Stop	Proposed: Yes Existing: Yes
Outbound	Blackrock Park	3032	A1200	Island Bus Stop	Proposed: Yes Existing: Fingerpost
Outbound	Temple Road	7660	A0550	Island Bus Stop	Proposed: Yes Existing: Fingerpost
Outbound	Blackrock Clinic	429	A1625	Shared Landing Bus Stop	Proposed: Yes Existing: Yes
Outbound	Frascati Centre	6334	A1025	Shared Landing Bus Stop	Proposed: Yes Existing: Fingerpost
Outbound	Temple Hill	3114	A0050	Shared Landing Bus Stop	Proposed: Yes Existing: Fingerpost

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.

At the southern end of this section, new segregated cycle tracks will be provided on Temple Hill, tying in with the existing provision to the south. These cycle tracks will continue along Primary Route No. 13 (as annotated in the Greater Dublin Area (GDA) Cycle Network Plan). In sections on Temple Road there are existing raised adjacent cycle tracks – however these will be upgraded to the arrangement set out in the PDGB (including 120mm upstand kerb between cycle track and traffic lane). Segregated cycle tracks are proposed in place of the existing on-road cycle lanes along the Frascati Road and Rock Road.

Tie-ins are provided to a number of Secondary Routes within the GDA Cycle Network Plan at intersecting junctions such as the 13D, 13E, S06, and S04. At George's Avenue, on Frascati Road, a two-way cycle crossing is proposed, aligning with a Feeder Route identified in the GDA Cycle Network Plan. A new Toucan crossing is also proposed north of the Blackrock College gates across the Rock Road.

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 - Stradbroke Road to Booterstown of the Proposed Scheme are outlined in Table 4.5.

Table 4.5: Major and Moderate Junctions (Signalised) within Section 1 of the Proposed Scheme

Junction Name	Summary	Signal Operation
Major Junctions (Signalised)		
N/A		
Moderate Junctions (Signalised)		
Temple Hill / Temple Crescent	The number of general traffic lanes will be reduced for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.	A five stage signal operation is proposed – mainline traffic, buses and cyclists on the southern approach will run for three stages, with cyclists followed by buses and then the mainline traffic on the northern approach will operate separately. The side arm will operate in its own stage, followed by pedestrians and cyclists on the Toucan crossings. A dedicated on-demand right turn phase for buses only onto Monkstown Road, with detection from northbound general traffic lane will be provided. This Intelligent Transport Systems (ITS) solution proposed for right turning buses is already being employed by Dublin City Council.
Temple Hill / Newtown Avenue	The segregated left turn lane will be removed to simplify the pedestrian movements. The pedestrian crossing on the western arm will be retained as a staggered crossing; however, the orientation will be reversed from existing. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.	A six stage signal operation is proposed. Buses and cyclists will operate in the same stage as mainline straight-ahead traffic on the southern arm. Buses and straight-ahead traffic will continue on the southern arm with the right turning traffic into Newtown Avenue to run unopposed. The northern arm mainline traffic will require its own stage due to left turning traffic conflicting with buses. The side roads will operate in separate stages, followed by pedestrians and cyclists turning right towards the side roads.
Frascati Road / Temple Road	The number of general traffic lanes will be reduced for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety. The pedestrian crossing on the western arm will be retained as a staggered crossing to align with the existing situation with particular 3D geometrical constraints.	A six stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction. Mainline straight-ahead and left-turning traffic, and cyclists will operate together, with left turning traffic to give way to cyclists on flashing ambers. Right turning traffic into Temple Road will run unopposed. The side roads will operate separately, with left turning traffic to give way to cyclists on flashing ambers. Pedestrian crossings to operate in their own stage.
Frascati Road / Carysfort Avenue	The number of general traffic lanes will be reduced for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.	A five stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction. This will be followed by mainline straight-ahead and left-turning traffic and cyclists operating together, with left turning traffic to give way to cyclists on flashing ambers. The side roads will operate separately, with left turning traffic to give way to cyclists on flashing ambers. Pedestrian crossings will operate in their own stage.
Rock Road / Rock Hill	The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of left turn lanes and flared entries into the junction. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety. The egress from Frascati Centre will be retained as two exit lanes and the existing left turn ban into Frascati Centre from Rock Road will be included.	A six stage signal operation is proposed. Mainline buses and cyclists in both directions, and straight-ahead traffic on the southern approach will operate within the same stage through the junction. The southern approach will continue with right turning traffic to run unopposed. Mainline traffic from the northern approach will operate in its own stage and the side roads to operate separately, with left turning traffic to give way to cyclists on flashing ambers. Pedestrian crossings will operate in their own stage.
Rock Road / Mount Merrion Avenue	The number of general traffic lanes will be reduced and the segregated left turn cycle lanes will be brought tighter into the junction for better cycle provision and dedicated bus infrastructure. The central island on Mount Merrion Avenue approach will be removed along with the left turn slip lane to Mount Merrion Avenue. A new pedestrian crossing on the western arm will be introduced. The design rationale is to provide more	A five stage signal operation is proposed. Buses and cyclists will operate in the same stage as mainline straight-ahead traffic on the northern arm. The southern arm mainline traffic will require its own stage due to left turning traffic conflicting with buses. Buses and straight-ahead traffic will continue on the northern arm with the right turning traffic. The side road will operate separately, with left turning traffic to give way to cyclists on flashing ambers, followed by

Junction Name	Summary	Signal Operation
	priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.	pedestrians and cyclists turning right towards the side road.
Rock Road / Emmet Square [Blackrock Clinic]	The number of general traffic lanes will be reduced for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety, as well as reducing land take into adjacent property. The existing time restrictions on the right turn into the Blackrock Clinic from the Rock Road will be retained.	A five stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction. Mainline traffic and cyclists will operate together, with turning traffic to give way to cyclists on flashing ambers. The side arms will operate separately, followed by pedestrians and cyclists on the Toucan crossings.
Rock Road / Booterstown Avenue	The number of general traffic lanes will be reduced for better cycle provision and dedicated bus infrastructure. The existing right turn ban to Booterstown DART Station will be retained. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety. The pedestrian crossing on the eastern arm will be converted to a straight across crossing as opposed to the existing staggered crossing. It was considered that a new crossing on the western arm was not required given the width of the crossing on the eastern side and the desire lines from Booterstown DART Station.	A six stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction, followed by mainline straight-ahead and left-turning traffic. Right turning traffic into Booterstown Avenue will run unopposed. The side roads will operate separately, with left turning traffic to give way to cyclists on flashing ambers. Pedestrian crossings will operate in their own stage.

4.5.1.7 Parking and Loading Bays

Changes to the parking and loading provisions along Section 1- Stradbroke Road to Booterstown Avenue as a result of the Proposed Scheme are shown in Table 4.6 and Table 4.7 respectively.

Table 4.6: Section 1 – Stradbroke Road to Booterstown Avenue: On-Street Parking Spaces Change Impact Summary

Location	Type of Parking		Existing	Proposed	Change
	Informal	Residential			
Between Phoenix Terrace and Castledawson Avenue	Informal	Residential	3	2	-1
Between Phoenix Terrace and Castledawson Avenue	Informal	Commercial	2	0	-2
Adjacent to Seafort Parade	Informal	Commercial	5	4	-1
Adjacent to Seafort Parade	Informal	Residential	2	0	-2
South of Booterstown Avenue Junction	Informal	Residential	6	0	-6
Approx. adjacent on-street parking within 200m			31	31	0
Total			49	37	-12

Table 4.7: Section 1 – Stradbroke Road to Booterstown Avenue: Existing and Proposed Loading Bays

Location	Type of Parking		Existing	Proposed	Change
	Loading Bay	Commercial			
Between Phoenix Terrace and Castledawson Avenue	Loading Bay	Commercial	1	2	1
Total			1	2	1

4.5.1.8 Landscape and Urban Realm

For an overview of the landscape design principles and approach, reference should be made to Section 4.6.12. The following sections provide a description of specific landscape and urban realm design works in Section 1 of the Proposed Scheme.

Towards the southern end of the route where there is an existing dual carriageway with dedicated cycle facilities, the Proposed Scheme will have negligible physical alteration, with the primary change being the re-allocation of traffic lanes to bus lanes.

North of Blackrock, the junctions with Rock Hill and Mount Merrion Avenue will be modified to remove slip lanes and increase the quantum of public space and use of hard and soft landscaping to make a more attractive and pedestrian friendly character (Image 4.1).

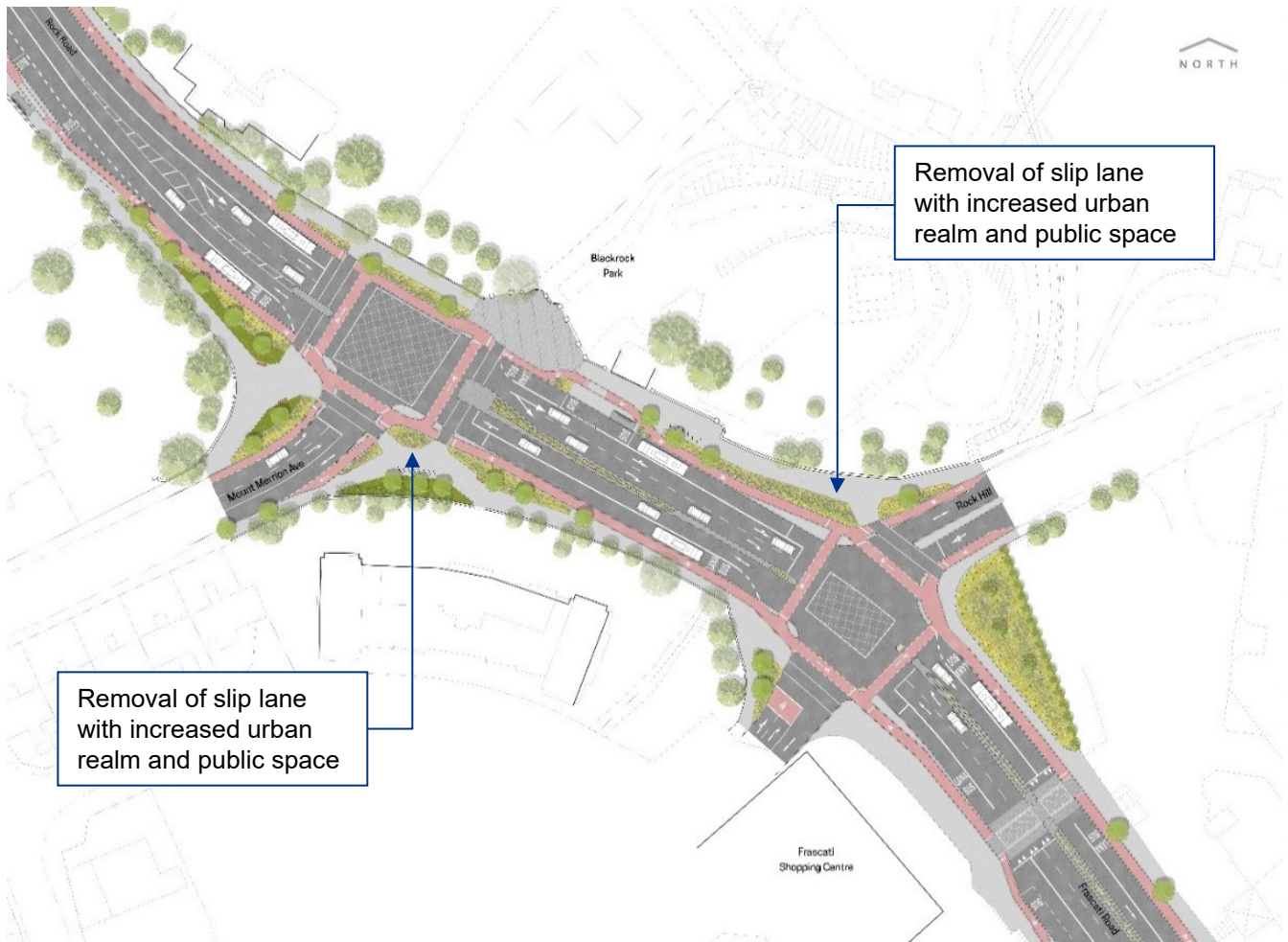


Image 4.1: Rock Road junctions with Rock Hill (bottom) and Mount Merrion Avenue (top)

There will be encroachment into the boundary of Blackrock Park and the existing low boundary wall will be reinstated to maintain the open aspect over the park to the sea. Similarly, there will be encroachment into the grounds of Blackrock Clinic and Blackrock College requiring felling of the outermost trees at the hospital entrance and realignment of the college boundary plinth wall railing further back into the college grounds. The entrance gateway to the college, a protected structure, will be rebuilt to maintain the same relationship with the revised railing alignment (Image 4.2).

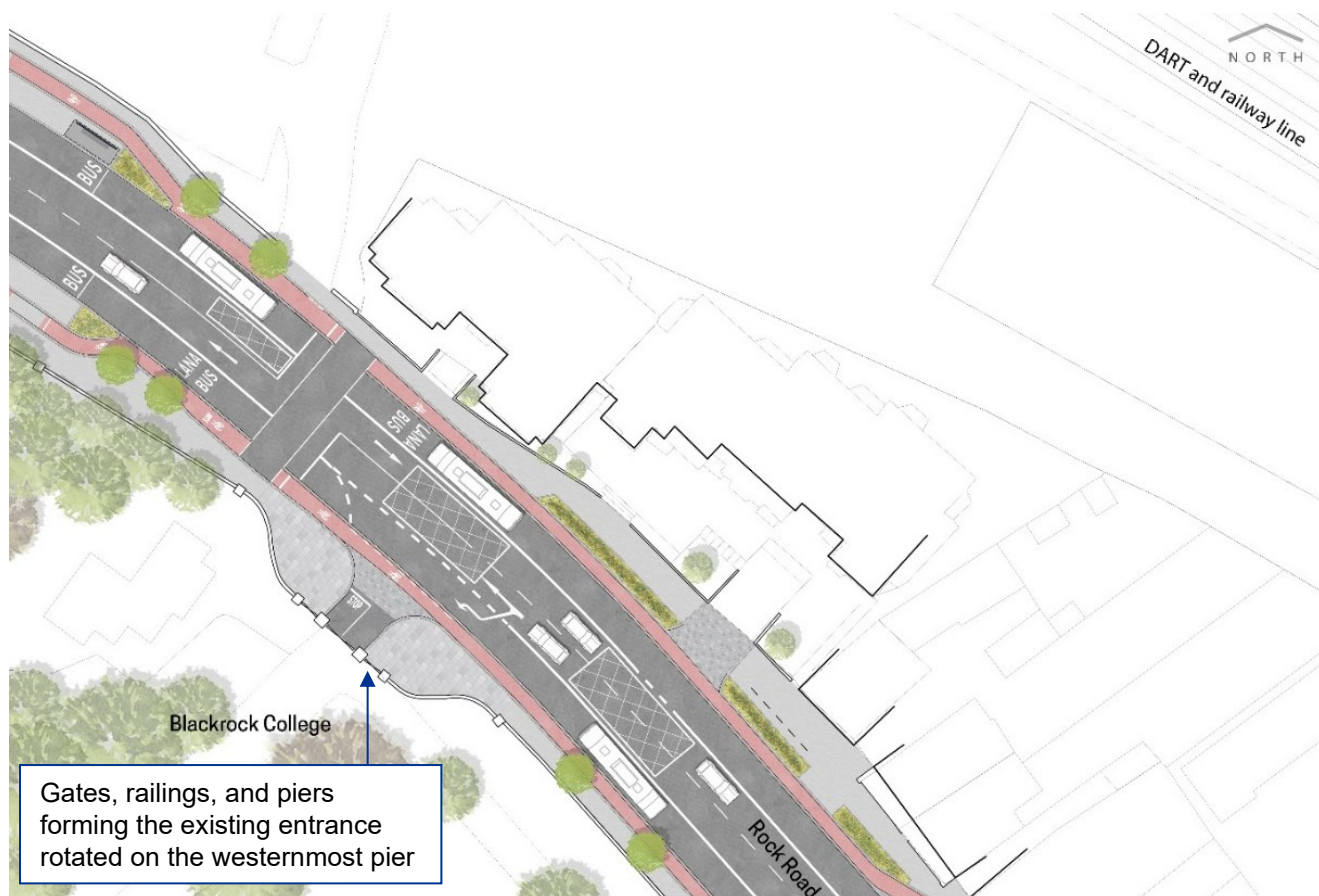


Image 4.2: Rock Road along frontage of Blackrock College

4.5.1.9 Land Acquisition and Use

Permanent land take is required through this section to facilitate the scheme, including minor encroachment into the green area between Newtownpark Avenue And Temple Park Avenue, junction reconfiguration at the Frascati Centre, widening works into Blackrock Park, widening works into Blackrock Clinic, including the plot at Castledawson Avenue, widening works into Blackrock College, entry treatment at the entrance to Willow Park and widening into the adjacent portion of landscaped area at the back of footpath.

Temporary land take is required within this section to facilitate:

- Footpath works and road regrading at the southern vehicular entrance to Frascati Centre;
- Construction of new retaining wall and boundary wall along the Blackrock Park frontage;
- Footpath works, road regrading, and construction of new entry treatment at entrance to Castledawson residential development;
- Road widening and boundary works at Blackrock Clinic and Castledawson Avenue;
- Road widening and boundary works at Blackrock College, including reconfiguring existing gate and piers;
- Road widening and boundary works at the existing DLRCC Car Park opposite Blackrock College;
- The establishment of construction compound within the existing DLRCC Car Park opposite Blackrock College;
- Works within a portion of landscaped area at the back of footpath in front of Willow Park; and
- Footpath regrading / resurfacing works at the Booterstown Avenue junction.

The impacts on residential amenity arising from land acquisition in Section 1 of the Proposed Scheme 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).

4.5.1.10 Rights of Way

Table 4.8 outlines the locations where existing rights of way will be affected by the Proposed Scheme.

Table 4.8: Existing rights of way affected by the Proposed Scheme

Location	Chainage	Existing Situation	Proposed Change
Junction of George's Avenue and Frascati Road	A0975	Currently, vehicular traffic heading northeast on George's Avenue can use the slip lane to turn left and head northbound on Frascati Road.	As part of the Proposed Scheme it is proposed to provide traffic management measures at the mouth of this slip lane. Following the implementation of the Proposed Scheme, vehicular traffic (except bicycles and authorised vehicles) would no longer be able to use this slip lane. Access to Frascati Road will still be available via the surrounding road network.
Open space between the Carroll & Kinsella car dealership and College House, Rock Road	A1950	Currently, Iarnród Éireann use this site to access the railway line at the back of the site for maintenance purposes.	As part of the Proposed Scheme it is proposed to widen the road at this location. This will require the existing access point to be relocated slightly, potentially resulting in a temporary interference with access to the railway line at this location. Access to the railway will be retained throughout the construction works and will continue to operate as before once complete.

4.5.2 Section 2: Booterstown Avenue to Nutley Lane

4.5.2.1 General overview of the Proposed Scheme

Between the Rock Road / Booterstown Avenue junction and the Merrion Road / Nutley Lane junction, it is proposed to provide a single bus lane, a single general traffic lane and a segregated cycle track arrangement in each direction along the majority of the route.

Between Strand Road and Booterstown Avenue (Booterstown DART Station), a two-way cycle track is proposed on the outbound/eastern side of the route. This integrates with the proposed East Coast Trail (Sutton to Sandycove Greenway) along this section.

The design of the Rock Road cross-section and layout between the junctions of Booterstown Avenue and Trimleston Avenue is such that it avoids the need for land acquisition and provides an improved access to the nearby school, while achieving the objectives of the Proposed Scheme. This also includes the removal of the existing dedicated right turn pocket into the western access to St. Helen's Road. Right turning into St. Helen's Road at this location will still be permitted, albeit from the single general traffic lane.

At the junction of the Elmpark Green Development on Merrion Road, along with providing a protected junction for cyclists the arrangement proposes the removal of the left turn slip lanes into and out of the development, as well as introducing a new pedestrian crossing on the western arm.

The Proposed Scheme includes works at the junction of Merrion Road and Strand Road ('Merrion Gates'), including the provision of segregated cycle facilities, the removal of the slip lane from Strand Road to Merrion Road (southbound) and the control of traffic exiting Strand Road utilising traffic signals. On the southern arm of the junction, a strip of parallel parking spaces is proposed on the outbound side.

The existing cut stone masonry archway located outside the Telford Nursing Home on the Merrion Road at the Merrion Gates junction will be carefully dismantled and re-erected at the back of the proposed footpath.

Between the Strand Road junction and Elm Court, it is proposed to provide a three-lane carriageway along this section with a footpath and cycle track in both directions. The carriageway will comprise two general traffic lanes

(one in each direction) and one outbound bus lane. Priority for inbound buses will be provided via signal controlled priority at the Merrion Gates junction. A strip of parallel parking spaces is proposed to be provided on the outbound side in the vicinity of No. 264 to No. 270 Merrion Road.

The cross-section proposed between SVUH and Estate Avenue has been designed so as to minimise the extent of necessary land acquisition. The existing cut stone masonry archway (referred to as the Bloomfield Gate) located outside the Gas Networks Ireland (GNI) Above Ground Installation (AGI) between the old Gowan Motors site (143 Merrion Road) and SVUH will, however, need to be relocated due to the proposed road widening. It will be carefully dismantled and re-erected in an adjacent area along the northern boundary of SVUH, sited within the existing hedge fronting onto the plaza at the junction of Merrion Road and Nutley Lane.

At the access junction to SVUH from Merrion Road, it is proposed to reduce the radius of the existing left turn into SVUH and remove the dedicated right-turn lane into Merrion Avenue in order to improve cyclist safety and reduce the necessary land acquisition, while achieving the objectives of the Proposed Scheme.

4.5.2.2 Deviations from Standard Cross Sections

The width of the cross-sectional elements as outlined in Section 4.6.1 have been reduced (from published guidance, e.g., DMURS), at a number of constrained locations across the Proposed Scheme. The deviations within Section 2 - Booterstown Avenue to Nutley Lane are detailed in Table 4.9.

Table 4.9: Reduced Standard Cross Sections on Section 2 - Booterstown Avenue to Nutley Lane

Location	Design Element	DMURS / NCM	Type	Design	Justification
Ch. A3460 – A3760	Cycle track (both directions)	2.0m	Deviation	1.5m	Approximately 300m of narrowed cycle track on both sides of the Merrion Road. Providing a standard width would require the demolition of adjacent private properties, result in the loss of a further number of trees, and require additional land acquisition, further impacting a number of adjacent private properties. In some cases, this would result in existing driveways becoming unusable. A standard cross section would also result in a significant impact to the operation of the existing GNI above ground installation, the potential relocation of an existing ESB sub-station, and a recently constructed building in SVUH.

4.5.2.3 Bus Lane Provision

An overview of the bus lane provision as part of the Proposed Scheme is set out 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 - Booterstown Avenue to Nutley Lane

Junction Location	Priority Type	Note
Merrion Road / Strand Road [Merrion Gates]	Separate bus stages on mainline corridor inbound only. Bus lanes up to stop lines on mainline corridor inbound only.	Onset of receiving bus lane in inbound direction delayed to avoid impact to existing private properties, including buildings.

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. Two out of the nine proposed bus stops within this Section of the Proposed Scheme are Island Bus Stops. The bus stop locations and types are outlined in Table 4.11 and shown in the General Arrangement series of drawings (BCIDC-ARP-GEO_GA-1415_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 4.11: Proposed Bus Stop Locations within Section 2 - Booterstown Avenue to Nutley Lane

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Inbound	St Helen's Road	4705	A2725	Shared Landing Bus Stop	Proposed: Yes Existing: Yes
Inbound	Bellevue Avenue	475 Relocated	A3150	Shared Landing Bus Stop	Proposed: Yes New location
Inbound	Merrion Gates	476	A3375	Shared Landing Bus Stop	Proposed: Yes Existing: Yes
Inbound	St Vincent's University Hospital	478 Relocated	A3850	Island Bus Stop	Proposed: Yes New location
Inbound	St Vincent's University Hospital	N/A	A3900	Lay- By Bus Stop	Proposed: Yes New location
Outbound	Nature Reserve	426	A2750	Island Bus Stop	Proposed: Yes Existing: Yes
Outbound	St Vincent's University Hospital	422	A3825	Shared Landing Bus Stop	Proposed: Yes Existing: Yes
Outbound	Merrion Gates	424 Relocated	A3400	Shared Landing Bus Stop	Proposed: Yes New location
Outbound	Bellevue Avenue	425 Relocated	A3075	Shared Landing Bus Stop	Proposed: Yes New location

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.

At the southern end of this section, new segregated cycle tracks will be provided along the Rock Road, with a single cycle track on the inbound side, and a two-way cycle track on the outbound side. The two-way cycle track offers a connection opportunity to existing cycle facilities within and through Blackrock Park at the Booterstown Avenue junction. The cycle tracks will continue along Primary Route No. 13 (as annotated in the GDA Cycle Network Plan) with the two-way cycle track also forming a key part of the N5 East Coast Trail. The existing provision in this section consists of portions of on-road advisory and mandatory cycle lanes, cycling in bus lanes, and no dedicated cycle facilities.

From the Merrion Road / Strand Road junction (Merrion Gates) to the northern end of the section at Nutley Lane, the two-way cycle track will cease, and a single outbound cycle track will be provided.

Tie-ins are provided to a number of Secondary Routes within the GDA Cycle Network Plan at intersecting junctions such as the 13E and at Trimleston Avenue, as well as the Greenway Route N5 East Coast Trail.

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 - Booterstown Avenue to Nutley Lane 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 Name	Summary	Signal Operation
Major Junctions (Signalised)		
Merrion Road / Strand Road [Merrion Gates]	The Merrion Gates junction has been altered to a consolidated T-junction with improved cycle facilities and to facilitate Signal Controlled Priority inbound. Note that this junction will be integrated with the DART level crossing on the Strand Road	An adaptive signal operation is proposed, to allow priority for buses with the level crossing, and a bonus green offered after the train. Outbound traffic and bus movements will operate with inbound buses and cyclists. All mainline straight ahead traffic and cyclists,

Junction Name	Summary	Signal Operation
	<p>arm. The junction is in compliance with the PDGB with respect to pedestrians, cyclists and buses. The design will improve cyclist facilities and safety at the junction and improve the safety of vehicles crossing the level crossing by signalling the junction.</p>	<p>and the pedestrian crossing on the side road, will operate while the train gates are closed. Once the gates are open, the left-turn into Strand Road will operate to prevent blocking the outbound bus movement. This is followed by the right-turning traffic into Strand Road and left-turn only from Strand Road.</p>
Moderate Junctions (Signalised)		
Rock Road / Trimleston Avenue	<p>The number of general traffic will be reduced for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.</p>	<p>A four stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction. Outbound buses will be able to continue with the mainline traffic in both directions. Trimleston Avenue will operate on its own without a flashing amber due to high-left turning flow. Pedestrians and cyclists turning right to and from the side road will operate together.</p>
Merrion Road / Elmpark Green	<p>The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of left turn lanes and their associated splitter islands. A new pedestrian crossing will also be introduced on the western arm. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.</p>	<p>A five stage signal operation is proposed. Buses and cyclists will operate in the same stage as mainline straight-ahead traffic on the northern arm. The southern arm mainline will operate separately from the buses, with left-turning traffic to give way to cyclists on flashing ambers. Buses and straight-ahead traffic will continue on the northern arm with the right turning traffic into Elmpark Green. The side road will operate separately, with left turning traffic to give way to cyclists on flashing ambers, followed by pedestrians and cyclists turning right into the side road.</p>
Merrion Road / St Vincent's University Hospital	<p>The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of left turn lanes flared entries into the junction. The design includes the continuation of outbound cycle lane along Merrion Road, along with a single traffic lane on the Nutley Lane arm. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety. Provisions have been included in the design to allow an outbound right turning bus enter the right turn lane towards Nutley Lane.</p>	<p>A five stage signal operation is proposed. Straight-ahead and left-turning mainline traffic and buses will operate in the same stage, with left turning vehicles to cross the bus lane path at a distance of 20m from the junction and giving way to cyclists on flashing ambers. This will maximise green time for buses and minimise delay. The right-turning movement from Merrion Rd to SVUH will run unopposed. The side roads will operate in separate stages, with flashing ambers for left-turning traffic. The pedestrian crossings will operate in their own stage.</p>
Merrion Road / Nutley Lane	<p>The number of general traffic will be reduced for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.</p>	<p>A five stage signal operation is proposed. Straight-ahead and left-turning mainline traffic and buses will operate in the same stage, with left turning vehicles to cross the bus lane path at a distance of 20m from the junction and giving way to cyclists on flashing ambers. This will maximise green time for buses and minimise delay. The right-turning movement from Merrion Road to Nutley Lane will run unopposed. The pedestrian crossings will operate with right-turning cyclists to and from the side road. This will then be followed by traffic from Nutley Lane, followed by buses. Traffic from the side road will not operate with a flashing amber due to high-left turning flow.</p>

4.5.2.7 Parking and Loading Bays

Changes to the parking provisions along Section 2 - Booterstown Avenue to Nutley Lane as a result of the Proposed Scheme are shown in Table 4.13.

Table 4.13: Section 2 - Booterstown Avenue to Nutley Lane: On-Street Parking Spaces Change Impact Summary

Location	Type of Parking		Existing	Proposed	Change
North of Booterstown Avenue Junction	Designated Paid	Residential	5	4	-1
Between Grotto Ave and St. Helen's Road	Designated Paid	Residential	22	13	-9
	Disabled	Residential	1	1	0
Between Trimleston Avenue and Nutley Lane	Designated Paid	Residential	8	13	5
	Designated Paid	Commercial	3	0	-3
Approx. adjacent on-street parking within 200m			127	127	0
Total			166	158	-8

There are no existing loading bays along this Section.

4.5.2.8 Landscape and Urban Realm

For an overview of the landscape design principles and approach, reference should be made to Section 4.6.12. The following sections provide a description of specific landscape and urban realm design works in Section 2 of the Proposed Scheme.

The Proposed Scheme will continue the same cross-section up to the Merrion Gates junction and will require encroachment into the field immediately north of Booterstown Marsh as well as the adjoining commercial property. The stone boundary wall will be rebuilt along the new alignment and boundary vegetation will be re-established.

The wider approach to the Merrion Gates junction will be re-configured with the seaward side redesigned to incorporate a bus stop, two-way cycle tracks and footpaths integrated with the adjacent landscaping. The junction will incorporate safe cycle facilities to connect Merrion Road and the coastal Strand Road and will require localised realignment of the boundary of St. Mary's Centre (Telford) including rebuilding the stone arched entrance gate (Image 4.3).

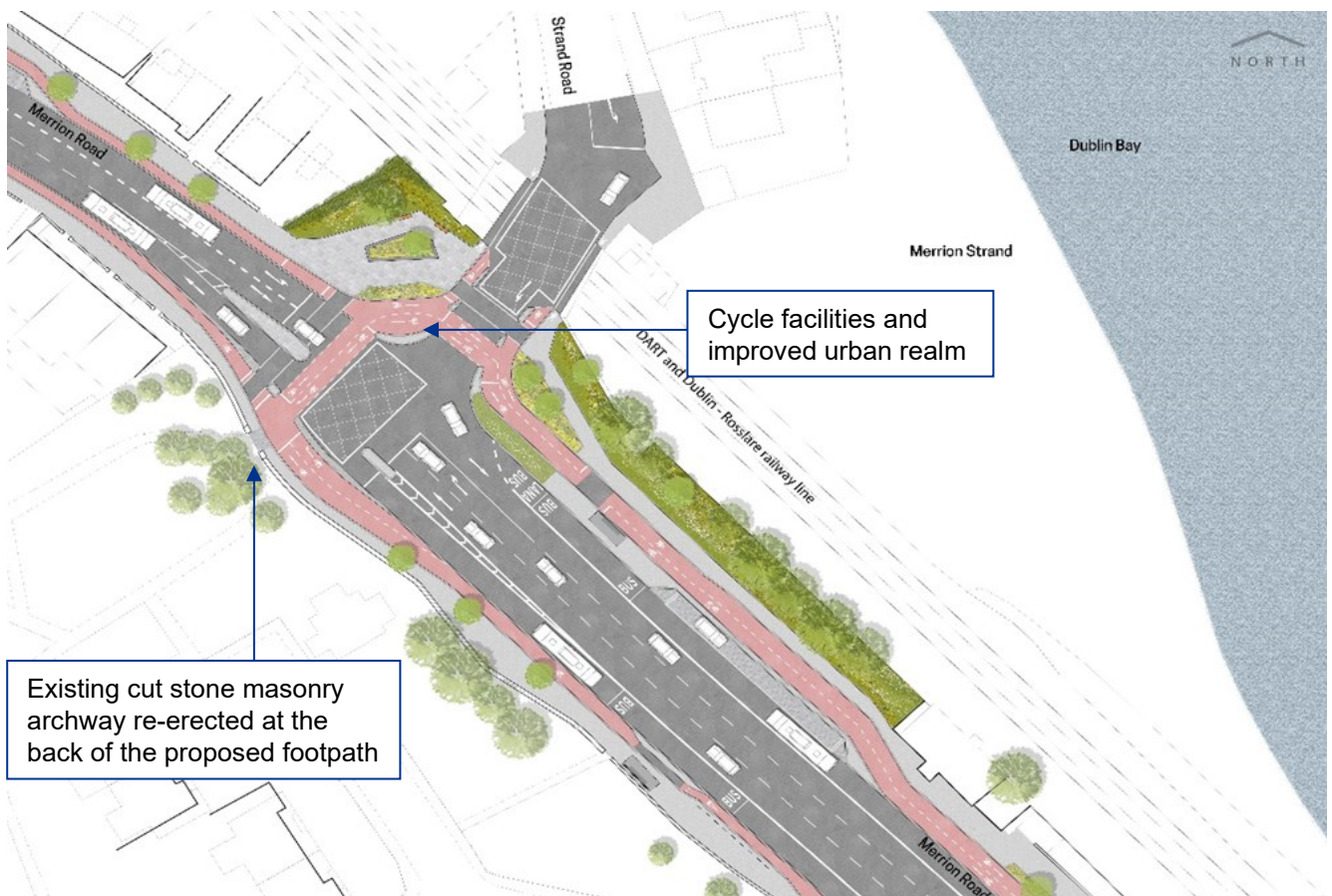


Image 4.3: Rock Road at Merrion Gates

Moving onto the Section between Strand Road and Nutley Lane, a number of existing street trees will need to be felled on either side of the road and private property boundaries will be slightly set back to provide continuous footpaths, cycle tracks and bus stop facilities. Property boundaries will be reinstated along the realigned boundary and new trees will be planted.

The SVUH hospital entrance will be rationalised to reduce carriageway widths and improve pedestrian and cycle amenity as well as upgrading the urban realm to be more consistent with the hospital frontage at the junction with Nutley Lane further north and incorporating hard and soft landscaping.

4.5.2.9 Land Acquisition and Use

Permanent land take is required through this section to facilitate the Proposed Scheme, including junction reconfiguration at the Elmpark Green Development, and widening works into the lands opposite Bellevue Avenue and the Elmpark Green Development, the St. Mary's Centre (Telford) – Religious Sisters Of Charity lands – at the Merrion Gates junction, the entrance area and landscaping in front of Elm Court Apartments residential site, a number of residential properties on Merrion Road, lands previously occupied by Gowan Motors (143 Merrion Road), as well as a site occupied by Gas Networks Ireland, and a portion of lands in SVUH as well as the entrance area off Merrion Road.

Temporary land take is required within this section to facilitate:

- Boundary works in the plots opposite Bellevue Avenue and the Elmpark Green Development;
- Boundary works in the St. Mary's Centre (Telford), Religious Sisters of Charity lands;
- Road and footpath reconfiguration works across the DART rail line at the Merrion Gates junction;
- Roadway and landscaped area regrading at the Elm Court Apartments residential site;
- Boundary and driveway regrading works at the residential properties along Merrion Road;

- Boundary works at the site previously occupied by Gowan Motors (143 Merrion Road);
- Boundary works and regrading within the site occupied by Gas Networks Ireland;
- Boundary works and regrading within SVUH lands including relocation of existing ESB sub-station; and
- The reconstruction of the Bloomfield Gate and Archway within the plaza owned by SVUH fronting onto Merrion Road.

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).

4.5.2.10 Rights of Way

Table 4.14 outlines the locations where existing rights of way will be affected by the Proposed Scheme.

Table 4.14: Existing rights of way affected by the Proposed Scheme

Location	Chainage	Existing Situation	Proposed Change
Elm Court Apartments	A3550	Currently, there is an existing ESB substation to the rear of the site. ESB access this substation through the access to the apartment complex.	As part of the Proposed Scheme it is proposed to widen the road at this location requiring the existing access point to be relocated slightly potentially resulting in a temporary interference with access to the substation. Access to the site will be retained throughout the construction works and will continue to operate as before once complete.
St. Vincent's Hospital	A3800	Currently both Ervia and Elm Park Golf Club have rights to access/pass through St. Vincent's Hospital grounds.	As part of the Proposed Scheme it is proposed to widen the road at this location requiring the existing access point to be relocated slightly potentially resulting in a temporary interference with these access rights . Access to the site will be retained throughout the construction works and will continue to operate as before once complete.

4.5.3 Section 3: Merrion Road (Nutley Lane to Ballsbridge)

4.5.3.1 General overview of the Proposed Scheme

4.5.3.1.1 R118 Merrion Road

The R118 Merrion Road from Nutley Lane to Sandymount Avenue is sub-divided into three portions by its junctions with Ailesbury Road and Shrewsbury Road.

A four-lane cross-section is proposed between Nutley Lane and Ailesbury Road. On the outbound approach to Nutley Lane, it is proposed to provide a bus priority signal at the pedestrian crossing between Ailesbury Road and Nutley Lane. This will permit buses accessing Nutley Lane to move into the right turn general traffic lane and complete their manoeuvre from this lane. This in turn facilitates continuous bus and cycle lanes along the R118 Merrion Road southbound through the junction.

Between Ailesbury Road and Shrewsbury Road, it is proposed to provide a three-lane carriageway along this stretch of Merrion Road with a footpath and cycle track in each direction and back-to-back bus lanes in opposite directions. The carriageway cross-section will comprise of two general traffic lanes (one in each direction) and one bus lane. The bus lane will be inbound (northbound) on the northern half of this stretch of Merrion Road (approaching Shrewsbury Road) and outbound (southbound) on the southern half of this stretch of Merrion Road (approaching Ailesbury Road). Signal controlled priority will be implemented to give buses priority along the stretch of road that buses share with general traffic. The direction in which the bus lanes travel changes in the vicinity of Wanderers Rugby Football Club (WFC). From WFC to Shrewsbury Road, only an inbound bus lane will be provided, while from WRC to Ailesbury Road, only an outbound bus lane is proposed. This will permit the retention of a number of existing trees and avoids the requirement for land acquisition from a number of properties in the vicinity of the Dutch Embassy.

The section between Shrewsbury Road and Sandymount Avenue is proposed as a four-lane carriageway with a bus lane and a general traffic lane in both directions. There are a number of mature trees located along the footway on this section of road and the proposed layout is such that it retains a number of trees where practicable.

A small section of land acquisition is proposed within the grounds of the Clayton Hotel Ballsbridge, Merrion Road, whereby a new footpath and cycle lane is proposed to run behind the existing trees at this location, with these trees to be retained. This will require land acquisition of a portion of the grass frontage and the realignment of a section of the boundary wall and railing of this property.

Also, along this section of the R118 Merrion Road, it is proposed to reduce the proposed footpath and cycle track widths locally in certain locations which aids in the retention of a number of trees. This locally reduces footpaths to a minimum width of 1.2m and cycle tracks to a minimum width of 1.4m over the short length of each pinch point.

4.5.3.1.2 Ballsbridge

The proposed road layout between Sandymount Avenue and Anglesea Road comprises a four-lane carriageway with a bus lane and a general traffic lane in both directions, and includes the removal of the traffic islands on Merrion Road at Serpentine Avenue with associated widening of the proposed footpath.

The left slip road from the R118 Merrion Road to Anglesea Road is proposed to be removed, with the relocation of the existing vehicular access to the City of Dublin Educational and Training Board (CDET B) premises on the corner of the junction to a new proposed vehicular access on Anglesea Road. The proposed access into the CDET B premises has been positioned to minimise the impact on historic railings. A new internal roadway arrangement is proposed as a result within the CDET B premises.

Entry to Ballsbridge Avenue from Ballsbridge Park is proposed to be located at the current exit, while a new exit to the north is proposed. This will remove the requirement for vehicles to turn right onto Beatty's Avenue from the R118 in Ballsbridge Village.

On the eastern side of the Dodder River, it is proposed to provide a two-way cycle track from Anglesea Road to Beatty's Avenue connected by a Toucan crossing on the R118 in Ballsbridge Village. This integrates with the proposed Dodder Greenway Route.

4.5.3.2 Deviations from Standard Cross Sections

The width of the cross-sectional elements as outlined in Section 4.6.1 have been reduced (from published guidance, e.g., DMURS), at a number of constrained locations across the Proposed Scheme. The deviations within Section 3 are detailed in Table 4.15.

Table 4.15: Reduced Standard Cross Sections on Section 3 – Merrion Road (Nutley Lane to Ballsbridge)

Location	Design Element	DMURS / NCM	Type	Design	Justification
Ch. A4245	Footway (inbound)	2.0m	Permitted Reduction	1.75m	Localised pinch point (over < 2.0m in length) due to existing pillar in boundary wall of adjacent property.
Ch. A4300 – A4850	Cycle track (both directions)	2.0m	Deviation	1.5m	Approximately 550m of narrowed cycle tracks on both sides of Merrion Road. It is noted that the carriageway cross-section is also reduced to only three lanes in this section. Providing a standard width would result in the loss of a further number of trees and require additional land acquisition to a number of properties. This narrowed width enables the retention of the existing kerb line along much of this section and as such provides more opportunities for the retention of existing trees at the footway edge.
Ch. A4980	Cycle track (outbound)	2.0m	Deviation	1.2m	It is proposed to reduce the cycle track width locally in this location to retain an existing semi-mature tree. This would reduce cycle tracks to a minimum width of 1.2m over the short length of the pinch point.

Location	Design Element	DMURS / NCM	Type	Design	Justification
Ch. A4980	Footway (outbound)	2.0m	Permitted Reduction	1.4m	As above, it is proposed to reduce the footpath width locally in this location to retain an existing semi-mature tree. This would reduce footpaths to a minimum width of 1.4m over the short length of the pinch point.
Ch. A5125	Cycle track (outbound)	2.0m	Deviation	1.2m	It is proposed to reduce the cycle track width locally in this location to retain a large mature tree. This would reduce cycle tracks to a minimum width of 1.2m over the short length of the pinch point.
Ch. A5125	Footway (outbound)	2.0m	Permitted Reduction	1.4m	As above, it is proposed to reduce the footpath width locally in this location to retain an existing large mature tree. This would reduce footpaths to a minimum width of 1.4m over the short length of the pinch point.
Ch. A5075 – A5125	Cycle track (inbound)	2.0m	Deviation	1.5m	Approximately 50m of narrowed cycle tracks inbound on Merrion Road. Providing a standard width would result in the loss of a further number of trees and would require additional land acquisition to an adjacent private property.

4.5.3.3 Bus Lane Provision

An overview of the bus lane provision as part of the Proposed Scheme is set out 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 a number of junctions in Section 3 of the Proposed Scheme as listed in Table 4.16.

Table 4.16: Proposed Signal Controlled Priority Junctions within Section 3 – Merrion Road (Nutley Lane to Ballsbridge)

Junction Location	Priority Type	Note
Merrion Road / Ailesbury Road	Separate bus stages on mainline corridor. Bus Lanes up to stop lines on mainline corridor	As outlined, there is no receiving bus lane in the inbound direction due to the three lane cross-section proposed.
Merrion Road / Shrewsbury Road	Separate bus stages on mainline corridor. Bus Lanes up to stop lines on mainline corridor	As outlined, there is no receiving bus lane in the outbound direction due to the three lane cross-section proposed.

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. All ten proposed bus stops within this Section of the Proposed Scheme are Shared Landing bus stops. The bus stop locations are outlined in Table 4.17 and shown in the General Arrangement series of drawings (BCIDC-ARP-GEO_GA-1415_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 4.17: Proposed Bus Stop Locations within Section 3 – Merrion Road (Nutley Lane to Ballsbridge)

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Inbound	Merrion Centre / Ailesbury Road	479 Relocation	A4210	Shared Landing Bus Stop	Proposed: Yes New location
Inbound	Merlyn Road	481 Relocated	A4625	Shared Landing Bus Stop	Proposed: Yes New location
Inbound	Shrewsbury Road	482	A4925	Shared Landing Bus Stop	Proposed: Yes Existing: Yes
Inbound	Simmons Court Road	483	A5225	Shared Landing Bus Stop	Proposed: Yes

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
		Relocated			New location
Inbound	RDS	485	A5550	Shared Landing Bus Stop	Proposed: Yes Existing: Yes
Outbound	RDS	416 Relocated	A5450	Shared Landing Bus Stop	Proposed: Yes New location
Outbound	British Embassy	418 Relocated	A5125	Shared Landing Bus Stop	Proposed: Yes New location
Outbound	Shrewsbury Park	419	A4800	Shared Landing Bus Stop	Proposed: Yes Existing: Yes
Outbound	Merlyn Road	420	A4500	Shared Landing Bus Stop	Proposed: Yes Existing: Fingerpost
Outbound	Ailesbury Road	421 Relocated	A4175	Shared Landing Bus Stop	Proposed: Yes Existing: Yes

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.

At the southern end of this section, new segregated cycle tracks will be provided along the Merrion Road, with a single cycle track in each direction. The cycle tracks will continue along the Proposed Scheme along Primary Route No. 13 (as annotated in the GDA Cycle Network Plan). The existing provision along this section consists of portions of on-road advisory and mandatory cycle lanes, cycling in bus lanes, or no dedicated cycle facilities.

The existing pedestrian crossings on the Merrion Road, at the Merrion Shopping Centre and at WFC, will be upgraded to a Toucan crossing. At the junction with Anglesea Road a two-way cycle track will be provided on the western side of Anglesea Road, along with a dedicated Toucan crossing on Merrion Road and short sections of two-way cycle tracks along Merrion Road. This is to form part of the Dodder Greenway Route, connecting Anglesea Road to Beatty's Avenue across the Proposed Scheme.

Tie-ins are provided to a number of routes within the GDA Cycle Network Plan at intersecting junctions such as the Primary Route SO3, the Secondary Route 13E, the Dodder Greenway Route and a Feeder Route at Ailesbury Road.

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 – Merrion Road (Nutley Lane to Ballsbridge) of the Proposed Scheme are outlined in Table 4.18.

Table 4.18: Major and Moderate Junctions (Signalised) within Section 3 of the Proposed Scheme

Junction Name	Summary	Signal Operation
Major Junctions (Signalised)		
N/A		
Moderate Junctions (Signalised)		
Merrion Road / Ailesbury Road	The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of the segregated left turn lanes and flared entries into the junction. Signal Controlled Priority will be introduced to enable the traffic management measures on Merrion Road between this junction and Shrewsbury Road. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.	A four stage signal operation is proposed. Buses and cyclists will operate within the same stage through the junction. This will be followed by mainline traffic and cyclists, with the traffic to give way to cyclists using flashing ambers. The side roads will operate together, with traffic turning north to give way to cyclists using flashing ambers. Traffic turning south will not operate with a flashing amber due to high-left turning flow. The pedestrian crossings will operate in their own stage, with cyclists from Merrion Road (eastern arm).
Merrion Road / Shrewsbury Road	This junction is currently a priority T-junction; however Signal Controlled Priority is to be implemented to enable the traffic management measures on Merrion Road between this junction and Ailesbury Road, and to provide pedestrian and cyclist facilities. The existing right turn ban onto Shelbourne Road will be maintained. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.	A four stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction, followed by mainline traffic. The side road will operate in its own stage with left turning traffic to give way to cyclists on flashing ambers, followed by pedestrians and right-turning cyclists.
Merrion Road / Sandymount Avenue	The number of general traffic lanes will be reduced to improve the environment for pedestrians and cyclists as well as to provide bus priority through the junction, yet with left-turning vehicles to be allowed to turn from the bus lane.	A five stage signal operation is proposed. Mainline traffic and buses will operate in the same stage, with left turning vehicles will be crossing the bus lane paths at a distance of 20m from the junction. This will maximise green time for buses and minimise delay. Traffic will give way to cyclists on flashing ambers. A right turn indicative arrow will facilitate the traffic flow into Simmonscourt Road. The side roads will operate in separate stages, with left turning traffic to give way to cyclists on flashing ambers. Pedestrian crossings will operate in their own stage.
Merrion Road / Serpentine Avenue	The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of left turn lanes and flared entries into the junction. The design rationale was to provide more priority to buses and to improve cyclist safety. The traffic islands will be removed on the Merrion Road arms and southern footpath will be widened. The design rationale was to improve the pedestrian environment in an area of occasional high pedestrian activity (RDS events).	A four stage signal operation is proposed. Mainline traffic and buses will operate in the same stage, with left turning vehicles to cross the bus lane path at a distance of 20m from the junction. This will maximise green time for buses and minimises delay. Traffic will give way to cyclists on flashing ambers. A right turn indicative arrow will facilitate the heavy traffic flow into Serpentine Avenue. The side road will operate in its own stage with flashing ambers, followed by pedestrians and right-turning cyclists.
Pembroke Road / Anglesea Road	The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of splitter islands and flared entries into the staggered junction. A Toucan crossing is proposed to connect the Dodder Cycle Route across Merrion Road, along with the removal of the left slip from Merrion Road to Anglesea Road. The design rationale was to allow cyclists to safely cross Merrion Road when cycling on	A five stage signal operation is proposed. Mainline buses and cyclists in both directions will operate within the same stage through the junction. Mainline straight ahead traffic in both directions will operate in the same stage, with right turning traffic into Anglesea Road giving way to oncoming traffic. Straight-ahead traffic stops to allow priority to right turning traffic into Anglesea Road, which will operate with right turning traffic into

Junction Name	Summary	Signal Operation
	the Dodder Cycleway and improve cyclist safety. The existing vehicular access to CDETB will be relocated south onto Anglesea Road given the proposed removal of the slip lane at from which it is currently accessed.	Ballsbridge Park and left-turning traffic out of Anglesea Road. Traffic and cyclists from Ballsbridge Park will operate together, with left turning traffic to give way to cyclists on flashing ambers. Pedestrian crossings will operate in their own stage.

4.5.3.7 Parking and Loading Bays

Changes to the parking and loading provisions along Section 3 – Merrion Road (Nutley Lane to Ballsbridge) as a result of the Proposed Scheme are shown in Table 4.19 and Table 4.20, respectively.

Table 4.19: Section 3 – Merrion Road (Nutley Lane to Ballsbridge): On-Street Parking Spaces Change Impact Summary

Location	Type of Parking		Existing	Proposed	Change
Between Anglesea Rd & Ballsbridge Terrace	Designated Paid & Permit	Commercial	5	0	-5
	Disabled Designated Paid Parking	Commercial	1	1	0
Ballsbridge Avenue	Designated Paid & Permit	Commercial	4	9	+5
Approx. adjacent on-street parking within 200m			71	71	0
Total			81	81	0

Table 4.20: Section 3 – Merrion Road (Nutley Lane to Ballsbridge): Existing and Proposed Loading Bays

Location	Type of Parking		Existing	Proposed	Change
Between Anglesea Rd & Ballsbridge Terrace	Loading Bay / Taxi Rank	Commercial	2	3	+1
Total			2	3	+1

4.5.3.8 Landscape and Urban Realm

For an overview of the landscape design principles and approach, reference should be made to Section 4.6.12. The following sections provide a description of specific landscape and urban realm design works in Section 2 of the Proposed Scheme.

Along Merrion Road, the Proposed Scheme includes a carriageway varying from three to four traffic lanes together with cycle lanes and will provide bus priority either directly or through signalisation. To achieve this, there will be a need to fell mature trees at different locations along the road. The design of the road alignment has been an iterative process seeking wherever possible to retain the higher quality trees and also to facilitate new tree planting post construction.

At Ballsbridge, the design seeks to rationalise the junction arrangements north and south of the bridge (Balls' Bridge) and to improve the quality and provision for pedestrians and cyclists at this urban village core. Junctions will be substantially reduced by removing slip lanes to increase pedestrian space. A palette of materials commensurate with the existing materials of the village core will be used so as to establish a continuous and high-quality streetscape and village presentation. This will help connect and draw together the two different parts of the village north and south of the bridge with new hard and soft landscape areas that will enhance pedestrian and passive amenity within the village (Image 4.4).

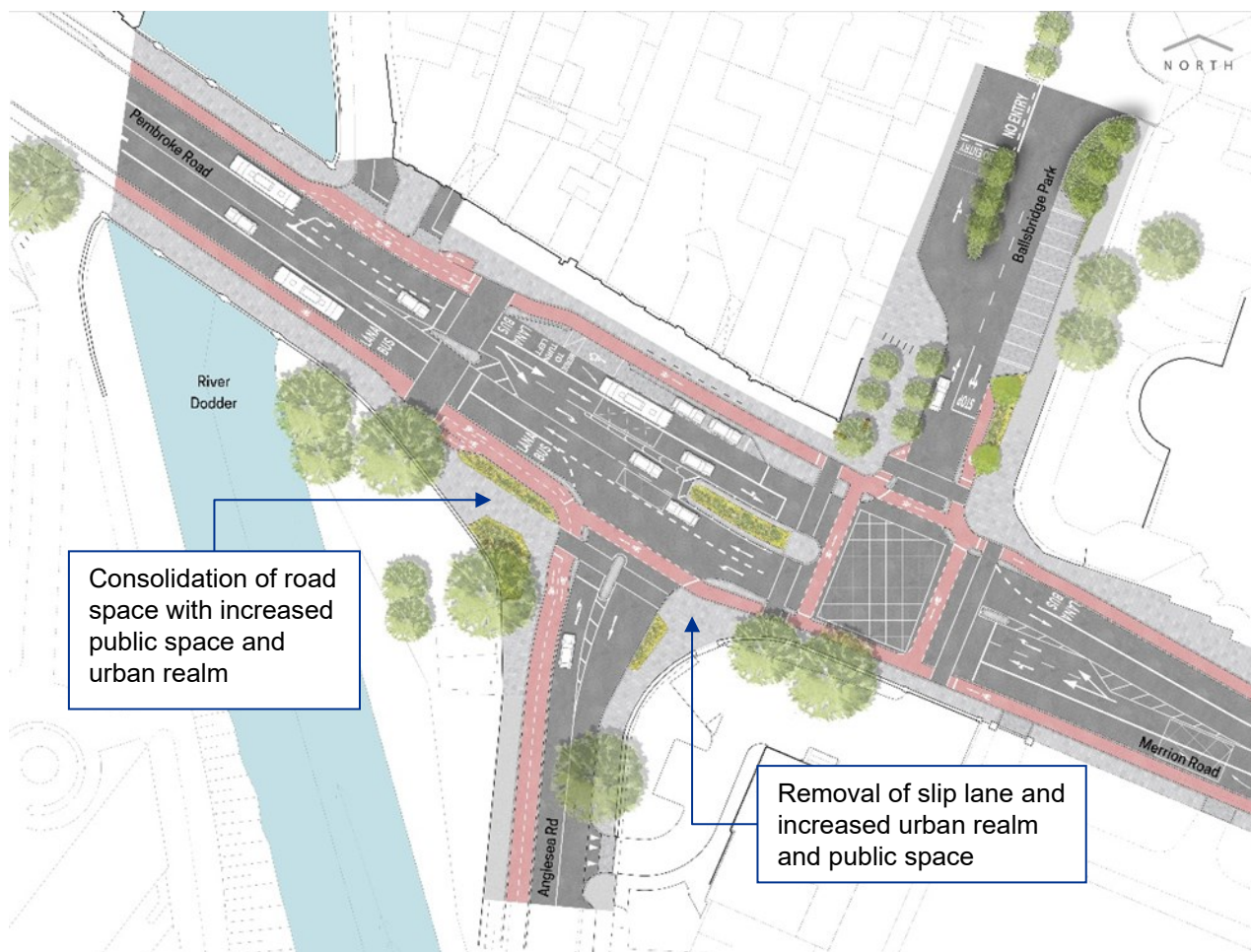


Image 4.4: Ballsbridge at Anglesea Road

On the northern side of Ballsbridge, at the junction of Pembroke Road, Herbert Park, Shelbourne Road and Elgin Road, a similar approach will be applied to reduce vehicular dominance of the junction and to enhance pedestrian amenity and the standard of urban realm.

The northern end of Herbert Park which currently forks into two separate sections of road will be rationalised to become a single carriageway facilitating a substantial increase in the size of urban realm between Herbert Road and Elgin Road. This new space will incorporate the existing mature tree and provide a network of pavements and passive urban realm that are segregated from the roadway. The junction at Elgin Road will become left-in entry only facilitating inbound traffic only and the carriageway on Elgin Road will be substantially reduced in favour of increased pedestrian and landscape space along the southern side of the road (Image 4.5).

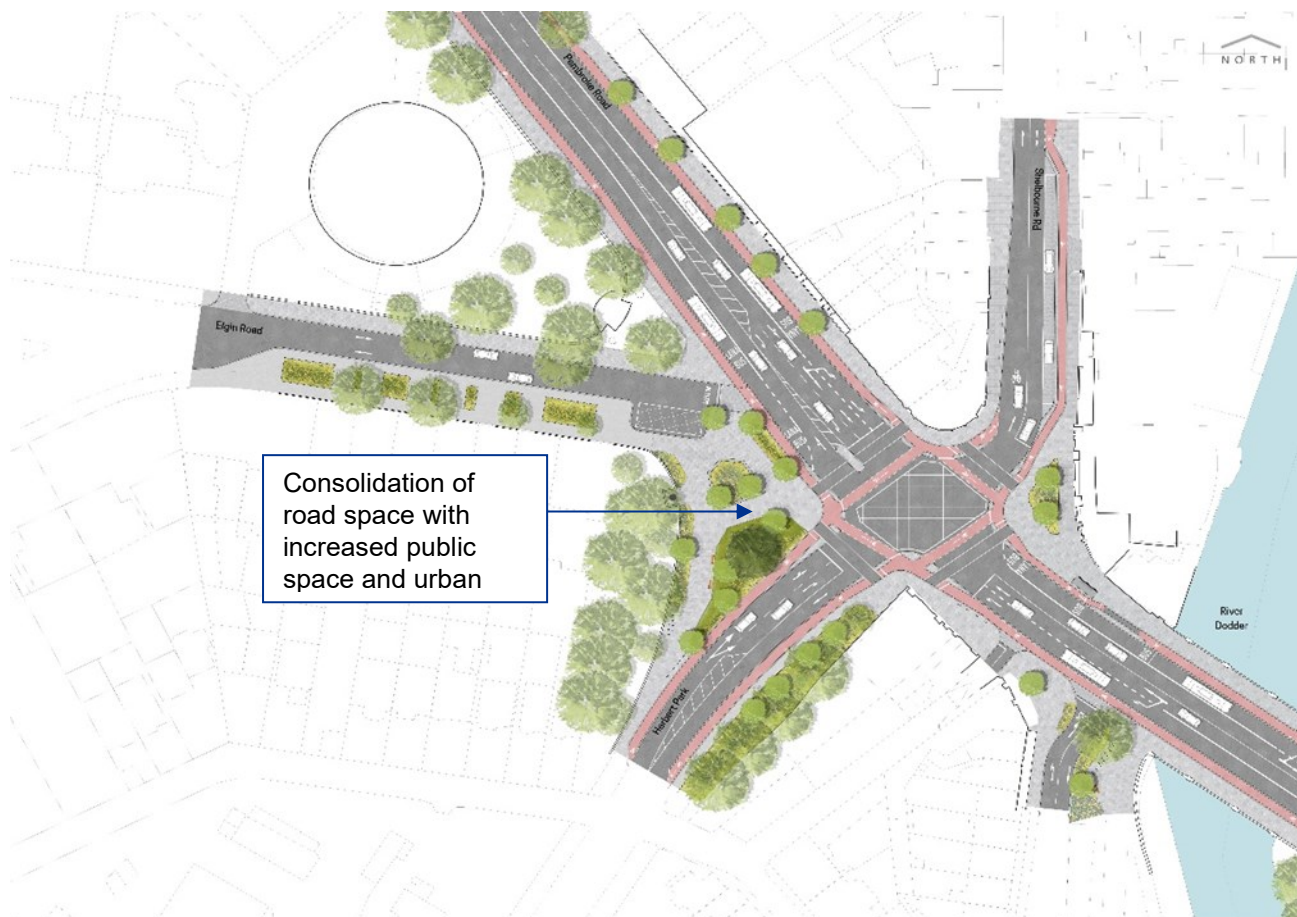


Image 4.5: Ballsbridge at Herbert Park, Shelbourne Road and Elgin Road

4.5.3.9 Land Acquisition and Use

Permanent land take is required through this section to facilitate the scheme, including junction reconfiguration, and widening works into the Merrion Shopping Centre, a residential property and adjacent laneway on Merrion Road, and into the Clayton Hotel Ballsbridge.

Temporary land take is required within this section to facilitate:

- Footpath regrading / resurfacing at areas in front of the Merrion Shopping Centre;
- Boundary works and regrading within a residential property and adjacent laneway on Merrion Road;
- Footpath works, road regrading, and construction of new entry treatment at entrance to a residential site on Merrion Road;
- Boundary works within the Clayton Hotel Ballsbridge;
- Footpath works, road regrading, and construction of new entry treatment at entrance to a commercial site on Merrion Road;
- Construction of new vehicular entrance to the CDETB site off Anglesea Avenue, and associated internal roadway, parking, and footpath reconfiguration.

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).

4.5.3.10 Rights of Way

Table 4.21 outlines the locations where existing rights of way will be affected by the Proposed Scheme.

Table 4.21: Existing rights of way affected by the Proposed Scheme

Location	Chainage	Existing Situation	Proposed Change
CDETB Merrion Road	A5650	There is an existing vehicular access to the CDETB which is accessed from the slip lane connecting Merrion Road and Anglesea Road.	As part of the Proposed Scheme it is proposed to close this access to vehicular traffic (except bicycles). An alternative vehicular access will be provided from Anglesea Road in close proximity to the existing entrance.

4.5.4 Section 4: Ballsbridge to Merrion Square (Pembroke Road, Baggot Street and Fitzwilliam Street)

4.5.4.1 General overview of the Proposed Scheme

4.5.4.1.1 Ballsbridge Village

At the Ballsbridge Village junction of Shelbourne Road, Herbert Park and Elgin Road, it is proposed to introduce a left turn only entry into Elgin Road from Ballsbridge. At this junction, the re-alignment of the Herbert Park arm has been designed so as to minimise the impact on adjacent properties and to retain a number of existing trees to the east of the junction.

4.5.4.1.2 Pembroke Road

On Pembroke Road, from Elgin Road to Northumberland Road, 2m wide cycle tracks are proposed where practicable. It is proposed to reduce the width of the cycle tracks to 1.5m in places, in order to facilitate the retention of a number of existing trees along this section of Pembroke Road.

At the junction of Pembroke Road, Northumberland Road and Lansdowne Road, a right turn lane will be introduced from Pembroke Road onto Lansdowne Road to replace the right turn movement at Ballsbridge Junction (Pembroke Road to Shelbourne Road) that will be removed. The western approach to the junction will be reduced from two lanes to one lane. The existing slip lane which currently allows inbound traffic to bypass the junction, will be removed, resulting in all traffic being brought up to the junction to turn left on to Pembroke Road towards Baggot Street Upper. The existing kiosk which is currently located on the existing splitter island on the south-western corner of the junction will be relocated nearby to the new proposed urban realm as part of the proposed works. Any existing services to the existing kiosk will be retained at the new location.

A single bus gate is proposed on Pembroke Road, between the Eastmoreland Place and Waterloo Road junctions. This bus gate will ensure that the only traffic utilising Pembroke Road (during the hours of operation) will be local traffic with a destination on or close to Pembroke Road, as well as through buses and authorised vehicles. This removes the need for four traffic lanes including dedicated bus lanes along this section of Pembroke Road resulting in a cross-section of a general traffic lane in each direction and a cycle track in each direction, i.e. inbound and outbound buses will use the two general traffic lanes. This reduced quantum of lanes avoids any permanent land take along Pembroke Road which means that existing trees will be retained, with some on-street parking also retained. The existing footpath width along this section of the Proposed Scheme will also be retained and/or widened where practicable.

Access to Pembroke Road, between Northumberland Road and Eastmoreland Place, during the hours of operation of the proposed bus gate, will be maintained via the Lansdowne Road junction. Local access will also be maintained via Eastmoreland Place, Wellington Road and Raglan Road. Offline traffic management measures at Clyde Lane and at the Herbert Park / Pembroke Park junction are also proposed to prevent through traffic diverting inappropriately.

4.5.4.1.3 Baggot Street Upper

Along Baggot Street Upper, it is proposed to reduce the width of the existing carriageway. This is facilitated through the proposed installation of the bus gate at the western end of Pembroke Road with a short section of bus lane between the Eastmoreland Place and Waterloo Road junctions.

Eastbound general traffic on Baggot Street Upper will not be permitted to access Pembroke Road and vice versa for westbound traffic on Pembroke Road during the hours of operation of the proposed bus gate. Consequently, the existing right-turn lane from Baggot Street Upper to Waterloo Road will be retained and the existing straight-ahead general traffic lane towards Pembroke Road can be converted to a bus lane. The proposal includes providing dedicated cycle tracks through the Baggot Street Upper retail area while improving the urban realm. Some loading and parking will be retained in the Baggot Street Upper retail area with additional / compensatory parking / loading provided where practicable.

At the McCartney Bridge (also known as MacCartney Bridge, Baggot Street Bridge), where Baggot Street Lower meets Baggot Street Upper, it is proposed to widen the existing footpaths on both sides of the bridge and introduce cycle tracks on both sides of the carriageway on the bridge. It is also proposed to reduce the number of lanes to one general traffic lane in each direction crossing the bridge which allows for the provision of improved widths for pedestrians and cyclists crossing the canal.

At Baggot Street Upper on the inbound approach to the Mespil Road junction, it is proposed to reduce the number of lanes at the junction from four to two. Signal controlled priority will be provided approaching the Mespil Road junction, where inbound (northbound) buses will be allowed to cross the bridge ahead of other traffic.

4.5.4.1.4 Baggot Street Lower

Along Baggot Street Lower, it is proposed to provide a bus lane in each direction, a general traffic lane in each direction, a cycle track in each direction and a footpath on both sides of the road. A similar signal controlled priority facility to that on Baggot Street Upper will be provided for buses travelling outbound from Baggot Street Lower to Upper. In order to optimise the operation of this arrangement, left and right turn bans are proposed from Herbert Place and Wilton Terrace respectively onto McCartney (Baggot Street Bridge), as well as a right turn ban from Mespil Road onto Baggot Street Upper.

In order to maintain the existing historical lighting columns and the majority of existing trees located in the median, it is proposed to retain the existing median along Baggot Street Lower.

Some recessed parking bays are proposed on both sides of the road where practicable. A new Toucan crossing is proposed on Baggot Street Lower near the school (Scoil Chaitríona).

4.5.4.1.5 Fitzwilliam Street Lower

Along Fitzwilliam Street Lower the proposed cross-section will provide a bus lanes and a general traffic lane in each direction, together with cycle tracks in each direction. No land acquisition will be required to provide this cross-section, however, it requires the removal of all parking along this section.

This main alignment of the Proposed Scheme ends at the junction of Fitzwilliam Street Lower with Mount Street Upper / Merrion Square South / Merrion Square East where it ties in with the existing environment.

4.5.4.2 Deviations from Standard Cross Sections

The width of the cross-sectional elements as outlined in Section 4.6.1 been reduced (from published guidance, e.g., DMURS), at a number of constrained locations across the Proposed Scheme. The deviations within Section 4 are detailed in Table 4.22.

Table 4.22: Reduced Standard Cross Sections on Section 4 – Ballsbridge to Merrion Square (Pembroke Road, Baggot Street and Fitzwilliam Street)

Location	Design Element	DMURS / NCM	Type	Design	Justification
Ch. A5930 – A6090	Cycle track (both directions)	2.0m	Deviation	1.5m	Approximately 160m of narrowed cycle tracks on both sides of Pembroke Road. Providing a standard width would result in the loss of a further number of trees. This narrowed width enables the retention of the existing kerb line along much of this section and as such provides more opportunities for the retention of existing trees at the footway edge.

Location	Design Element	DMURS / NCM	Type	Design	Justification
Ch. A7070 – A7100	Cycle track (inbound)	2.0m	Deviation	1.5m	Approximately 30m of narrowed cycle track alongside adjacent parking bays. Providing a standard width would result in an impact to existing coal holes along this section, or would result in an impact to the existing central median which is proposed to be retained along with the existing trees and high value heritage lighting poles.
Ch. A7125 – A7190	Cycle track (outbound)	2.0m	Deviation	1.5m	Approximately 65m of narrowed cycle track alongside adjacent parking bays. Providing a standard width would result in an impact to the existing central median which is proposed to be retained along with the existing trees and high value heritage lighting poles therein.

4.5.4.3 Bus Lane Provision

An overview of the bus provision being proposed 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 a number of junctions in Section 4 of the Proposed Scheme as listed in Table 4.23.

Table 4.23: Signal Controlled Bus Priority Junctions within Section 4 – Ballsbridge to Merrion Square (Pembroke Road, Baggot Street and Fitzwilliam Street)

Junction Location	Priority Type	Note
Baggot Street Upper / Haddington Road	Separate bus stages on mainline corridor in the inbound direction. Bus lane curtailed in advance of junction to avoid impact to existing cellar, with traffic island provided to enable signal controlled priority.	A number of existing and proposed turning bans for general traffic further enable the proposed operation.
Baggot St Lower / Herbert Place	Separate bus stages on mainline corridor in the outbound direction. Bus Lanes up to stop lines on mainline corridor in the outbound direction.	A number of existing and proposed turning bans for general traffic further enable the proposed operation.

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. Three out of the eleven proposed bus stops within this Section of the Proposed Scheme are Island Bus Stops. The bus stop locations and types are outlined in Table 4.24 and shown in the General Arrangement series of drawings (BCIDC-ARP-GEO_GA-1415_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 4.24: Proposed Bus Stop Locations

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Inbound	American Embassy	487	A5975	Shared Landing Bus Stop	Proposed: Yes Existing: Yes
Inbound	Mespil Road	782	A6800	Shared Landing Bus Stop	Proposed: Yes Existing: Yes
Inbound	Pembroke Road	2798 Relocated	A6290	Island Bus Stop	Proposed: Yes New location
Inbound	Pembroke Row	783	A7025	Shared Landing Bus Stop	Proposed: Yes Existing: Fingerpost
Inbound	Fitzwilliam Street	784 Relocation	A7325	Shared Landing Bus Stop (Urban Centre Detail)	Proposed: Yes (Urban Centre Detail) New location
Outbound	Mespil Road	752 Relocated	A6675	Island Bus Stop	Proposed: Yes New location

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Outbound	Northumberland Road	2797	A6350	Island Bus Stop	Proposed: Yes New location
Outbound	Fitzwilliam Street	750 Relocated	A7250	Shared Landing Bus Stop (Urban Centre Detail)	Proposed: Yes (Urban Centre Detail) New location
Outbound	Herbert Street	751 Relocated	A7000	Shared Landing Bus Stop (Urban Centre Detail)	Proposed: Yes (Urban Centre Detail) New location
Outbound	Lansdowne Road	414 Relocated	A6075	Shared Landing Bus Stop	Proposed: Yes New Location
Outbound	Elgin Road	415 Relocated	A5775	Shared Landing Bus Stop (Urban Centre Detail)	Proposed: Yes (Urban Centre Detail) New location

4.5.4.5 Cycling Provision

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

At the southern end of this section, new segregated cycle tracks will be provided along the Merrion Road and on to Pembroke Road, with a single cycle track in each direction. The cycle tracks will continue along Primary Route No. 13 and then the 13A (as annotated in the GDA Cycle Network Plan). The cycle tracks will then continue on the Secondary Route C7 on Fitzwilliam Street Lower as far as the end of the section at Merrion Square.

At the McCartney Bridge on Wilton Terrace / Herbert Place the Proposed Scheme will tie in with the N10 Grand Canal Greenway, and as such a two-way cycle track will be provide at the junction across the Proposed Scheme.

A new Toucan crossing is proposed on Baggot Street Lower at the location of an existing uncontrolled crossing in front of Scoil Chaitriona.

Tie-ins will be provided to a number of routes within the GDA Cycle Network Plan at intersecting junctions such as the Primary Route SO1, the Secondary Routes 13B, SO2, and C7, the N10 Grand Canal Greenway Route and a Feeder Routes at Herbert Park and Elgin Road.

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 4.25.

Table 4.25: Major and Moderate Junctions (Signalised) within Section 4 – Ballsbridge to Merrion Square (Pembroke Road, Baggot Street and Fitzwilliam Street)

Junction Name	Summary	Signal Operation
Major Junctions (Signalised)		
Pembroke Road / Shelbourne Road	The junction will be rationalised and reduced in size to improve the environment for pedestrians and cyclists. The northbound right-turning lane into Shelbourne Road will be removed and relocated to the junction of Pembroke Road and Lansdowne Road. The design will also include a right turn on to Herbert Park. Adjacent to the junction, the Elgin Road arm (of the existing junction) will be a left-in only priority side road off Pembroke Road. The design rationale was to ensure buses will have more priority at the junction and to reduce potential impacts on local access to Elgin Road and surrounding areas.	A five stage signal operation is proposed. Mainline straight and left turning traffic and buses will operate in the same stage, with left turning vehicles to cross the bus lane paths at a distance of 20m from the junction and to give way to cyclists on flashing ambers. This will maximise green time for buses and minimise delay. Right turning mainline traffic from Pembroke Rd to Herbert Park will operate unopposed. The side roads will

Junction Name	Summary	Signal Operation
		operate in separate stages, with left turning traffic to give way to cyclists on flashing ambers. The pedestrian crossings will operate in their own stage.
Pembroke Road / Northumberland Road	A right turn lane will be introduced from Pembroke Road onto Lansdowne Road to replace the movement at Ballsbridge Junction (Pembroke Road / Shelbourne Road) that will be removed. The western approach to the junction will be reduced from two lanes to one lane. Bus lane will be brought up to the junction rather than bypassing it via slip lane to Pembroke Road. The Design Rationale was to improve pedestrian and cyclist safety at the junction, integrate with the traffic management proposals on Pembroke Road, and provide improved bus priority. As there will be no receiving bus lane proposed on the Northumberland Road arm, and there may be both left-turning and straight through buses approaching from the southern arm, this southern arm will not be able to allow buses and general traffic run in the same stage.	A six stage signal operation is proposed. Buses on the southern arm and buses and cyclists on the northern arm will operate in a single stage. Mainline traffic and northbound cyclists will operate together, with left turning traffic to give way to cyclists on flashing ambers. A right turn indicative arrow from Pembroke Road into Lansdowne Road is proposed. The side road traffic and cyclists will operate separately with flashing ambers, followed by pedestrian crossings in their own stage.
Moderate Junctions (Signalised)		
Baggot Street Upper / Waterloo Road	The number of general traffic lanes and on street parking will be reduced to improve the environment for pedestrians and cyclists as well as providing bus priority. A bus gate is proposed on Pembroke Road at the junction of Waterloo Road, removing the need for extensive permanent land acquisition along this section and allowing existing trees to be retained. Design rationale was to cater for the extremely high volumes of pedestrians in this area, provide space for trading purposes on Baggot Street Upper while protecting bus priority through this area and improving the urban realm of the Baggot Street Upper retail area. This arrangement will also reduce traffic on Pembroke Road and will give more priority to buses.	A four stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction, with left turning traffic to give way to cyclists on flashing ambers. Mainline traffic, buses, and cyclists turning right will go with side arm traffic turning left. The bus lane from the side road will operate when called. Pedestrians and cyclists turning right from the side road will operate together.
Baggot Street Upper / Haddington Road	No bus lanes are proposed through the junction enabled by Signal Controlled Priority on Baggot Street Upper approach and same at Baggot Street Upper / Herbert Place junction outbound. A no right turn from Mespil Road onto Baggot Street Upper will be introduced to assist in junction operation. An additional pedestrian crossing will be included on bridge arm of the junction. The existing advisory cycle lanes on Mespil Road will be upgraded to cycle tracks. Design rationale was to cater for the extremely high volumes of pedestrians in this area, provide space for trading purposes on Baggot Street Upper while protecting bus priority from Baggot Street Upper to Lower and vice versa, and improving the urban realm of the Baggot Street Upper retail area.	A three stage signal operation is proposed, for mainline traffic and cyclist to operate in the same stage, with left turning traffic to give way to cyclists on flashing ambers. The side roads will operate together, though Mespil Road will not operate with a flashing amber due to high-left turning flow. Cyclists from Mespil Road will operate with pedestrians.
Baggot St Lower / Herbert Place	Vehicular turning movement from Herbert Place onto the bridge will be removed. The existing pedestrian crossing on the Baggot Street Lower Arm of the junction will be retained. The right turn from the bridge onto Herbert Place will be removed. There will be Signal Controlled Priority on Baggot Street Lower approach and on inbound approach to the Baggot Street Upper / Haddington Road junction. Design rationale was to improve pedestrians and cyclist facilities and prevent blocking of the junction from vehicles onto the bridge from Herbert Place and provide bus priority from Baggot Street Upper to Lower and vice versa.	A four stage signal operation is proposed. Buses on the northern arm, mainline traffic on the southern arm, and mainline cyclists in both directions will operate in the same stage, with left turning traffic to give way to cyclists on flashing ambers. This will be followed by mainline traffic on both the southern and northern arms. Side arm traffic and cyclists will operate in the same stage. The pedestrian crossings will operate within their own stage.

Junction Name	Summary	Signal Operation
Baggot Street Lower / Fitzwilliam Street Upper	The number of general traffic lanes and on street parking will be reduced to improve the environment for pedestrians and cyclists as well as the provision of bus priority on the NE and SE arms. Buses turning right from left hand lane onto Fitzwilliam Street Lower will be enabled through Signal Controlled Priority. The on-set of the proposed bus lane on Fitzwilliam Street Lower will be curtailed due to constrained existing cross-section. Design rationale is to improve cyclist facilities at the junction and to provide priority for buses to turn right from Baggot Street Lower to Fitzwilliam Street.	A six stage signal operation is proposed. Buses from Baggot Street Lower I and Fitzwilliam Street Lower (N) will operate in a single stage. Traffic and cyclist from each arm will operate in separate stages, with left turning traffic to give way to cyclists on flashing ambers. Pedestrian crossings will operate in their own stage.
Fitzwilliam Street Lower / Merrion Square East	This is where the proposed scheme ends and ties in with Merrion Square and Mount Street Upper. The parking spaces on Fitzwilliam Street Lower will be removed for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.	A five stage signal operation is proposed. The bus lane from Fitzwilliam Street Lower will operate in its own stage. Traffic from Fitzwilliam Street Lower and Merrion Square East will operate together. Traffic from Mount Street Upper and Merrion Square (S) will operate together. The pedestrian crossings will operate in their own stage, as well as the cycle lane from Fitzwilliam Street Lower.

4.5.4.7 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 4.26 and Table 4.27, respectively.

Table 4.26: Section-4 - Ballsbridge to Merrion Square (Pembroke Road, Baggot Street and Fitzwilliam Street): On-Street Parking Spaces Change Impact Summary

Location	Type of Parking		Existing	Proposed	Change
Shelbourne Rd	Designated Paid & Permit	Commercial	10	7	-3
Pembroke Road (Between Pembroke Lane and Wellington Road)	Designated Paid & Permit	Residential	67	38	-29
	Disabled Designated Paid Parking	Residential	1	1	0
Pembroke Road (Between Wellington Rd and Waterloo Road)	Designated Paid & Permit	Residential	22	16	-6
Wellington Road	Designated Paid & Permit	Residential	16	23	7
Waterloo Road	Disabled Designated Paid Parking	Commercial	0	1	1
Baggot Street Upper (Between Waterloo Road and Haddington Road)	Designated Paid & Permit	Commercial	13	3	-10
	Disabled Designated Paid Parking	Commercial	4	3	-1
Eastmoreland Place (northern side)	Designated Paid Parking	Commercial	6	2	-4
Baggot Street Lower (Between Wilton Tce and James St E)	Designated Paid & Permit	Residential	42	13	-29
	Designated Paid	Commercial	7	0	-7
Fitzwilliam Street Lower (Between Baggot St Lower and Mount St Upper)	Designated Paid & Permit	Commercial	18	0	-18
	Designated Paid & Permit (Electric)	Commercial	2	0	-2
Approx. adjacent on-street parking within 200m			650	650	0
Total			858	757	-101

Table 4.27: Section-4 - Ballsbridge to Merrion Square (Pembroke Road, Baggot Street and Fitzwilliam Street): Existing and Proposed Loading Bays

Location	Type of Parking		Existing	Proposed	Change
Pembroke Road (Between Wellington Rd and Waterloo Road)	Loading Bay	Commercial	1	0	-1
Wellington Road	Loading Bay	Commercial	0	2	2
Baggot Street Upper (Between Waterloo Road & Haddington Road)	Loading Bay / Taxi Rank	Commercial	4	3	-1
	Loading Bay	Commercial	6	3	-3

Location	Type of Parking		Existing	Proposed	Change
Eastmoreland Place (northern side)	Loading Bay	Commercial	0	4	4
Total			11	12	1

4.5.4.8 Landscape and Urban Realm

For an overview of the landscape design principles and approach, reference should be made to Section 4.6.12. The following sections provide a description of specific landscape and urban realm design works in Section 2 of the Proposed Scheme.

Urban realm and landscape proposals have evolved iteratively to re-balance the carriageway along Pembroke Road so as to reduce the effective vehicular space and to use the space for dedicated cycle and pedestrian facilities. The existing street trees are all retained and new trees will also be planted.

By elimination of the left turning slip road onto Pembroke Road, the kiosk that is presently located on a traffic island will be incorporated within a more generous and attractive urban realm Image 4.6.



Image 4.6: Pembroke Road at Lansdowne Road and Northumberland Road

At Baggot Street Upper, pedestrian footpath space is to be increased so as to create a more accessible, attractive and pedestrian friendly village environment in which both sides of the street are more strongly connected (Image 4.7). Additional urban realm space will permit new tree planting, bicycle parking and open areas that will establish a more cohesive village environment and with high quality materials that reflect those of the existing built environment. Improvement in pedestrian facilities and urban realm will extend to incorporate the bridge (McCartney Bridge), crossing Grand Canal and leading into Baggot Street Lower.



Image 4.7: Baggot Street (Upper) Village

At Baggot Street Lower, the existing streetscape cross-section is to be retained including the central median and trees. On-street parking will be removed to facilitate the provision of cycle segregated tracks alongside footpaths. This will reduce and increase the perceived width of carriageway and the pedestrian zone along both sides of the street and will be able to accommodate pedestrian and cyclists on a day-to-day basis and larger volumes of pedestrians when crowds are making their way to and from events at the Aviva Stadium and the city centre.

4.5.4.9 Land Acquisition and Use

Permanent land take is required through this section to facilitate the scheme, including, an area at the Herbert Park junction adjacent to Roly's Bistro, the lands currently housing the existing kiosk on Pembroke Road, which is to be relocated, and the grassed open space at the junction of Pembroke Road and Pembroke Lane.

- Temporary land take is required within this section to facilitate:
- Boundary works to amend vehicular entrance arrangements to properties on Pembroke Road;
- Walking ramp upgrades along the Grand Canal edge at the McCartney Bridge; and
- Works to the coal hole and roof of an existing cellar on Baggot Street Lower.

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).

4.5.4.10 Rights of Way

Table 4.28 outlines the locations where existing rights of way will be affected by the Proposed Scheme.

Table 4.28: Existing rights of way affected by the Proposed Scheme

Location	Chainage	Existing Situation	Proposed Change
Elgin Road	A5850	Currently, vehicular traffic heading southwest on Elgin Road can turn left or right onto Pembroke Road.	As part of the Proposed Scheme it is proposed to restrict vehicular traffic (except bicycles) from accessing Pembroke Road from the Elgin Road approach. Following the implementation of the scheme, vehicular traffic (except bicycles) would no longer be able to turn onto Pembroke Road from Elgin Road. Access to Pembroke Road will still be available via the surrounding road network.
ESB substation at Roly's Bistro – Herbert Park Road	A5810	Currently, there is an existing ESB substation adjacent to Roly's Bistro at Herbert Park Road. ESB access this substation through a gated access at Herbert Park Road	As part of the Proposed Scheme, it is proposed to relocate this ESB substation locally. As such this existing right of way will be removed. Access to be maintained to the relocated substation.
1-11 Pembroke Road	A6700	There are two existing shared vehicular accesses to a row of properties at 1-11 Pembroke Road.	As part of the Proposed Scheme it is proposed to close the western access at No. 1, to vehicular traffic (except bicycles). Following the implementation of the Proposed Scheme, vehicular traffic would no longer be able to use the western access, however an alternative vehicular access will be provided in close proximity in the southernmost corner of the site off Waterloo Road. The existing eastern vehicular access will also remain in place.

4.5.5 Section 5: Nutley Lane

4.5.5.1 General overview of the Proposed Scheme

This alignment of the Proposed Scheme ties in with the existing signalised junction of the R138 Stillorgan Road and Nutley Lane. Proposed works to this junction include removing the existing left turn slip lane from Nutley Lane to the R138 Stillorgan Road, and providing a new two-way cycle crossing across the R138 Stillorgan Road on the eastern arm of the junction. Between the R138 Stillorgan Road and Nutley Road, a four lane cross-section is proposed, with a bus lane and a general traffic lane in each direction. It is proposed that a two-way cycle track will be provided on the eastern side of Nutley Lane, continuing north past the entrance to Elm Park Golf & Sports Club. This proposed cross-section includes the requirement for land acquisition from the properties currently occupied by RTÉ and Eir.

Between the entrance to Elm Park Golf & Sports Club and the entrance to SVUH, no footpath is proposed on the Elm Park Golf & Sports Club side of road, however, a Toucan crossing will be provided just north of the access to Elm Park Golf & Sports Club. The proposed two-way, 3.0m wide, cycle track will continue on the Elm Park Golf & Sports Club side of Nutley Lane, as far as the SVUH access junction. The existing footpath and verge on the north-western (residential) side of this stretch of Nutley Lane, is proposed to be retained, which in turn allows the trees on this side of the road to also be retained. No land acquisition of any residential property (i.e., no boundary wall of residences will be affected) along this stretch of Nutley Lane will be required, however, to achieve the proposed cross section, land acquisition from the Elm Park Golf & Sports Club as well as SVUH will be required.

Toucan crossings are proposed at the SVUH access junction to connect the two-way cycle track to the single cycle tracks to the north.

At the access junction to SVUH, a right turn lane into the hospital is proposed which requires a curtailment of the receiving southbound bus lane in order to mitigate potential impact on the operation of internal roadways within the hospital. Southbound bus priority will be enabled through signal controlled priority provided on the northern arm.

From the access junction to SVUH to the junction of Nutley Lane with Merrion Road, the proposed cross-section comprises four lanes, including a bus lane and a general traffic lane in each direction with a single cycle track in each direction also. To achieve the proposed cross section along this stretch of Nutley Lane, land acquisition from the Merrion Shopping Centre as well as SVUH will be required.

4.5.5.2 Deviations from Standard Cross Sections

The width of the cross-sectional elements as outlined in Section 4.6.1 have been reduced (from published guidance, e.g., DMURS), at a number of constrained locations across the Proposed Scheme. The deviations within Section 5 are detailed in Table 4.29.

Table 4.29: Reduced Standard Cross Sections on Section 5 – Nutley Lane (R138 to Merrion Road)

Location	Design Element	DMURS / NCM	Type	Design	Justification
Ch. B-040 – A570	Cycle track (two-way)	3.25m	Deviation	3.0m	Approximately 610m of narrowed two-way cycle track on the east side of Nutley Lane. Providing a standard width would result in the loss of a further number of trees and would require additional land acquisition to adjacent private properties with more significant impacts. This narrowed width enables the retention of the existing kerb line on the west side of the road and as such provides more opportunities for the retention of existing trees at the footway edge.

4.5.5.3 Bus Lane Provision

An overview of the bus provision being proposed 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 a junction in Section 5 of the Proposed Scheme as listed in Table 4.30.

Table 4.30: Signal Controlled Bus Priority Junctions within Section 5 – Nutley Lane (R138 to Merrion Road)

Junction Location	Priority Type	Note
Nutley Lane / St. Vincent's Hospital	Separate bus stages on mainline corridor. Bus Lanes up to stop lines on mainline corridor.	Onset of receiving bus lane in outbound direction delayed to avoid significant impact to existing private property, including an existing internal roadway.

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. The bus stop locations and types are outlined in Table 4.24. and shown in the General Arrangement series of drawings (BCIDC-ARP-GEO_GA-1415_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 4.31: Proposed Bus Stop Locations within Section 5 – Nutley Lane (R138 to Merrion Road)

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type	Bus Shelter
Inbound	Nutley Avenue	2086	B0650	Shared Landing Bus Stop	Proposed: Yes Existing: Fingerpost
Inbound	Nutley Lane, RTE	2085	B0160	Inline Bus Stop (no cycle track)	Proposed: Yes Existing: Fingerpost
Outbound	Nutley Lane	7053 Relocated	B0650	Shared Landing Bus Stop	Proposed: Yes New location
Outbound	Nutley Lane, RTÉ	2089 Relocated	B0140	Shared Landing Bus Stop	Proposed: Yes New location

4.5.5.5 Cycling Provision

The specific proposals for cycling facilities in Section 5 of the Proposed Scheme are described below. Provisions for cyclists at the signal-controlled junctions are described in Section 4.3.1.5.

At the western end of this section, a new segregated two-way cycle track will be provided on the eastern side of Nutley Lane, tying in with the junction on the R138 Stillorgan Road. An associated two-way crossing is proposed on the out-of-town arm of this junction. The two-way cycle track will continue along the Proposed Scheme along Secondary Route 13E (as annotated in the GDA Cycle Network Plan), as far as the junction with SVUH. From this junction northwards to the end of the section at the Merrion Road, a single segregated cycle track will be provided in each direction. Shared spaces and Toucan crossings are proposed at the junction to connect the two-way cycle track to the single cycle tracks. This also offers connectivity to Nutley Avenue, through which the nearby St. Michael's College can be accessed by cyclists.

There are currently no dedicated cycle facilities on this section.

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 and moderate 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 Name	Summary	Signal Operation
Major Junctions (Signalised)		
N/A		
Moderate Junctions (Signalised)		
Stillorgan Road / Nutley Lane	This is where the Proposed Scheme ties in with the existing measures on the R138 Stillorgan Road). The design is also such that it aligns with the current proposals within the Bray to City Centre Core Bus Corridor Scheme, and ensures both schemes can be completed independently as well as being compatible when both schemes are constructed. The design will include the incorporation of a two-way cycle crossing on southern arm of Stillorgan Road for better cycle provision and the introduction of controlled pedestrian crossing across Nutley Lane. Left turning vehicles from Nutley Lane will share the bus lane on approach to the junction as the left turn slip lane will be removed. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.	A five stage signal operation is proposed. Straight-ahead and left-turning mainline traffic and buses will operate in the same stage, with left turning vehicles into Greenfield Park to give way to cyclists on flashing ambers. Northbound mainline movements will continue with the right turn into and left turn out of Nutley Lane. Northbound movements will stop to allow the right turn into Greenfield Park. Nutley Lane and Greenfield Park will operate together. The two-way cycle movement across Stillorgan Lane will operate in their own stage.
Nutley Lane / St Vincent's Hospital	The junction will be reduced in size by removing flare on entry to the junction in order to maximise the provision for pedestrians and cyclists. Toucan crossings will be introduced on the northern and eastern arms to enable the transition from the two-way cycle track to the two single cycle facilities. The southbound bus lane on the southern arm will be curtailed, with bus priority to be enabled through priority signalling, in order to minimise the impact of land take on the adjacent property. With consideration for granted planning permission for the junction, a right turn lane is proposed from Nutley Lane into SVUH.	A five stage signal operation is proposed, for buses on both arms and straight-ahead traffic on the western approach to operate within the same stage through the junction. The western approach will continue as traffic on the eastern approach starts, to be followed by right turning mainline traffic running unopposed. The side arm traffic will operate in its own stage, followed by pedestrians and cyclists on the Toucan crossings.

4.5.5.7 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 4.33 and Table 4.34 respectively.

Table 4.33: Section 5 – Nutley Lane (R138 to Merrion Road): On-Street Parking Spaces Change Impact Summary

Location	Type of Parking		Existing	Proposed	Change
Between Nutley Road to Nutley Ave	Designated Paid	Residential	39	0	-39
Adjacent to Merrion Shopping Centre	Disabled Designated Paid Parking	Commercial	4	0	-4
	Designated Paid	Commercial	1	0	-1
Approx. adjacent on-street parking within 200m			105	105	0
Total			149	105	-44

Table 4.34: Section 5 – Nutley Lane (R138 to Merrion Road): Existing and Proposed Loading Bays

Location	Type of Parking		Existing	Proposed	Change
Adjacent to Merrion Shopping Centre	Loading Bay	Commercial	2	0	-2
Total			2	0	-2

4.5.5.8 Landscape and Urban Realm

For an overview of the landscape design principles and approach, reference should be made to Section 4.6.12. The Proposed Scheme includes widening into the golf course and hospital frontage along Nutley Lane to retain the character and integrity of the residential side of the street and provide a two-way cycle track on the opposite side. The existing hedgerow boundaries to the golf course and hospital grounds will be reinstated along the revised boundary alignment.

4.5.5.9 Land Acquisition and Use

Permanent land take is required through this section to facilitate the scheme, including junction reconfiguration, and widening works into the Eir telephone exchange, RTÉ Studios, Elm Park Golf & Sports Club, the Merrion Shopping Centre and SVUH. There is no permanent land take from residential properties proposed on this section.

Temporary land take is required within this section to facilitate:

- Boundary works to amend one of two vehicular entrances to a residential property on Nutley Lane;
- Widening works and boundary construction at RTÉ Studios, and construction of new entry treatment at entrances;
- Widening works and boundary construction at Elm Park Golf & Sports Club;
- Widening works, boundary construction, and regrading at SVUH; and
- Footpath regrading / resurfacing at areas in front of the Merrion Shopping Centre.

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).

4.5.5.10 Rights of Way

Table 4.35 outlines the locations where existing rights of way will be affected by the Proposed Scheme.

Table 4.35: Existing rights of way affected by the Proposed Scheme

Location	Chainage	Existing Situation	Proposed Change
RTÉ	A3800	Currently Cairn Homes and ESB have rights to access/pass through RTÉ grounds.	As part of the Proposed Scheme it is proposed to widen the road at this location requiring the existing access point to be relocated slightly, potentially resulting in a temporary interference with access to the substation. Access to the site will be retained throughout the construction works and will continue to operate as before once complete.
118 Nutley Lane	B-50	There is an existing vehicular access to 118 Nutley Lane which is accessed from the slip lane connecting Nutley Lane and Stillorgan Road.	As part of the Proposed Scheme it is proposed to close this access to vehicular traffic (except bicycles). Following the implementation of the Proposed Scheme, vehicular traffic would no longer be able to use the existing access, however there is currently a second access to the property off Nutley Lane which will continue to remain available for use.

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 urban realm encapsulated in the PDGB 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 4.8.

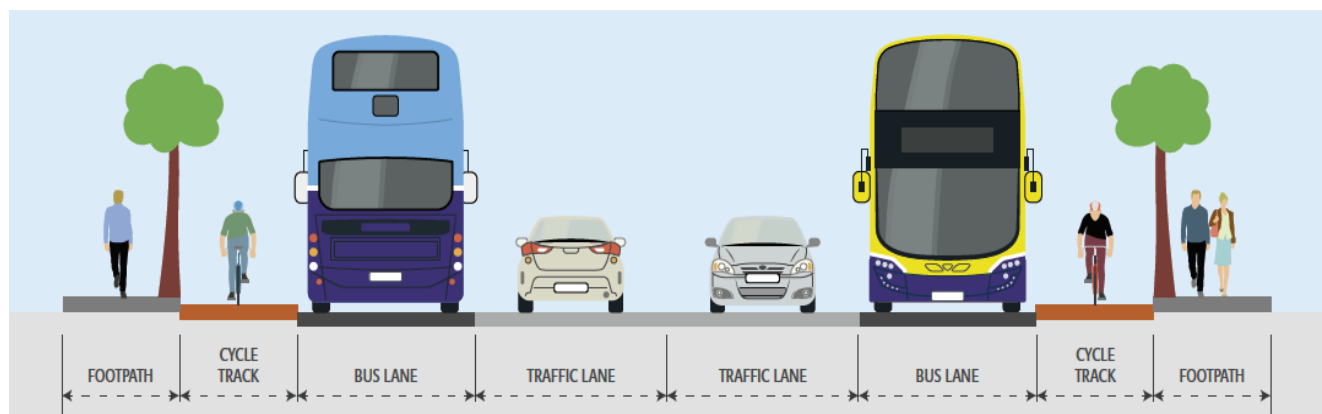


Image 4.8: Typical BusConnects Road Layout (PDGB)

The cross-sectional design of the mainline has been developed to achieve the desirable width criteria contained within the PDGB wherever reasonably practicable. Where these criteria are not achievable, for instance due to physical constraints at pinch points, the widths have been reduced as shown within Table 4.36.

Table 4.36: Cross-Sectional Design Parameters

Design Element	Desirable Minimum Standard	Minimum Width	Permitted Reductions at Constraints
Footway	2.0m	1.8m	1.2m (over distances <2m as per Preliminary Design Guidance Booklet in Appendix A4.1 in Volume 4 of this EIAR)
Cycle Track (one-way)	2m	1.5m	1.2m (over distances <2m as per Preliminary Design Guidance Booklet in Appendix A4.1 in Volume 4 of this EIAR)
Cycle Track (two-way)	3.25m + 0.5m (buffer)	Refer to National Cycle Manual Width Calculator. 0.3m (buffer)	Reduced at bus stops.
Bus Lane	3.0m	3.0m	n/a
Traffic Lane	3.0m (<60kph)	3.0m	2.75m (low HGV flow)

For the Proposed Scheme the width of the bus lanes and traffic lanes have not been reduced below 3.0m. The width of the cross-sectional elements detailed in Table 4.36 have been reduced at a number of constrained locations across the Proposed Scheme. These deviations from the standards are outlined for each section of the Proposed Scheme in Section 4.5 above.

4.6.2 Pedestrian Provision

4.6.2.1 Footpath Widths

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

Where possible, DMURS recommends that designers provide pedestrian crossings that allow pedestrians to cross the street in a single, direct movement. To facilitate road users who cannot cross in a reasonable time, the desirable maximum crossing length without providing a refuge island applied across the Proposed Scheme is 19m. This is applicable at stand-alone pedestrian crossings as well as at junctions. There are cases where it has been necessary to provide crossing lengths greater than 19m in village settings where large pedestrian volumes are expected and where space for central medians cannot be provided.

Refuge islands should be a minimum width of two metres. Larger refuge islands should be considered by designers in locations where the balance of place and movement is weighted towards vehicle movements, such as areas where the speed limit is 60kph or greater, in suburban areas or where there is an increased pedestrian safety risk due to particular traffic movements. Where a refuge island is provided, straight crossings are desirable, and the refuge island has been designed to be 4m wide or more. At a staggered crossing, islands of less than 4m in width may be provided, and these have been designed to have a minimum effective width of 2m between obstacles such as signal poles.

Along the Proposed Scheme pedestrian crossings varying from 2.4m and 4m in width have been incorporated. Larger pedestrian crossing widths have been allocated in areas that are expected to accommodate a high number of pedestrians crossing or at locations where both pedestrians and cyclists share a crossing such as at a Toucan crossing.

At signalised junctions and standalone pedestrian crossings, the footpath is to be ramped down to carriageway level to facilitate pedestrians who require an unobstructed crossing. At minor junctions, raised tables are provided to raise the road level up to footpath level and facilitate unimpeded crossing. Tactile paving is provided at the mouth of each pedestrian crossing and audio units will be provided on each traffic signal push button to assist mobility impaired users. Pedestrian crossings are indicated in the Landscaping General Arrangement drawings (BCIDC-ARP-ENV_LA-1415_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 (BCIDC-ARP-ENV_LA-1415_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 2m. 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 will provide fully segregated cycle tracks provided throughout its entirety, which is 8.3km in length, compared with an existing provision of just 0.7km of cycle track and 7.1km unsegregated cycle lane. 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 4.9, taken from the PDGB.

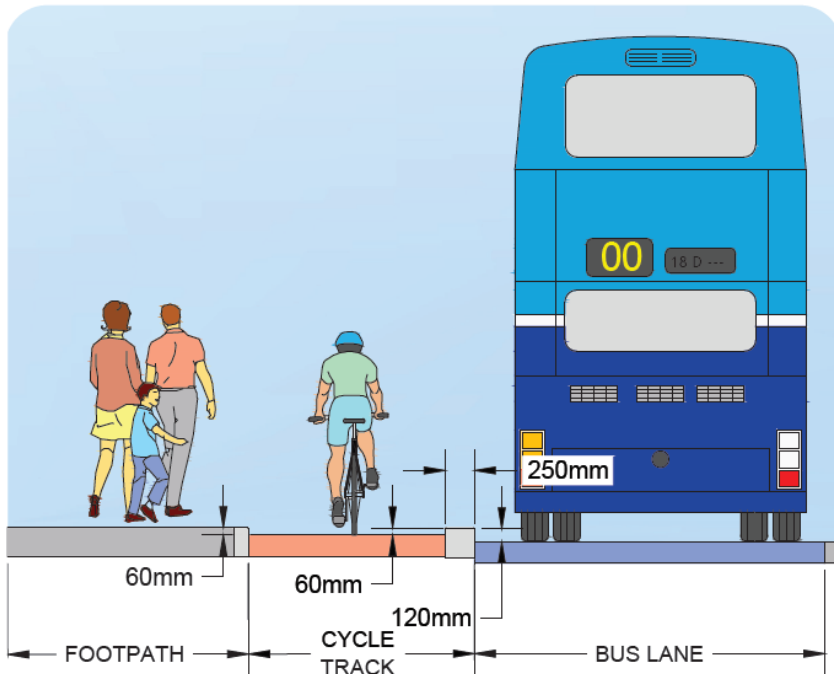


Image 4.9: Fully Segregated Cycle Track

Segregated cycle tracks have been provided throughout the entirety of the Proposed Scheme. 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, such as along Merrion Road and Pembroke Road in particular.

4.6.3.2 Cycle Lanes

Cycle lanes do not have vertical and / or horizontal separation from adjacent traffic lanes. There are no sections of cycle lane proposed as part of the Proposed Scheme with cycle tracks being preferred where practicable.

4.6.3.3 Quiet Street Treatment

As there is provision for fully segregated cycle facilities along the entire length of the Proposed Scheme, there will be no Quiet Street Treatments required.

4.6.3.4 Treatment of Constrained Areas

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.

4.6.3.5 Cycling 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 BusConnects Infrastructure team 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 (BCIDC-ARP-GEO_GA-1415_XX_01-DR-CR-9001) included in Volume 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 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. In general, bus lanes will be a minimum of 3m wide. 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 (BCIDC-ARP-GEO_GA-1415_XX_01-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 4.10 illustrates a schematic operation of SCP.



Image 4.10: 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 the Merrion Road, in the inbound direction only between Merrion Gates Junction and Elm Court Apartments – Approximately 100m length;
- Merrion Road between Ailesbury Road and WFC (inbound) – Approximately 250m length;
- Merrion Road between WFC and Shrewsbury Road (outbound) – Approximately 305m length;
- Baggot Bridge and Baggot Street Upper between Herbert Place and Baggot Village (inbound and outbound) – Approximately 90m length inbound and approximately 145m length outbound; and
- On Nutley Lane in the southbound direction from the junction at SVUH – Approximately 70m 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.

A Bus Gate is proposed on Pembroke Road between the junctions of Eastmoreland Place and Waterloo Road. This results in a shared lane in each direction for buses and general traffic on Pembroke Road between Eastmoreland Place and Northumberland 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 assessment.

The criteria that are considered when locating a bus stop are as follows:

- Driver and waiting Passengers are clearly visible to each other;
- Location close to key facilities;
- Location close to main junctions without affecting road safety or junction operation;
- Location to minimise walking distance between bus interchange stops;
- Where ideally there is space for a bus shelter;
- Location in pairs, 'Tail to Tail' opposite sides of the road;
- Close to (and on exit side of) pedestrian crossings;
- Away from sites likely to be obstructed; and
- Adequate footpath width.

For the Core Bus Corridor Infrastructure Works it is proposed that bus stops should be preferably spaced approximately 400m apart on typical suburban sections of route, dropping to approximately 250m in urban centres.

It is important that bus stops are not located too far from pedestrian crossings as pedestrians will tend to take the quickest route, which may be hazardous. Locations with no or indirect pedestrian crossings should be avoided.

The following bus stop designs were considered for use on the Proposed Scheme - the Island Bus Stop, the Shared Landing Bus Stop, the Inline Bus Stop and the Layby Bus Stop.

Further detail on the design and locations of bus stops along the Proposed Scheme are described in Section 4.5.

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/cyclist conflict, a pedestrian priority crossing point is provided for pedestrians accessing the bus stop area. Part-time signals will enable controlled crossing when. Visually impaired pedestrians may call for a fixed green signal when necessary and the cycle signal will change to red. The cycle track will narrow from 2.0m to 1.5m for single file cycling through the bus stop, as overtaking is not required in this area.

An example of an Island Bus Stop is showed in Image 4.11 (One-way Cycle Track) and Image 4.12 (Two-way Cycle Track).

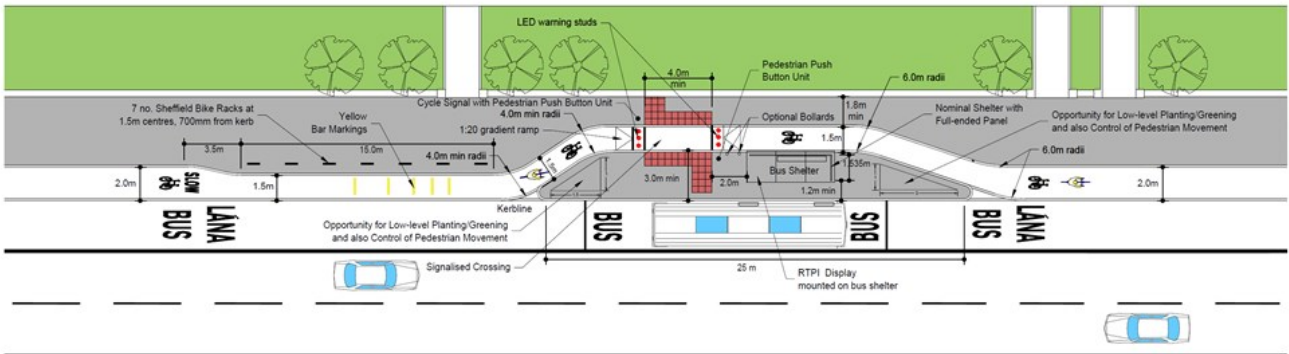


Image 4.11: Island Bus Stop Arrangement – One-way Cycle Track

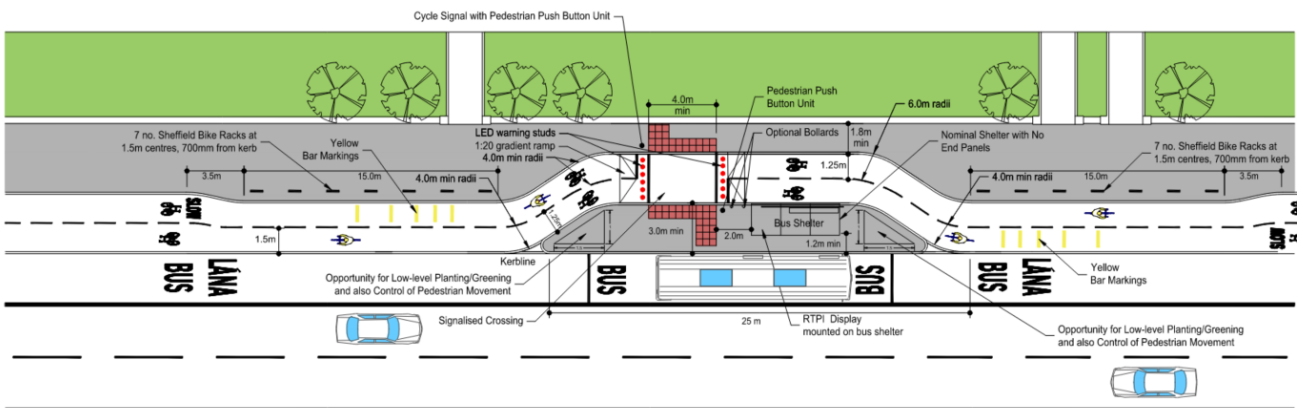


Image 4.12: Island Bus Stop Arrangement – Two way Cycle Track

4.6.4.5.2 Shared Landing Bus Stops

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 Bus Stop is shown in Image 4.13.

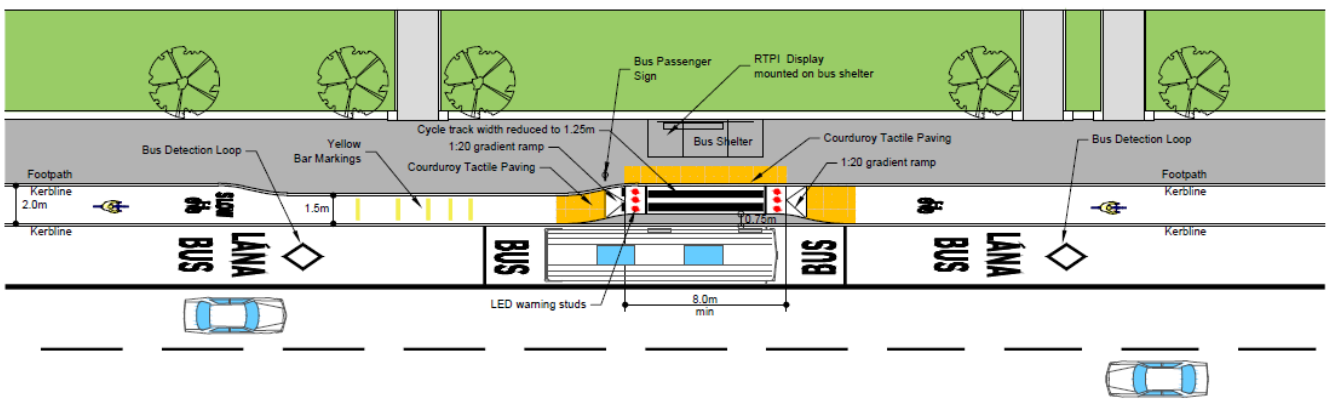


Image 4.13: Shared Landing Bus Stop

The location of Shared Landing Bus Stops, which are used for most of the bus stops along the Proposed Scheme, are described in Section 4.5.

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 footway. One Inline Bus Stop will be located on the Proposed Scheme; RTÉ along Nutley Lane.

4.6.4.5.4 Layby Bus Stop

Layby bus stops can provide an effective solution for coaches with long dwell times at bus stops, allowing other buses to pass the stopped bus. In these cases, and where space has permitted, a separate layby bus stop has been proposed.

An example of a Layby Bus Stop is shown in Image 4.14.

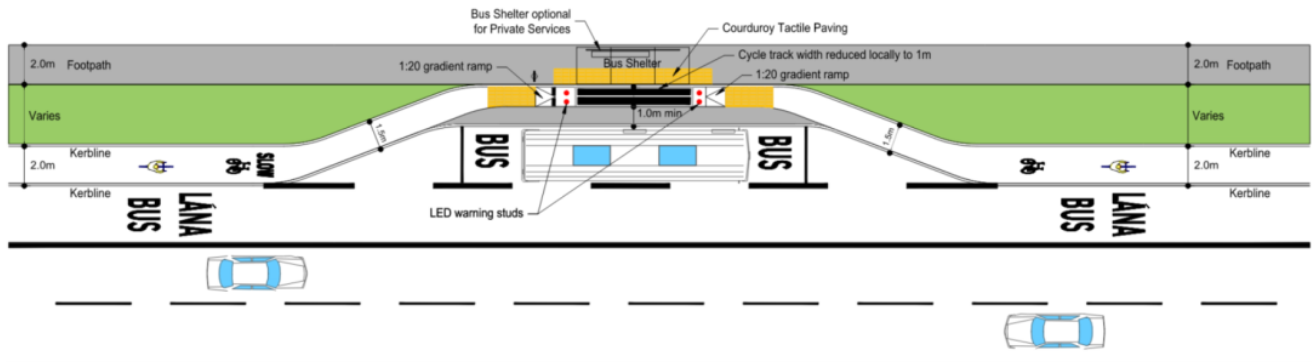


Image 4.14: Layby Bus Stop Landing Arrangement

4.6.4.5.5 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.

4.6.5 Accessibility for Mobility Impaired Users

The aim of the Proposed Scheme is to provide enhanced walking, cycling and bus infrastructure along the corridor. 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);
- How Walkable is Your Town? (NDA 2015);
- Shared Space, Shared Surfaces and Home Zones from a Universal Design Approach for the Urban Environment in Ireland (NDA 2012);
- Best Practice Guidelines, Designing Accessible Environments. Irish Wheelchair Association (IWA) (IWA 2020).;
- UK DfT Inclusive Mobility (UK DfT 2005);
- UK DfT Guidance on the use of tactile paving surfaces (UK DfT 2007); and
- BS8300:2018 Volume 1 Design of an accessible and inclusive built environment. External Environment- 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. A Disability Audit of the existing environment and proposed draft preliminary design for the corridor was undertaken. The Audit provided a description of the key accessibility features and potential

barriers to disabled people based on the Universal Design standards of good practice. The 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 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 prioritised, where possible, 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 Interchange 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:

- DART stations along the route, notably Blackrock, Booterstown, Lansdowne, Sandymount and Sydney Parade;
- Existing bus services at numerous locations along the route, including routes 39a, 145, 155, 47, 27x, 4, 7, 7a, 18, 38, 38a, 39, 39a, 70, 37, 46e, 84, 17 and 114;
- Future Bus service proposals including Spine B and Spine E associated with the New Dublin Area Bus Network;
- Future Rail public transport services including DART+ and MetroLink; and
- Greater Dublin Area Cycle Network Plan (GDACNP) (NTA 2013) which capture the East Coast Trail (Sutton to Sandycove Greenway) and the Dodder Greenway.

4.6.6.2 Integration with Other Road Users

General traffic flow and local access will 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 along the route, without removing the option for general traffic to use the route. 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 Other Infrastructure Projects

Several infrastructure projects are planned within the vicinity of the Proposed Scheme which will interface with the proposals. These are outlined below:

Maldron Hotel at Former Tara Towers

This project includes a four-star Maldron hotel with 140 rooms, a restaurant, bar, and meeting facilities being constructed on the former Tara Towers hotel site on Merrion Road. The Proposed Scheme ties in with the proposed boundary and footpath works along Bellevue Avenue at this location.

Blackrock Park Masterplan 2020

A detailed plan has been proposed for Blackrock Park, undertaken by DLRCC Parks Section (with input from other departments within DLRCC) and it includes specific upgrades to the Booterstown DART Station junction and the integration with Blackrock Park. The Proposed Scheme integrates with the proposals for pedestrian and cycling connectivity at this location.

Former Gowan Motors Site

A private developer has received planning permission from An Bord Pleanála to build 63 apartments on the site formerly occupied by Gowan Motors on the Merrion Road in Dublin 4. The required road widening at this location associated with the Proposed Scheme has been coordinated with the proposals for this site.

National Maternity Hospital

Planning permission has been granted to build a new national maternity hospital on the site of SVUH campus. The associated works include the reconfiguration of the access junctions on Nutley Lane and Merrion Road. The Proposed Scheme has been coordinated with the proposals for this site at these junctions.

Dodder Greenway at Ballsbridge

Plans are being developed by DCC for the Dodder Greenway, with the Ballsbridge (Beatty's Avenue to Herbert Park) section being particularly relevant to the Proposed Scheme. Coordination has been carried out between the BusConnects Infrastructure team and DCC on the potential integration opportunities, with the Proposed Scheme including a Toucan crossing at this location and portions of two-way cycle tracks.

In the potential interim scenario whereby the Dodder Greenway infrastructure is not in place on Anglesea Road in advance of the Proposed Scheme, minor refinements to kerb extents and line markings relating to the proposed two-way cycle track here shall be implemented on Anglesea Road to tie-in with the existing environment.

ESB Headquarters on Fitzwilliam Street Lower

A new Headquarters for the ESB, is being constructed (and nearing completion at the time of writing) on Fitzwilliam Street Lower in the first block to the south of Merrion Square. The Proposed Scheme has been co-ordinated with the proposals for this site along this frontage.

East Coast Trail (Sutton to Sandycove Greenway)

The East Coast Trail forms part of a proposed National Cycle Network (NCN), which identifies a network of 13 national cycle routes. NCN Corridor 5 runs along the East Coast from Rosslare through Dublin to the border with Northern Ireland and onward to Belfast and Larne. The Sutton to Sandycove (S2S) Greenway section of the East Coast Trail will interact with the Proposed Scheme between the Merrion Road / Strand Road junction and the Merrion Road / Booterstown DART Entrance junction. As a result, the Proposed Scheme includes a two-way cycle track on the coast side of Merrion Road between Strand Road and Booterstown DART Entrance to accommodate the S2S section of the East Coast Trail and avoids cyclists travelling on the greenway in either direction from having to cross the road to continue on the East Coast Trail as it interacts with the Proposed Scheme.

4.6.6.4 Integration with Other Adjacent BusConnects Core Bus Corridor Schemes

As part of the design of the Proposed Scheme, consideration has been given to the potential coordination required in relation to other schemes within the BusConnects CBC Infrastructure Works. This section outlines potential interactions of the Proposed Scheme with adjacent scheme(s) and identifies any procedures within the construction strategies that may be required in order to account for various sequencing scenarios in the construction of the schemes.

The closest such scheme to the Proposed Scheme is the Bray to City Centre Core Bus Corridor Scheme (the Bray Scheme), with which the Proposed Scheme interacts at the signalised junction of the R138 Stillorgan Road and Nutley Lane (henceforth referred to as the subject junction).

The BusConnects Infrastructure Team has coordinated the design tie-ins to ensure a holistic design has been achieved, so that each scheme can be implemented, and integrated, regardless of the sequencing of their construction. The Proposed Scheme intends to tie-in with the subject junction at the Nutley Lane arm in terms of main carriageway, cycle facilities and footpaths, with some minor interventions required at the junction associated with a new two-way cycle crossing facility. Image 4.15 shows an extract of the preliminary design of the Proposed Scheme at the subject junction.

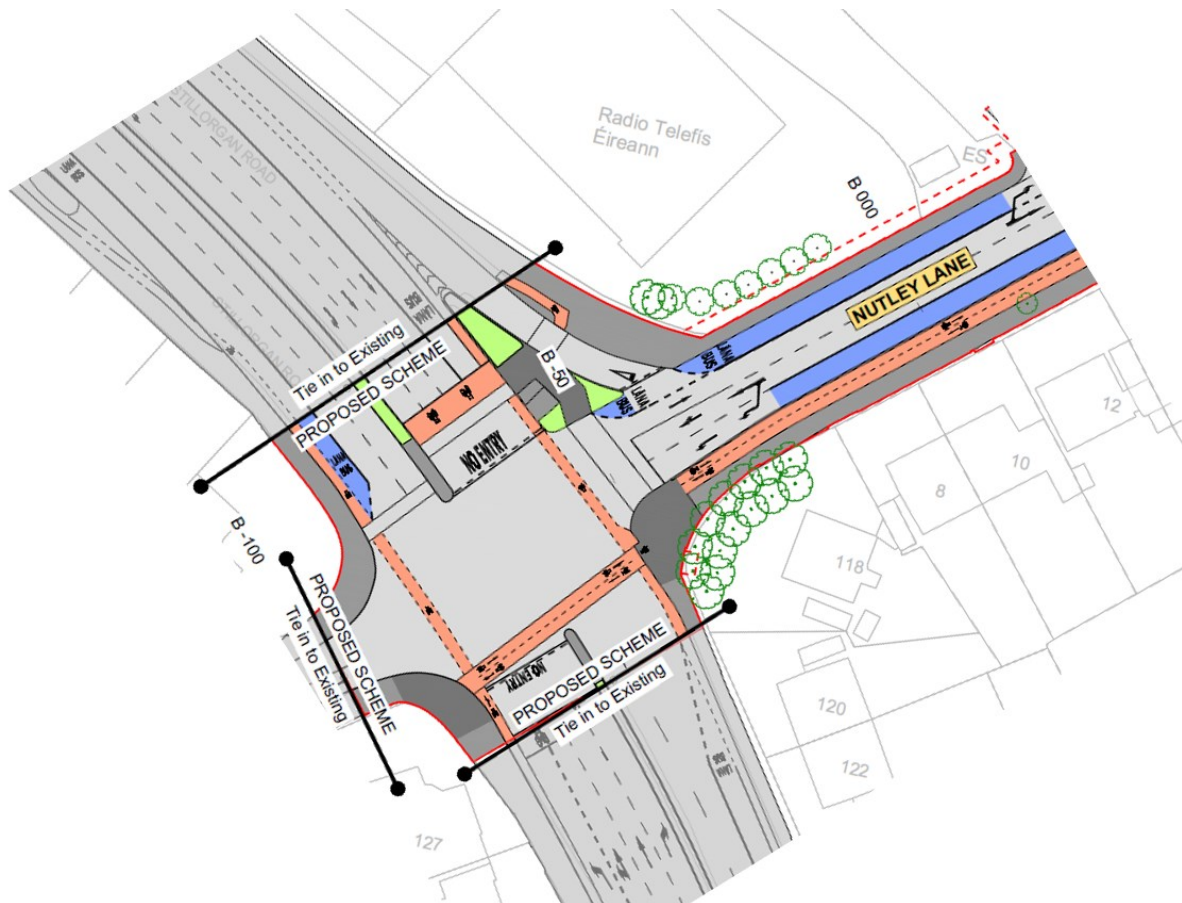


Image 4.15: Preliminary design of the Proposed Scheme tie-in with the Bray to City Centre Core Bus Corridor Scheme

The Bray to City Centre Core Bus Corridor Scheme proposes significant amendments to the existing junction to bring it in line with the PDGB, i.e. bus infrastructure, projected junction for cyclist principles, pedestrian crossing amendments etc. Image 4.16 shows an extract of the latest design (at the time of writing) of the Bray Scheme at the subject junction.

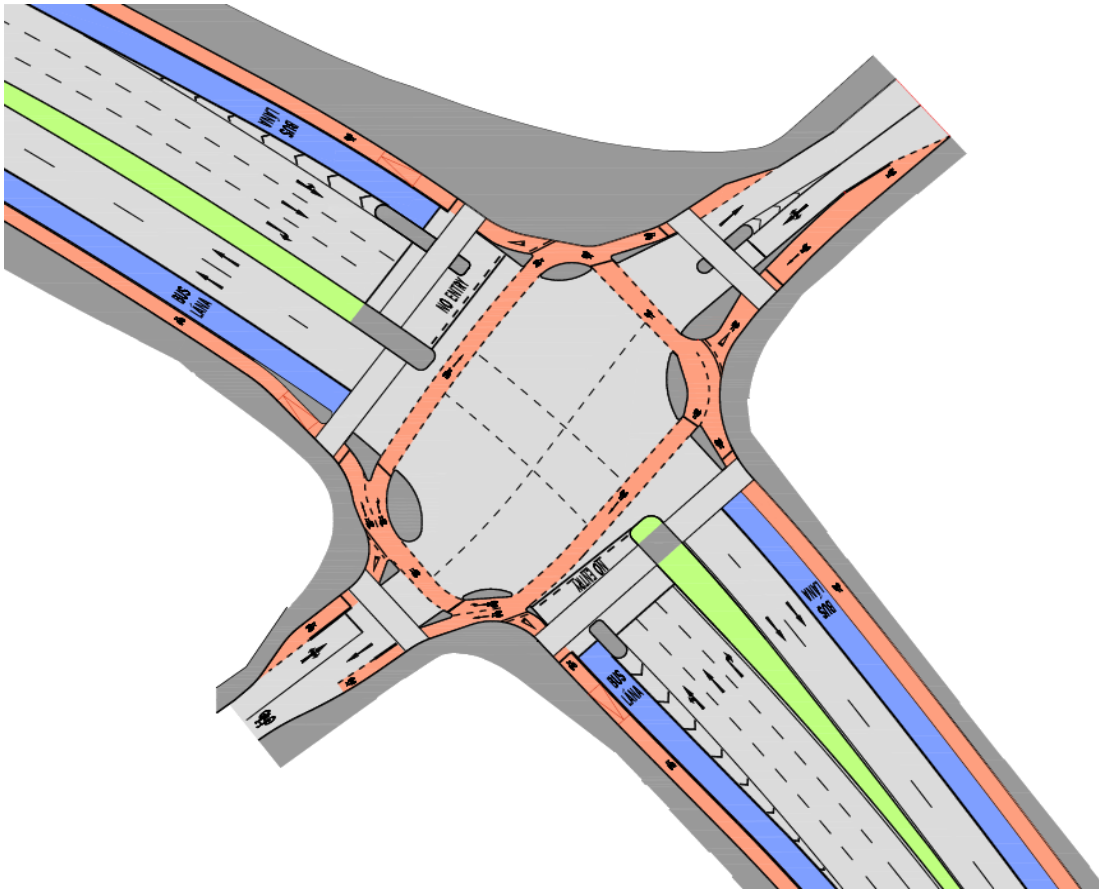


Image 4.16: Preliminary design of the Bray to City Centre Core Bus Corridor scheme at the subject junction

Image 4.17 shows an indicative coordinated design of the expected overall arrangement in a scenario in which both schemes have been implemented.

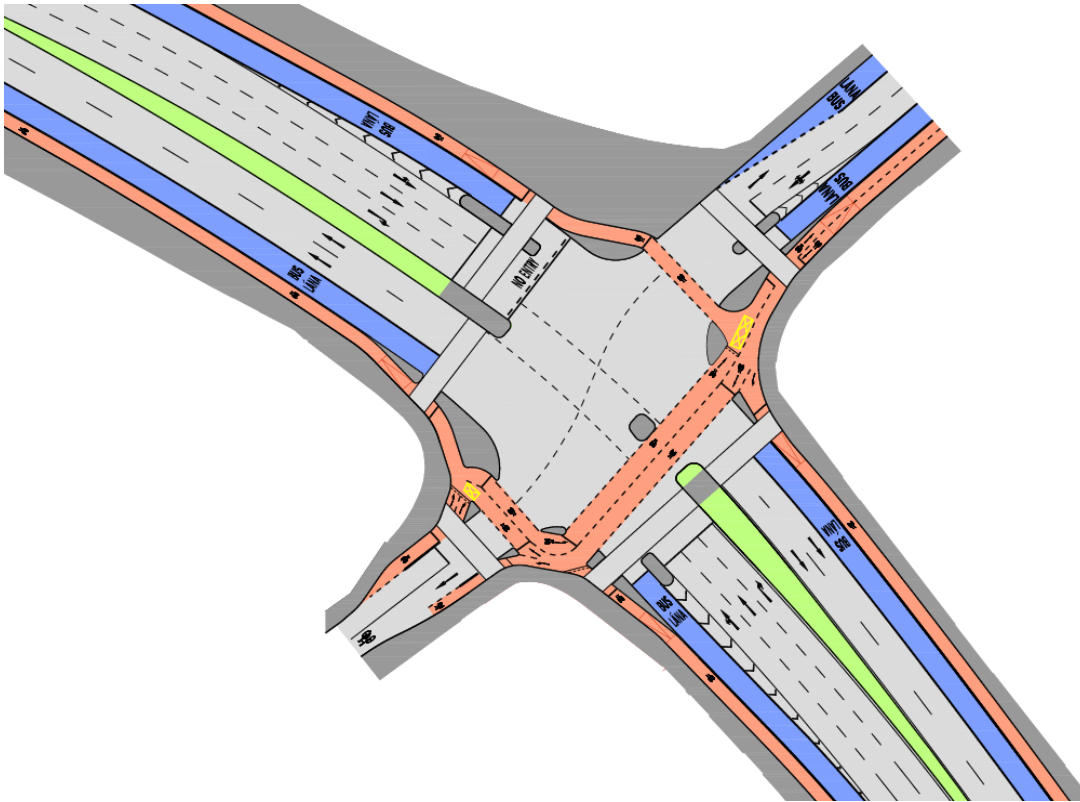


Image 4.17: Preliminary design of the expected overall arrangement of the Proposed Scheme and the Bray to City Centre Core Bus Corridor

The Bray to City Centre Core Bus Corridor Scheme is subject to a separate planning process, the timing of which is largely independent of that of the Proposed Scheme, and as such no exact sequencing of construction works can be determined at this stage. Table 4.37 presents a matrix of potential interactions and impacts associated with various potential sequencing scenarios in relation to construction and operation of both schemes.

Table 4.37: Matrix of potential interactions and impacts associated with different sequencing scenarios

	Bray Scheme: Not Yet Commenced	Bray Scheme: Under Construction	Bray Scheme: Completed
Proposed Scheme: Not Yet Commenced	N/A	<p>Construction of the proposed Bray Scheme shall be carried out in accordance with the Construction Strategy within that scheme's planning application, without any potential interaction with works associated with the Proposed Scheme.</p> <p>The works shall take place within the Red Line Boundary of same and tie-in with the existing environment on Nutley Lane.</p>	N/A
Proposed Scheme: Under Construction	<p>Construction of the Proposed Scheme will be carried out in accordance with the Construction Strategy within that scheme's planning application, without any potential interaction with works associated with the Bray Scheme.</p> <p>The works will take place within the Red Line Boundary of same and tie-in with the existing environment at the subject junction.</p>	<p>The R138 Stillorgan Road is likely to be required as a route for construction traffic serving the Proposed Scheme, including the route via the subject junction. Therefore, the Bray Scheme works could potentially impact upon access for construction traffic if there are significant temporary traffic management (TTM) interventions along the R138 Stillorgan Road. Similarly, portions of the Proposed Scheme, including Nutley Lane, could form part of the required construction traffic route for the Bray Scheme, and significant TTM interventions could hinder construction traffic accessibility to that scheme.</p> <p>As such, works at Nutley Lane would need to be coordinated according to the construction timelines of the two schemes. It is considered that there is sufficient flexibility in the proposed construction programmes to either align (tie-in) construction works here or keep activities staggered to occur at different stages in the programme. The approach taken will need to be determined based on detailed traffic management proposals, which will be coordinated between schemes once the start dates and detailed construction programmes are confirmed.</p> <p>A common tie-in point has been determined approximately 40m from the existing stop line on the Nutley Lane arm. In the scenario whereby construction of both schemes is being carried out in tandem at the subject junction, the works associated with the Proposed Scheme south of the agreed tie-in point would not need to be constructed.</p>	<p>The Bray Scheme will have been completed including the proposed upgrade of the subject junction.</p> <p>A common tie-in point has been determined approximately 40m from the existing stop line on the Nutley Lane arm, up to which the Proposed Scheme works will be constructed as per the coordinated design shown in Image 4.17.</p> <p>In this scenario it is not envisaged that any significant abortive works will be required, aside from minor works associated with footpath, cycle track, and pavement tie-ins.</p>

	Bray Scheme: Not Yet Commenced	Bray Scheme: Under Construction	Bray Scheme: Completed
Proposed Scheme: Completed	<p>The Proposed Scheme shall be in full operation, designed in accordance with its planning application.</p> <p>The subject junction shall remain unchanged, in terms of physical infrastructure, outside of the Bray Scheme's Red Line Boundary. Works to the subject junction shall include amendments up to and including the stop line on the Nutley Lane arm, and additional road markings and traffic signals associated with a new two-way cycle crossing across the eastern arm of the junction.</p> <p>It is considered that the southern of the two existing driveways of 118 Stillorgan Road will need to be extinguished as part of the Proposed Scheme works, and as such shall be included within the CPO process for the Proposed Scheme.</p>	<p>The Proposed Scheme will have been completed up to and including the interventions at the subject junction. As noted previously, the Bray Scheme proposes significant interventions at the subject junction, and as such any works carried out by the Proposed Scheme within the confines of the junction will be considered abortive and will be removed as part of the construction work on the Bray Scheme.</p> <p>A common tie-in point has been determined approximately 40m from the existing stop line on the Nutley Lane arm, up to which the Bray Scheme works will be constructed as per the coordinated design shown in Image 4.17.</p>	<p>The Bray Scheme will have been completed including the proposed upgrade of the subject junction.</p> <p>A common tie-in point has been determined approximately 40m from the existing stop line on the Nutley Lane arm, up to which the Proposed Scheme works will be constructed as per the coordinated design shown in Image 4.17.</p> <p>In this scenario it is not envisaged that any significant abortive works will be required, aside from minor works associated with footpath, cycle track, and pavement tie-ins.</p>

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 (Signalised);
- Moderate Junctions (Signalised); and
- Minor 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 route 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 a structural assessment has been carried out to ensure the structural capacity is fit-for-purpose for the revised arrangement.

4.6.8.1 Retaining Walls

Retaining walls with a retained height greater than 1.5m are classified as principal structures. There is a requirement for one wall greater than 1.5m along Rock Road, adjacent to Blackrock Park. The existing wall, which currently supports the road embankment, will be replaced with a new 97.5m long retaining wall with a maximum retained height of 4.0m. Refer to Bridges and Major Retaining Structures (BCIDC-ARP-STR_GA-1415_RW_01-DR-CB-9001) in Volume 3 of this EIAR and Image 4.18. Those retaining walls that have a retained height less than 1.5m are classified as minor retaining walls.



Image 4.18: Location of principal retaining wall

4.6.8.2 Archways

4.6.8.2.1 Blackrock College Archway Reorientation

The existing railings and boundary wall to Blackrock College will be dismantled and re-erected along the proposed back of the footpath. The gates, railings, and piers which form the existing entrance to Blackrock College will be rotated on the axis of the westernmost pier to accommodate the realigning of the adjacent boundary while preserving the symmetry of the protected entrance.

4.6.8.2.2 Merrion Gates Archway Relocation

The existing cut stone masonry archway located outside St Mary's Centre Nursing Home on Merrion Road at Merrion Gates will be dismantled and re-erected at the back of the proposed footpath.

4.6.8.2.3 Bloomfield Gate (Gas Networks Ireland) Archway Relocation

The existing cut stone masonry archway (referred to as the Bloomfield Gate) located outside Gas Networks Ireland Above Ground Installation (AGI) between the old Gowan Motors site and SVUH will be dismantled and re-erected in an area along the northern boundary of SVUH, sited within the existing hedge fronting onto the plaza at the junction of Merrion Road and Nutley Lane.

4.6.8.3 Retaining Walls (<1.5m)

Table 4.38: summarises the location and retained height of each minor retaining wall along the route.

Table 4.38: Summary of Minor Retaining Walls <1.5m

Ref.	Location	Chainage Start/ Chainage End	Length (m)	Max Retained Height (m)
MRW1	Castledawson Avenue	A1685 / A1715	30m	0.8m
MRW2	St. Mary's Nursing Home, Rock Road	A3410 / A3435	24m	0.9m
MRW3	Grand Canal Walkway	A6925	42m	0.9m

4.6.8.4 Other

4.6.8.4.1 Pembroke Kiosk Relocation

An existing kiosk, which is located at the junction of Pembroke Road, Lansdowne Road and Northumberland Road will be dismantled and re-erected at a new location nearby to the new proposed urban realm. The kiosk will be set back, to facilitate a new junction layout at this location. It is understood that the existing kiosk does not have a basement below the structure. Any existing services to the existing kiosk will be retained at the new location.

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*'.

A review of the existing regulatory and warning signs in the vicinity of the route was carried out to identify unnecessary repetitive and redundant signage to be removed. This includes rationalising signage structures by better utilising individual sign poles and clustering signage together on a single pole.

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 gantry signage exists along the route, and the Proposed Scheme has no requirement for any new gantry signage.

4.6.9.1.3 Road Marking

A preliminary design of road markings has been undertaken in accordance with TSM Chapter 7. 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 and the National Cycle Manual with particular attention given to junctions. Advance Stacking Locations (ASLs) have been designed where practicable 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 high number of pedestrians. DMURS classifies pedestrian crossing widths in areas of low to moderate pedestrian activity as 2.5m and areas of moderate to high pedestrian activity as 3m.

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).

Kerbs, Footways and Paved Areas (KFPA) assets along the Proposed Scheme comprise kerbs, footways and cycle tracks.

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 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.

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 (BCIDC-ARP-PAV_PV-1415_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 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:

- DN-PAV-03021 (Dec. 2010) – Pavement and Foundation Design;

- DN-PAV-03023 (Jun. 2020) – Surfacing Materials for New and Maintenance Construction for use in Ireland;
- AM-PAV-06050 (Mar. 2020) – Pavement Assessment, Repair and Renewal Principles;
- 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; and
- CC-SPW-00900 (Sep. 2017) – Specification for Road Works Series 900 – Road Pavements – Bituminous Materials.

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;
- BS 7533 series of standards (1999 – 2021) – Pavement Constructed with Clay, Natural Stone or Concrete Pavers.

4.6.10.3 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 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;
- 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.

4.6.11 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 bays were counted along the Proposed Scheme, and the proposed losses of these parking spaces and loading bays has been quantified. Mitigation measures have been identified to reduce the impact of the Proposed Scheme in so far as is reasonably practicable, by incorporating some parking provision and compensatory loading provision, and providing enhanced cycle parking facilities.

Changes to the parking and loading provisions along each section of the Proposed Scheme are described further in Section 4.5. Reference should be made to Chapter 6 (Traffic & Transport) for further information on the impacts on parking as a result of the Proposed Scheme.

4.6.12 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 commute to/from work. The urban realm encompasses all streets, squares, junctions, and other rights-of-way, whether in residential, commercial, or civic use. When well designed and laid out with care in a community setting, it enhances the everyday lives of residents and those passing through. It typically relates to all open-air parts of the built environment where the public has free access. It would include seating, trees, planting, and other aspects to 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.

4.6.12.1 Landscape and Character Analysis

The landscape and urban realm proposals are derived from analysis of the existing urban realm, including existing character, any heritage features, existing boundaries, existing vegetation and tree planting, and existing materials. For each section of the route, the design took a broad overview of typical dwelling age and style, extents of vegetation and tree cover. The predominant mixes of paving types, appearance of lighting features, fencing, walls, and street furniture was considered. The purpose of this analysis was to assess the existing character of the area and how the Proposed Scheme may alter this. The outcome of the analysis allowed the designers to consider appropriate enhancement opportunities along the route. The enhancement opportunities include key nodal locations which focus on locally upgrading the quality of the paving materials, extending planting, decluttering of streetscape and general placemaking along the route. Where possible, a SuDS approach has been taken to assist with drainage along the route.

4.6.12.2 Hardscape

4.6.12.2.1 Typical Material Typologies

Through the process of developing the Proposed Scheme, a typology and palette of proposed materials was developed to create a consistent design response for various sections of the route. The proposed materials were based on the existing landscape character, existing materials, historical materials while also identifying areas for betterment through the use of higher quality surface materials. The Landscaping General Arrangement drawings (BCIDC-ARP-ENV_LA-1415_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 footpaths can be laid without a kerb, can have neatly trowelled edges and textured surface for a clean, durable, slip resistant surface;
- **Asphalt footpath.** - Widely used on existing footpaths and will tie in with other sections of urban realm. Laid with a road kerb, can have a smooth finish or textured aggregate surface, provides a strong flexible slip resistant surface. Opportunities to retain good quality kerbs have been explored and tie-in points considered;
- **Precast concrete unit paving.** - Either concrete paving slabs or concrete block, there is a very wide variety of sizes and colours available to provide an enhanced urban realm. The use/reuse of granite kerbs where appropriate will further enhance the urban realm. This type of material use is mostly employed in non-inner-city urban realm enhancements;
- **Natural stone paving.** - Employed for high quality urban realm areas, mostly in city centre locations. This typology represents natural stone surface treatments such as granite and are used to create enhanced public spaces for major urban realm interventions;
- **Stone or Concrete setts.** - Proposed for distinguishing pedestrian crossing points either on raised table or at road level;
- **Self-binding gravel.** - Proposed for pedestrian paths set away from the road expected to see less traffic. Used for natural areas, for example, paths through wildflower meadows. They provide a defined informal route as an alternative to asphalt or concrete; and
- **No change.** - In addition to areas with proposed material changes, there were also areas identified where no change in materials would be required. For example, where pavement has recently been laid and is in good condition. The design also explores opportunities where good quality kerbs such as granite kerbs could be reused, which would have both cost and sustainability advantages.

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; and
- 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.

4.6.12.3 Softscape

4.6.12.3.1 Planting Strategy

The planting strategy has been developed to meet the needs of the Dún Laoghaire-Rathdown County Development Plan 2016-2022, the Dublin City Tree Strategy and the Dublin Biodiversity Action Plan as follows:

- Where possible the initial conservation of existing biodiversity has been considered;
- Opportunities have been identified to enhance biodiversity through green infrastructure;
- Promote the role of street trees planting consistent with the recommendations of the Dún Laoghaire-Rathdown County Development Plan 2016-2022 and Dublin City Tree Strategy; and
- Develop the role of SuDS opportunities within the Proposed Scheme to ideally reduce impervious areas for drainage management benefit.

4.6.12.4 Arboricultural Survey

4.6.12.4.1 Scope of Assessment

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.

4.6.12.5 Typical Planting Typologies

Several typologies were developed. These are discussed further below.

4.6.12.5.1 New Street Trees

As noted on the Landscaping General Arrangement (BCIDC-ARP-ENV_LA-1415_XX_00-DR-LL-9001) in Volume 3 of this EIAR, a range of urban street tree species (Image 4.19) 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.

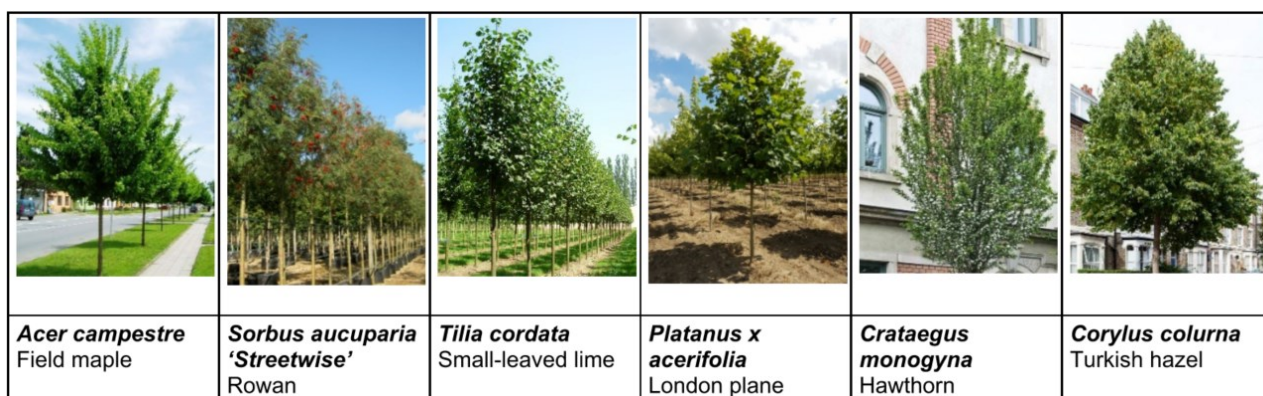


Image 4.19: Street tree species

4.6.12.5.2 New Woodland / Parkland Areas and Tree Groups

The Proposed Scheme corridor includes existing mature woodland / parkland, street trees and scrub areas, some of which will be impacted where the existing carriageway is to be widened or cycling infrastructure is to be provided. It is proposed to reinstate construction working areas and also to replant the edges of impacted areas to as to reinstate the streetscape or roadway character.

Woodland / parkland tree planting will typically comprise bare-root native tree species including (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) and *Prunus spinosa* (Blackthorn).

Elsewhere along the Proposed Scheme there are a range of existing mature and immature street trees. While it is proposed to retain and protect existing trees wherever possible, some will be impacted. The Proposed Scheme includes replacement and additional planting of semi-mature street trees to mitigate the loss of existing trees and to maintain the long-term tree-lined character of streets.

The Proposed Scheme incorporates additional landscaping arising from junction reconfiguration, reinforcement of existing vegetation areas, and the establishment of new urban realm and landscape opportunity areas. Tree species will be determined by location and will comprise of either native woodland / parkland trees as set out above. Landscaping proposals respond to the different localities and may include grass planting, hedgerows, trees, grasses, ornamental planting and swathes of bulbs.

4.6.12.5.3 Boundary Planting

The Proposed Scheme corridor 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 acquisition of lands.

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 scheme, the remaining grounds will be reinstated to match the landscape and character of the existing grounds in consultation with the property owner.

4.6.13 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. Several existing columns are proposed to be relocated or replaced to accommodate the Proposed Scheme, as shown on the Street Lighting drawings (BCIDC-ARP-LHT_RL-1415_XX_00-DR-EO-9001) in Volume 3 of this EIAR.

Light Emitting Diode (LED) lanterns will be the light source for any new or relocated public lighting provided. The lighting design will involve 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 will be replaced and relocated to the rear of the footpath to eliminate conflict with pedestrians, eliminating pedestrian obstruction. For existing columns that have specific aesthetic requirements, the intent for the replacement (where applicable) 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'.

4.6.13.1.1 New Lighting

All new public lighting will be designed and installed in accordance with the requirements of the relevant 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”.

Lighting schemes will comply with the 'Guidance notes for the Reduction of Light Pollution' issued by the Institution of Lighting Professionals (ILP).

4.6.13.1.2 Lighting at Bus Stops

The design will include for the standards and requirements for lighting at bus stops.

4.6.14 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.

4.6.14.1 Utility Diversions

Due to the extensive nature of the Proposed Scheme, there are certain areas along the route which will require utility diversions, due to localised conflicts. Identified service conflicts and recommended diversions are described and assessed in Chapter 19 (Material Assets).

4.6.15 Drainage

4.6.15.1 Relevant Standards and Guidance

The design basis statement was developed whilst taking 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 include Dublin City Council (DCC), Dún Laoghaire-Rathdown County Council (DLRCC) and Irish Water where applicable.

4.6.15.2 Existing Watercourses and Culverts

The location of existing watercourses and culverts has been identified from survey. Table 4.39 shows where the Proposed Scheme crosses the existing watercourses and culverts.

Table 4.39: Existing Watercourses and Culverts

Watercourse	Chainage	Crossing Detail
Grand Canal	A6907	Bridge
River Dodder	A5748	Bridge
Elm Park Stream	A3200	Culvert

Watercourse	Chainage	Crossing Detail
Boosterstown Stream	A2805	Culvert
Priory Stream	A1162	Culvert
Brewery Stream	A480	Culvert

4.6.15.3 Existing Drainage Description

Based on the information received from Irish Water, TII, DCC and DLRCC the Proposed Scheme is served by surface water and combined drainage networks. The surface water drainage system is managed by the Local Authority, whilst the 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 the 17 catchment areas based on topography and the existing pipe network supplied by Irish Water. The approximate catchment areas, existing sewer networks, outfalls and watercourses are shown on the existing catchment drawings, refer to the Proposed Surface Water Drainage Works drawings (BCIDC-ARP-DNG_RD-1415_XX_00-DR-CD-1001 to BCIDC-ARP-DNG_RD-1415_XX_00-DR-CD-1004) in Volume 3 of this EIAR. The existing catchments are summarised below in Table 4.40.

Table 4.40: Summary of Existing Catchments

Existing Catchment Reference	Chainage	Approx. Drainage Catchment Area (km ²)	Existing Network Type	Existing Outfalls
Catchment 1	A0000 – 0915	0.15	Surface Water (Storm)	Network outfalls to Brewery Stream
Catchment 2	A0915 – 1035	0.001	Surface Water (Storm) & Combined	Network outfalls to West Pier Pumpstation which discharges to Ringsend Treatment Works
Catchment 3	A1035 – 1265	0.92	Surface Water (Storm)	Network outfalls to Priory stream
Catchment 4	A1265 – 1695	0.16	Surface Water (Storm)	Network outfalls to Priory stream and onto Dublin bay south
Catchment 5	A1695 – 2212 (both sides) A2212 – 2404 (RHS) A2404 - 3006 (both sides)	0.12	Surface Water (Storm)	Network outfalls to Boosterstown Stream and onto Dublin Bay South
Catchment 6	A2212 – 2404 (LHS)	0.55	Combined	Network outfalls to Blackrock WWPS - Ringsend
Catchment 7	A3006 - 3534 (both sides) A3759 - 3591 (LHS) B-100 - B832 (both sides)	0.35	Surface Water (Storm)	Network outfalls to Elm Park Stream
Catchment 8	A3534 – 3759 (both sides) A3759 - 3991 (RHS) A3991 - 4100 (both sides)	0.41	Combined	Network outfalls to London Bridge PS, Ringsend Main Lift PS and onto Ringsend WWTP
Catchment 9	A4100 - 4842	0.35	Combined	Network outfalls to London Bridge Pumphouse which discharges to Ringsend Treatment Works
Catchment 10	A4842 - 5395	0.28	Combined	Network outfalls to London Bridge Pumphouse which

Existing Catchment Reference	Chainage	Approx. Drainage Catchment Area (km ²)	Existing Network Type	Existing Outfalls
				discharges to Ringsend Treatment Works
Catchment 11	A5395 - 5715	0.03	Combined	Network outfalls to London Bridge Pumphouse which discharges to Ringsend Treatment Works
Catchment 12	Anglesea Road & A5715 - 5770	0.06	Combined	Network outfalls to London Bridge Pumphouse which discharges to Ringsend Treatment Works
Catchment 13	A5770 – 5862 & Herbert Park	1.26	Combined	Network outfalls to London Bridge Pumphouse which discharges to Ringsend Treatment Works
Catchment 14	A5805 – Branch RHS	0.002	Combined	Network outfalls to London Bridge Pumphouse which discharges to Ringsend Treatment Works
Catchment 15	A5862 - A6495 & A6495 to A6654 (right)	0.23	Combined	Network outfalls to London Bridge Pumphouse which discharges to Ringsend Treatment Works
Catchment 16	A6495 to A6654 (left) & A6654 to A6905	0.24	Combined	Network outfalls to London Bridge Pumphouse which discharges to Ringsend Treatment Works
Catchment 17	A6905 – 7325 C0000 - C0188	0.35	Combined	Network discharges to Ringsend Treatment Work

4.6.15.4 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, oversized pipes, 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 4.41. In addition, the table contains a column entitled “Net change” which takes account of the change of use from impermeable to permeable areas and vice versa.

Table 4.41: Summary of Increased Permeable and Impermeable Areas

Existing Catchment Reference	Chainage	Approx. Drainage Catchment Area (km ²)	Change of use to impermeable areas (m ²)	Change of use to permeable areas (m ²)	Net Change (m ²)	Percentage Change (%)
Catchment 1	A0000 – 0915	28,305	0	200	-200	-0.7
Catchment 2	A0915 – 1035	3,788	0	25	-25	-0.7
Catchment 3	A1035 – 1265	8,168	0	524	-524	-6.4

Existing Catchment Reference	Chainage	Approx. Drainage Catchment Area (km ²)	Change of use to impermeable areas (m ²)	Change of use to permeable areas (m ²)	Net Change (m ²)	Percentage Change (%)
Catchment 4	A1265 – 1695	11,208	666	652	14	0.1
Catchment 5	A1695 – 2212 (both sides) A2212 – 2404 (RHS) A2404 - 3006 (both sides)	28,191	1,438	1011	427	1.5
Catchment 7	A3006 - 3534 (both sides) A3759 - 3591 (LHS) B-100 - B832 (both sides)	37,421	3103	1124	1979	5.3
Catchment 8	A3534 – 3759 (both sides) A3759 - 3991 (RHS) A3991 - 4100 (both sides)	10,550	105	150	-45	-0.4
Catchment 9	A4100 - 4842	16,863	315	64	251	1.5
Catchment 10	A4842 - 5395	13,260	45	131	-86	-0.6
Catchment 11	A5395 - 5715	9,955	0	80	-80	-0.8
Catchment 12	Anglesea Road & A5715 - 5770	2,901	193	147	46	1.6
Catchment 13	A5770 – 5862 & Herbert Park	5,610	270	465	-195	-3.5
Catchment 14	A5805 – Branch RHS	1,131	0	0	0	0.0
Catchment 15	A5862 - A6495 & A6495 to A6654 (right)	20,275	150	679	-5	-2.6
Catchment 16	A6495 to A6654 (left) & A6654 to A6905	12,151	0	155	-155	-1.3
Catchment 17	A6905 - 7325 & C0000 to C0188	15,434	0	434	-434	-2.8

4.6.15.5 Proposed Drainage System

The principle 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 comprising newly paved and combined existing / newly paved areas, as indicated on the Proposed Surface Water Drainage Works (BCIDC-ARP-DNG_RD-1415_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 carriageway 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 are designed to convey, attenuate, and treat runoff prior to discharge; and
- Attenuation Tanks / Oversized Pipes (AT / OSP) are provided where there is insufficient attenuation volume provided by the proposed SuDS drainage measures.

4.6.15.6 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 and combined existing / newly paved catchment areas. The capacity of the proposed SuDS measures and 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 measures have sufficient.

4.6.15.7 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 (BCIDC-ARP-DNG_RD-1415_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 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 areas: 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 collected by the systems ponds temporarily on the surface and then filters through the vegetation and underlying soils.

4.6.16 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.

4.6.17 Safety and Security

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 BCIDC-ARP-TSM_SJ-1415_XX_00-DR-TR-9001 in Volume 3 of this EIAR.

These will be high-definition digital cameras with a digital communications network providing transmission of video and camera monitoring/control functionality

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 BCIDC-ARP-GEO_GA-1415_XX_01-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:

- 12 residential properties; and
- 25 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 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 these 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

Construction Industry Research & Information Association (CIRIA) (1994). CIRIA Report 142 - Control of Pollution from Highway Drainage Discharges

Department of Transport, Tourism and Sport (2019). Traffic Signs Manual

Government of Ireland (2019). Design Manual for Urban Roads and Streets (DMURS)

Institute of Hydrology (1994). Report No. 124 – Flood Estimation for Small Catchments

National Transport Authority (NTA) (2011). National Cycle Manual

Transport Infrastructure Ireland (TII) (2019). Technical Acceptance of Road Structures on Motorways and Other National Roads DN-STR-03001

Transport Infrastructure Ireland (TII) (2015a). Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control DN-DNG-03066

Transport Infrastructure Ireland (TII) (2015b). Drainage Systems for National Roads DN-DNG-03022

Transport Infrastructure Ireland (TII) (2015c). Road Drainage and the Water Environment (including Amendment No. 1 dated June 2015) DN-DNG-03065