Clifton Scannell Emerson Associates

Lucan to City Centre Core Bus Corridor Options Study

Feasibility Report

Údarás Náisiúnta Iompair
National Transport Authority

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Table of Contents

Definitions

- Scheme: This refers to the measures, which will need to be put in place to deliver the Lucan to City centre Core Bus Corridor (CBC) infrastructure and priority measures.
- Study Area: The area along the Lucan to City Centre corridor within which route options have been identified and assessed.
- Study Area Section: An identifiable extent of study area between two locations.
- Route: The road, or alternative location, along which the Lucan to City Centre CBC service will be provided. The route is not necessarily confined to a single road/street. It could for example be partially diverted onto on adjacent/parallel road/street.
- Route Options: Short sections of route at specific locations where number of options exist on adjacent or nearby roads.
- End-to-End Route Options: Various route options are combined to form “end-to-end” route options.
- Journey Time: The time taken to make a journey between two distinct points including dwell times stops and delays at junctions.
- Route Options Assessment Study: The assessment process for potentially viable route options carried out in order to identify the nature and extent of the effects, both positive and negative, on the existing and planned transport infrastructure and receiving environment. The outcome of the route options assessment study is a recommendation for a preferred route for the proposed scheme.

Executive Summary

This report presents the route options assessment work undertaken for the Lucan to City Centre Core Bus Corridor (CBC).

A preferred route is recommended and a concept scheme design is included.

Transport Context

The NTA published the Transport Strategy for the Greater Dublin Area, 2016 – 2035 at the beginning of 2016. The strategy identifies a "Core Bus Network", representing the most important bus routes within the Greater Dublin area, generally characterised by high passenger volumes, frequent services and significant trip attractors along the routes. The identified core network comprises sixteen radial bus corridors, three orbital bus corridors and six regional bus corridors.

The Strategy states that it is intended to provide continuous bus priority, as far as is practicable, along the core bus routes. This will result in a more efficient and reliable bus service with lower journey times, increasing the attractiveness of public transport in these areas and facilitating a shift to more sustainable modes of transport.

The Lucan to City Centre CBC is identified as part of the Core Bus Network. The radial Core Bus Network identified in the Greater Dublin Area (GDA) Transport Strategy is shown in **Figure (i)** below with the Lucan CBC highlighted in orange.

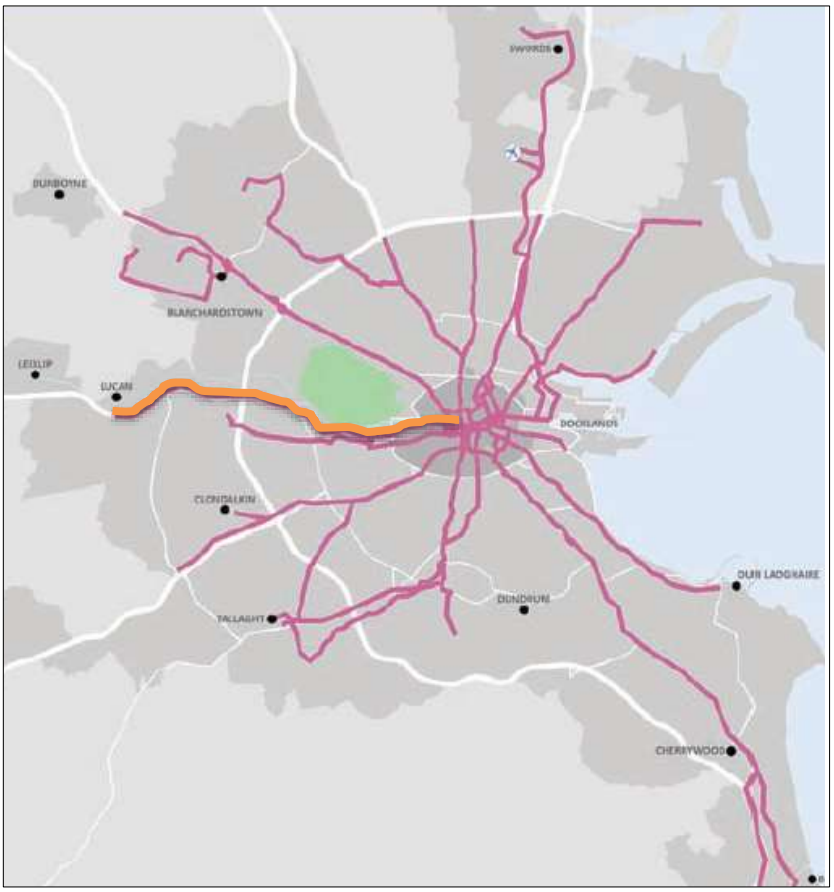

Figure (i): 2035 Radial Core Bus Network

CBC Scheme Objectives

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

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

The Study Area

Generally speaking, the study area for the proposed scheme is defined as including feasible routes between Lucan and the City Centre within the vicinity of the N4/R148 and is as shown in **Figure (ii) below**. In general, the study area begins at the Leixlip junction on the N4 and ends at Fr. Matthew Bridge in the City Centre. The study area is defined as not extending to the south of the N4, as local bus routes serving these areas will feed into the CBC corridor using the existing distributor roads. Current routes include Dublin Bus route nos. 25, 25a, 25b, 66 and 67. The close proximity of the Liffey Valley to Christchurch CBC was considered in establishing the study area for this scheme so as to avoid too much overlap between the corridors, particularly towards the Lucan area.

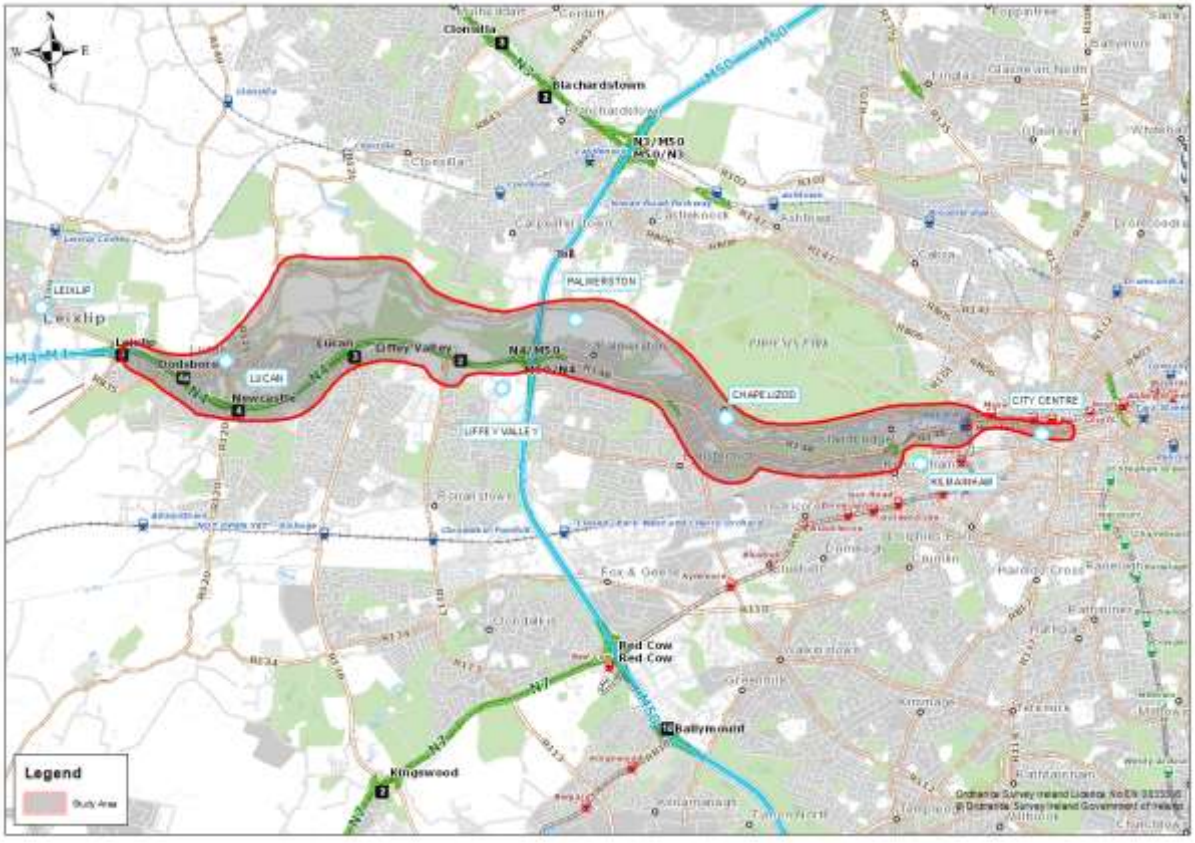

Figure (ii): Study Area

Route Options Assessment Methodology

The assessment was based on a two-stage approach:

- Initially a "Stage 1 – Sifting" assessment was carried out on all possible route options. This process was a high-level assessment whereby routes were appraised on their ability to meet the criteria for a CBC and whether they could practically be delivered. A simple pass/fail result was given for each route at this stage.
- The routes that passed Stage 1 were then taken forward and combined into a number of feasible longer routes between points. These were then assessed by a "Multi-Criteria Analysis" process, in which routes were ranked in a comparative manner under a number of criteria.

An initial "spiders-web" of potential routes that could feasibly accommodate the CBC was developed for the entire study area. The resulting spider web of route options for the entire study area is shown in **Figure (iii)** below.

Figure (iii): Spiders Web of Route Options

Once this spider web of routes was developed, it was narrowed down as part of the sifting process.

This process was a high level qualitative method based on experienced engineering judgement of the practicality and feasibility of providing a CBC along each route. This exercise identified options that would either not achieve the scheme objectives or would be subject to excessive impacts and/or cost to achieve these objectives, (e.g. excessive land-take, environmental impact etc.)

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

The first step in the Stage 2 assessment was to combine shorter route options which passed the Stage 1 assessment, to form longer end-to-end routes within each study area section. Following this, an initial indicative scheme for each route option was determined based on the specific constraints along the route (e.g. bus lane in each direction with cycle lanes, bus lanes in each direction only, bus lane in one direction only etc.). Where necessary, a number of variant scheme options were considered and assessed as necessary.

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

- Economy
- Integration
- Accessibility and Social Inclusion
- Safety
- Environment

Project specific sub-criteria under each of the main criteria were developed based on the scheme objectives. **Table (i)** presents a summary of the CBC assessment criteria and sub criteria used as part of the 'Stage 2' detailed route options assessment process.

Table (i): Assessment Criteria

Assessment Criteria	Assessment Sub-Criteria
1. Economy	1.a Capital Cost
	1.b Transport Reliability and Quality of Service
2. Integration	2.a Land Use Integration
	2.b Residential, Employment and Educational Catchments
	2.c Transport Network Integration
	2.d Cycling Integration
3. Accessibility & Social Inclusion	3.a Key Trip Attractors
	3.b Deprived Geographic Areas
4. Safety	4.a Road Safety
	4.b Pedestrian Safety
5. Environment	5.a Archaeology, Architectural and Cultural Heritage
	5.b Flora and Fauna
	5.c Soils and Geology
	5.d Hydrology
	5.e Landscape and Visual
	5.f Air Quality
	5.g Noise & Vibration

	5.h Land Use Character

The Emerging Preferred Route

Following the assessment process outlined in the previous section an emerging preferred route has been identified as shown in **Figure (iv)** and is described in the Lucan to City Centre direction.

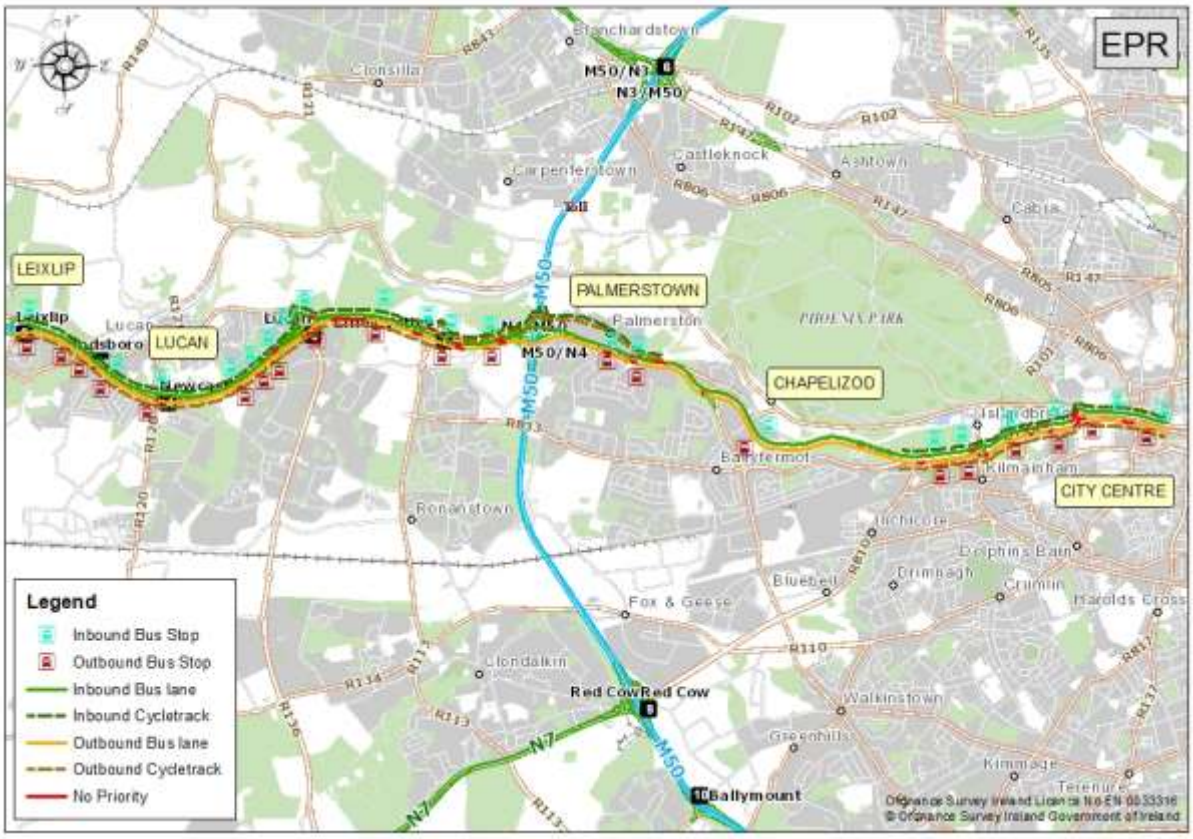

Figure (iv): Emerging Preferred Route

The CBC commences at the Junction 5 (Celbridge/Leixlip) on the N4 by way of the on and off-ramps. The route then joins the N4. Buses would divert off the N4 via the on and off-ramps at Junction 4 (Lucan/Adamstown) and travel through the said junction before re-joining the N4. Inbound buses would divert off the N4 again at Junction 3 (Ballyowen/Lucan) before turning left on to the R136 (Ballyowen Road) and right onto the R835 (Lucan Road) before re-joining the N4 again. Outbound buses would travel straight through the R136 junction via the on and off-ramps.

From there, the route travels along the N4 to Junction 2 (Fonthill/Liffey Valley), where inbound buses would divert via the off-ramp, through the roundabout and back onto the N4 at the on-ramp. Outbound buses would continue through this junction on the N4 with no diversion. From there the route stays on the N4, travelling straight through the M50/N4 free-flow junction on to the R148.

The proposed route then follows the R148 (Chapelizod Bypass/St John's Road West) all the way from the M50 to the Quays area in the City Centre, travelling through junctions with Kennelsfort Road Upper, The Oval and South Circular Road (R111). From here, inbound buses would travel over Frank Sherwin Bridge before turning right onto Wolfe Tone Quay while outbound buses would use Victoria Quay before turning left onto the R148 (St. John's Road West). Buses would then travel along the north and south quays to access the City Centre.

Concept Scheme Design Summary

The Emerging Preferred Route is 14.5km long from end to end. The existing bus priority infrastructure along the Emerging Preferred Route (EPR) is approximately 75% (10.9km) in the inbound direction and only 53% (7.7km) in the outbound direction. The proposed scheme would improve bus priority infrastructure to 99% (14.4km) in the inbound direction and 97% (14.1km) in the outbound direction. In general, the proposed scheme will provide increased bus priority through junctions, particularly the key junctions at the R111, Con Colbert Road, Kylemore Road, the M50 interchange, R136 and R120 junctions on the N4. This increased priority will ensure journey time reliability and reduce delays.

In addition to bus priority, upgraded cycle facilities are proposed along the R148 from Con Colbert Road to the quays area, which constitutes secondary cycle route no. 6A. The existing cycle tracks along the N4 forming part of primary cycle route no. 6 will also be maintained and upgraded in a number of locations. Pedestrian safety would also be improved at a number of junctions due to signalised crossings and reduced speeds.

As part of the proposed scheme, seven new bus stops are recommended along the N4: one inbound opposite the existing outbound bus stop at Esker Lane, one either side of the N4 adjacent to Willsbrook Park, one either side at Cherbury Park ave., one at the junction of R136 and Lucan Rd and one inbound adjacent to the on-ramp at Junction 2 (Fonthill/Liffey Valley) on the N4. A new pedestrian bridge is proposed at the Esker Lane stops while the new stops at Willsbrook Park and Cherbury Park would be serviced by the existing pedestrian bridge. The provision of these stops is critical to the viability of the catchment for this CBC as it allows it to serve large population areas both to the north and south of the N4 in the Lucan area.

Similarly there are four stops recommended along the Chapelizod Bypass (R148): one either side where Chapelizod Hill Road crosses underneath the Chapelizod Bypass and one either side adjacent to the Royal Hospital Kilmainaham. A new pedestrian crossing is proposed adjacent to the new bus stops on the Chapelizod Bypass, along with ramped pedestrian access to improve both pedestrian safety and accessibility. These proposed stops will improve the CBC's integration criteria, by increasing the residential, employment and educational catchments regarding the area of Chapelizod the area around Heuston Station.

Cost Estimate

A high level cost estimate was prepared based on the concept scheme design discussed above. From this, the proposed CBC scheme infrastructure cost is expected to be approximately €40m - €45m.

Scheme Benefits

The majority of current bus routes such as the 66, 67 and 25 travel through Lucan Village directly. The provision of the new bus stops along the N4 makes the CBC a viable option for buses to stay on the N4 rather than travelling through Lucan Village.

Although there is already considerable bus priority infrastructure along the proposed route, the proposed scheme provides further priority through a number of key junctions which will further reduce delays and ensure reliability. Existing average travel times for the 25 and 25A bus routes were calculated using Automatic Vehicle Location (AVL) data provided by Dublin Bus and compared to the proposed travel times. For the purposes of this comparison Dublin Bus Route 25 was compared with Section 1: N4 Junction 5 (Celbridge/Leixlip) to N4 Junction 3 (Ballyowen/Lucan). It must be noted that route 25 travels through Lucan Village and the proposed CBC does not, making the proposed route comparably longer. However route 25 serves more bus stops in that section than the proposed CBC, therefore it is the most appropriate route for the purposes of comparing average journey times.

Journey times for bus route 25during the core hours of bus operation (7:00 – 19:00) are observed to vary between 10 to 18 minutes in the inbound direction and 11 minutes and 15 minutes in the outbound direction. The variation in traffic times is most likely due to the lack of bus priority on large sections of the route (e.g. Lucan Village) and compounded by traffic congestion and passenger boarding times which are high. Meanwhile in the late evening (after 19:00 hrs) compared to the AM peak (07:00 to 09:30), average journey times and average speeds are significantly improved. After

19:00 hrs, it was observed that the inbound average journey time reduced to 8 minutes and 7 minutes in the outbound direction. This reflects the benefits of an uncongested network. Therefore a bus priority network allows buses to move along the route quicker and with more reliable journey times.

Bus route 25A generally overlaps with the emerging preferred route from Study Area Section 2: N4 Junction 3 (Ballyowen/Lucan) to Kennelsfort Road Upper to Study Area Section 4: Con Colbert Road to City Centre. Journey times during the core hours of bus operation (7:00 – 19:00) are observed to vary between 21 to 27 minutes in the inbound direction and 21 minutes and 24 minutes in the outbound direction. The variation in traffic times is most likely due to the lack of bus priority on sections of the route (Outbound on the N4 and outbound at Heuston Station) and compounded by traffic congestion and passenger boarding times which are high. Meanwhile in the late evening (after 19:00 hrs) compared to the AM peak (07:00 to 09:30), average journey times and average speeds are significantly improved. After 19:00 hrs, it was observed that the inbound average journey time reduced to 14 minutes and 13 minutes in the outbound direction. This reflects the benefits of an uncongested network. Therefore a bus priority network allows buses to move along the route quicker and with more reliable journey times.

Key to the provision of a high quality bus network is journey time reliability which makes the system more efficient in terms of number of people moved by the same level of vehicles and driver resources, in addition to user satisfaction in terms of reliability of their journey time and bus arrivals. This scheme will address the current journey time variability at key locations including at Lucan Village, the M50 interchange to Kennelsfort Road Junction, Chapelizod, outbound from Heuston Station to Con Colbert Road and on the N4 off ramps at Junction 3 (Ballyowen/Lucan) , 4 (Lucan/Adamstown) and 5 (Celbridge/Leixlip).

In reference to GDA Cycle Network Plan, the scheme will provide 5.1km of upgraded primary cycle route no. 6. Works will involve the provision of dedicated cycle tracks ensuring a minimum width of 2m is achieved where possible. This section includes the N4 from Junction 5 (Celbridge/Leixlip) to Junction 2 (Fonthill/Liffey Valley) and links Leixlip, Co. Kildare to Liffey Valley and further beyond to the city centre.

It will also deliver 3km of new and upgraded secondary cycle route no. 6A. Works will include the provision of dedicated cycle tracks ensuring a minimum width of 2m is achieved where possible. This cycle route runs from the junction of Con Colbert Road/Chapelizod Bypass and continues along St Johns Road West. From here inbound cyclists link up with the primary cycle route no. 5 on Wolf Tone Quay. For outbound cyclists route no. 6A begins on Bridgefoot Street, continues onto Victoria Quay where it joins St Johns Road West.

The proposed scheme has added improvements for pedestrians at a number of junctions along with pedestrian bridges on the N4 and Chapelizod bypass.

Next Steps

This report has identified an emerging preferred route for the bus infrastructure along this CBC for which a concept design has been developed.

The next project stage (The development of a Preliminary Design) will further refine and update the initial concept design along the route. Further account will be taken of likely public transport service levels, particularly the bus service patterns and any changes to the overall bus network which may arise from the separate bus network review process. The proposals will be amended, if and as required, to integrate any resultant changes. The Preliminary Design will define the final practically achievable scheme for the CBC, taking into account more detailed studies of constraints, impacts and environmental assessment required at a local level.

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

This Preliminary Design will form the basis of the planning consent process for the scheme, which will require a development consent application to be made directly to An Bord Pleanala, due to the nature and extent of the proposed works.

1. Introduction

1.1 Preamble

Clifton Scannell Emerson Associates (CSEA) were commissioned by the National Transport Authority (NTA) to carry out a feasibility and route options assessment study for the Lucan to City Centre CBC (CBC). This report presents the findings of the study and presents a preferred route for the CBC from Lucan to the City Centre.

This report considers the infrastructure required to provide bus priority and cycle facilities only and does not define the bus services that may use the CBC. Although bus services for the CBC have not yet been defined, it is assumed that a number of high frequency bus services will avail of this infrastructure.

The report sets out the detailed assessment undertaken of potentially viable route options within the identified study area and a concept scheme design along the preferred route option is presented.

1.2 Report Structure

The report structure is detailed below:

- **Section 2** – The strategic transport policy context which has led to the identification of a need for the delivery of a CBC on this corridor is discussed in this section. The objectives set out for the CBC scheme are also set out.
- **Section 3** – The objectives of the core bus network and the proposed scheme are presented. The extent of the CBC study is defined along with constraints and opportunities, the integration of the corridor with the wider public transport network and the compatibility with other road users. The study area is split into four sections.
- **Section 4 –** The methodology for identifying and assessing the feasibility of the various route options potentially available within the study area is discussed in this section including:
    - The selection and determination of initial criteria for screening and assessing technically feasible route options, bases on distinct, project-specific objectives
    - The definition of assessment criteria
    - The identification of study area sections where practical route options have been considered and presentation of an initial network (“spiders-web”) of options examined
- **Section 5, 6, 7 and 8 –** Details the route options assessment for each of the four study area sections.
- **Section 9 –** The Emerging Preferred Route is identified and described.
- **Section 10 –** The next steps for the project are set out in this section.

2. Transport Planning Context

2.1 Transport Strategy for the Greater Dublin Area, 2016 – 2035

The NTA published the Transport Strategy for the Greater Dublin Area, 2016 – 2035 at the beginning of 2016. The strategy identifies a "Core Bus Network", representing the most important bus routes within the Greater Dublin area, generally characterised by high passenger volumes, frequent services and significant trip attractors along the routes. The identified core network comprises sixteen radial bus corridors, three orbital bus corridors and six regional bus corridors.

The Strategy states that it is intended to provide continuous bus priority, as far as is practicable, along the core bus routes. This will result in a more efficient and reliable bus service with lower journey times, increasing the attractiveness of public transport in these areas and facilitating a shift to more sustainable modes of transport.

The Lucan to City Centre CBC is identified as part of the Core Bus Network. The radial Core Bus Network identified in the GDA Transport Strategy is shown in **Figure 2.1** below with the Lucan CBC highlighted in orange.

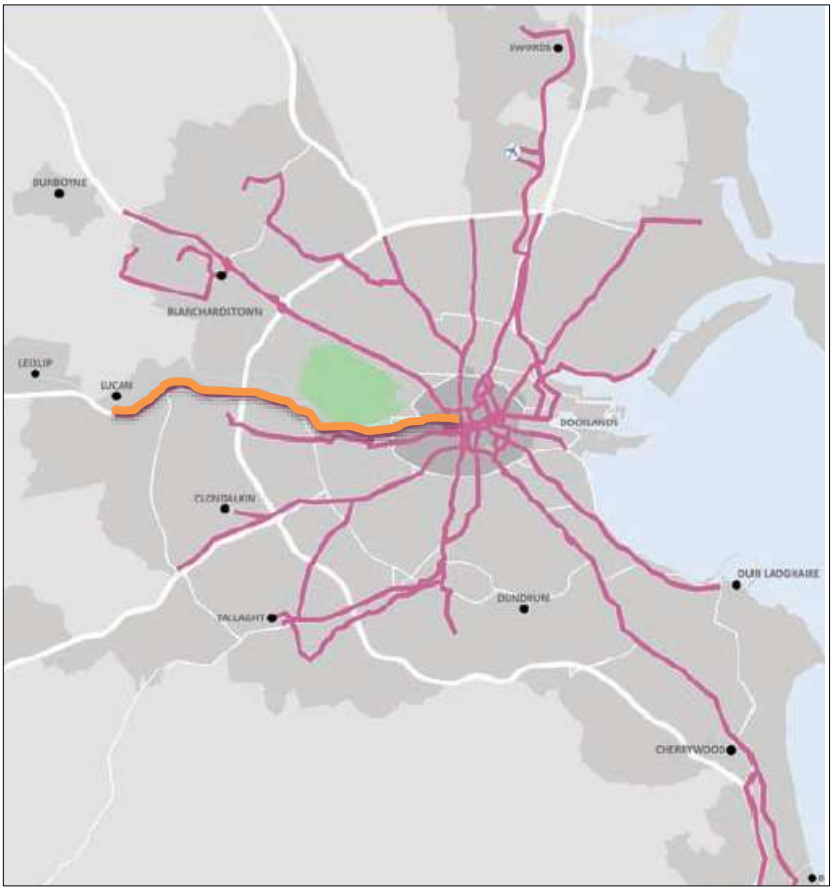

Figure 2.1: 2035 Radial Core Bus Network

2.2 Infrastructure and Capital Investment 2016 – 2021

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

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

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

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

"There will be funding for:

- Further upgrading of Quality Bus Corridors".

2.3 Integrated Implementation Plan 2013 – 2018

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

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

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

2.4 Greater Dublin Area Cycle Network Plan

The Greater Dublin Area Cycle Network Plan was adopted by the NTA in early 2014 following a period of consultation with the public and various stakeholders. This plan forms the strategy for the implementation of a high quality, integrated cycle network for the Greater Dublin Area.

There are a large number of primary (Routes 5, 6, 7A, SO1) and secondary (Routes 6A, SO6, SO7, SO4) cycle routes identified between Lucan and the City Centre. During the course of the analysis carried out to identify the preferred CBC, the provision of these cycle routes was considered at all stages. Therefore, as part of the analysis, any upgrading of infrastructure to provide bus priority also provides cycling infrastructure, where practical, to the appropriate level and quality of service (as defined by the NTA National Cycle Manual) required for primary and secondary cycle routes.

2.5 Core Bus Corridor Scheme Objectives

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

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

3. Study Area

Based on the transport context and scheme objectives set for the Lucan CBC, the study area for the proposed scheme is as identified in **Figure 3.1**. In general, the study are begins at the Leixlip junction

on the N4 and ends at Fr. Matthew Bridge in the City Centre. The study area is defined as not extending to the south of the N4, as local bus routes serving these areas will feed into the CBC corridor using the existing distributor roads. Current routes include Dublin Bus route nos. 25, 25a, 25b, 66 and 67. Further towards the city centre, the study area extends as far south as the R833 (Ballyfermot Road). To the north, the study area includes possible routes through Strawberry Beds. Routes outside of this area are considered to not viably meet the objectives for providing a CBC from Lucan to the City Centre. The close proximity of the Liffey Valley to Christchurch CBC was considered in establishing the study area for this scheme so as to avoid too much overlap between the corridors, particularly towards the Lucan area. The purpose of the scheme was to provide a CBC from Lucan to the City Centre by means of the quays. Details of bus infrastructure through the city centre will form part of the City Centre Traffic Management Plan.

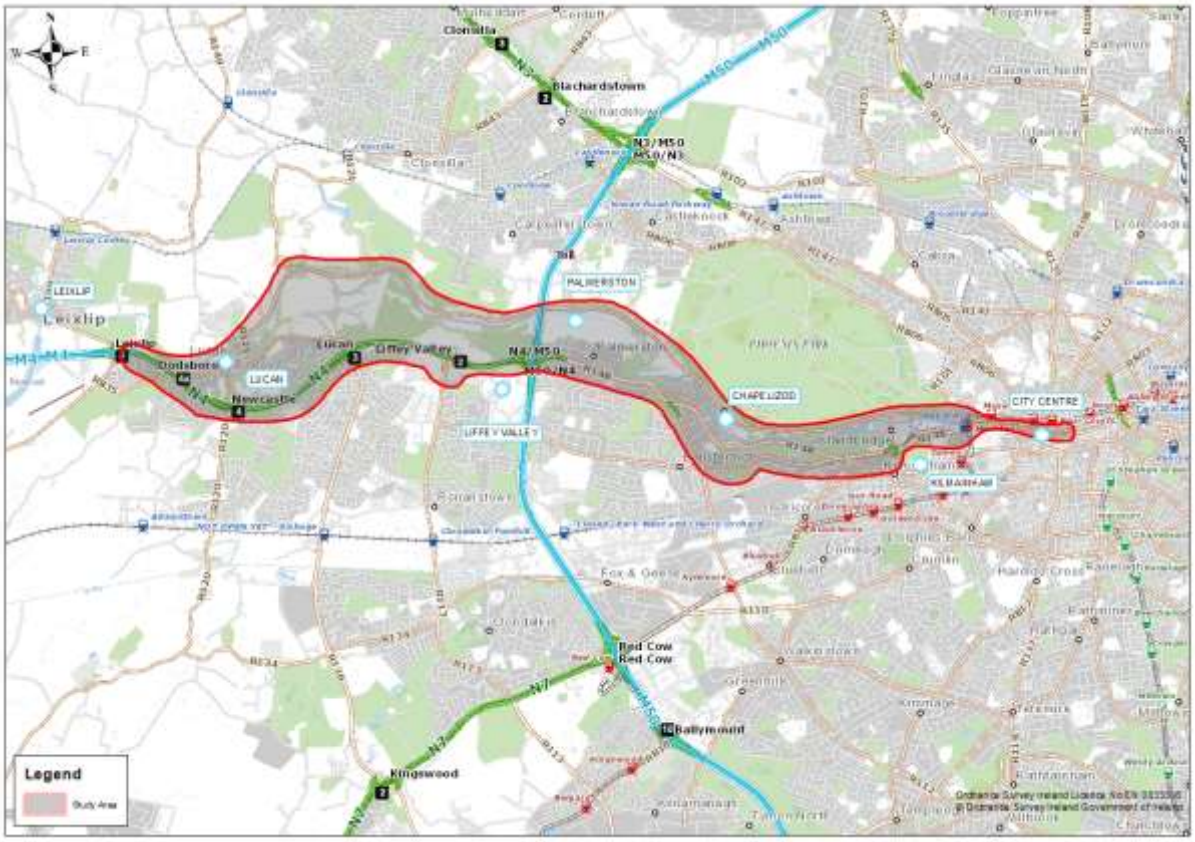

Figure 3.1: Study Area

3.1 Study Area Sections

In order to simplify the assessment process and allow it to be presented in a clear manner, the study area was divided into four sections:

- Section 1: N4 Junction 5 (Celbridge/Leixlip) to N4 Junction 3 (Ballyowen/Lucan)
- Section 2: N4 Junction 3 (Ballyowen/Lucan) to Kennelsfort Road Upper
- Section 3: Kennelsfort Road Upper to Con Colbert Road
- Section 4: Con Colbert Road to City Centre

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

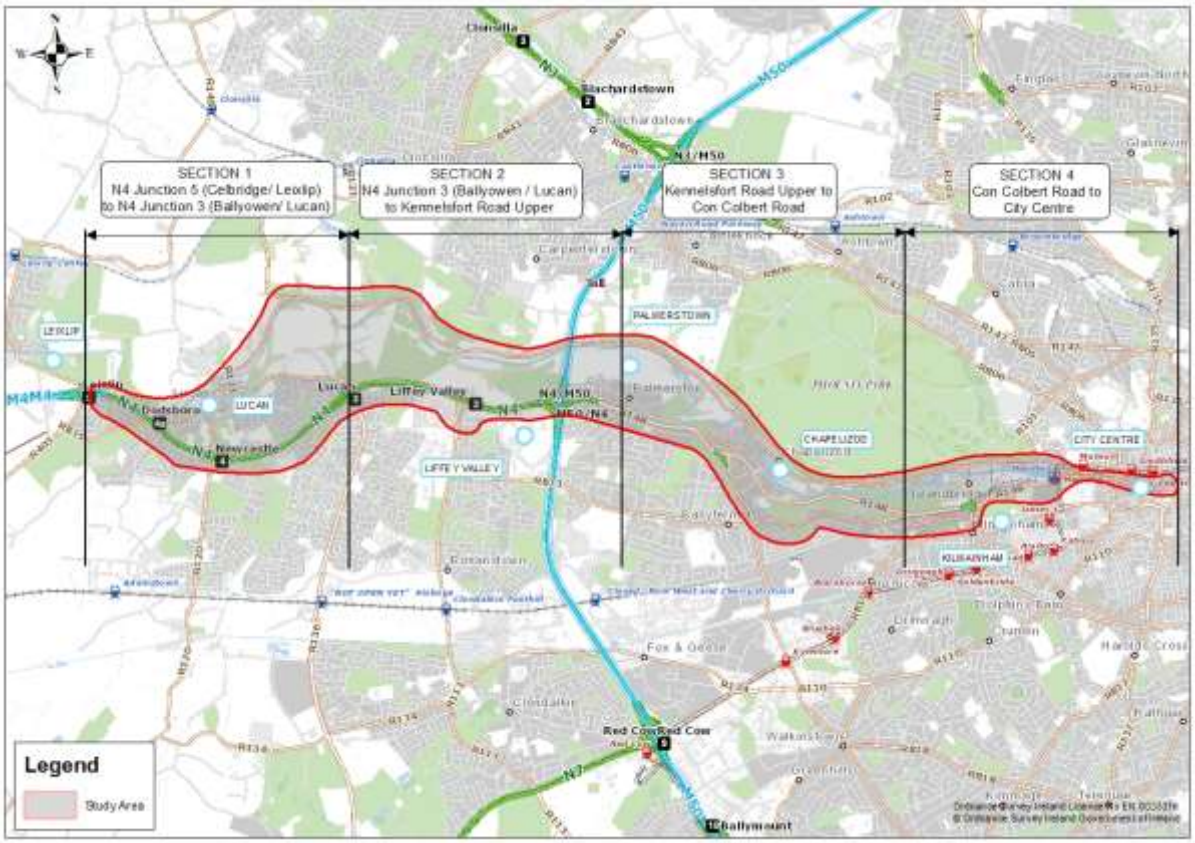

Figure 3.2: Study Area Sections

3.2 Physical Constraints and Opportunities

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

- Availability of space between building lines
- Italian ambassador's residence in Lucan
- River Liffey
- Existing and committed future development along the route
- Existing monuments and protected structures
- Bridges
- Public parks
- Free flow junction between N4 and M50
- Need to maintain traffic flow in key areas, such as traffic exiting from the city centre onto the R148
- Luas Red Line
- Railway lines in the vicinity of Heuston Station
- Urban realm upgrades in towns and village areas

3.3 Integration with Existing and Proposed Public Transport Network

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

- The Luas Red Line
- Heavy Rail at Heuston Station
- Bus services at numerous locations along the route
- Future Luas Line to Lucan

3.4 Compatibility with Other Road Users

A key objective of the proposed scheme is to improve pedestrian and cyclist facilities along the route. In general, segregated facilities should be proposed for these modes.

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

There may be locations where segregated cycle facilities cannot be provided along the CBC route and there is no suitable routing alternative. In such instances, it may be possible for cyclists to share with vehicles in the bus lane. Such proposals need careful consideration and design to ensure the safety of cyclists, with additional mitigation measures, such as traffic calming measures and other urban realm design solutions possibly required.

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

4. Assessment Methodology

4.1 General

This section outlines the methodology used in the assessment of feasible routes for the CBC. The assessment was based on a two-stage approach:

- Initially a "Stage 1 – Sifting" assessment was carried out on all possible route options. This process was a high-level assessment whereby routes were appraised on their ability to meet the criteria for a CBC and whether they could practically be delivered. A simple pass/fail result was given for each route at this stage.
- The routes that passed Stage 1 were then taken forward and combined into a number of feasible longer routes between points. These were then assessed by a "Multi-Criteria Analysis" process, in which routes were ranked in a comparative manner under a number of criteria.

4.2 Stage 1: Route Options Assessment – Sifting Stage

An initial "spiders-web" of potential routes was developed for the entire study area. This entailed identifying possible routes that could potentially accommodate the CBC. This "spiders-web" of route options was chosen with reference to the CBC characteristics and the scheme objectives as set out in Section 2, the physical constraints and opportunities present (Section 3.3) and the ability to integrate with other public transport modes and users (Section 3.4). While developing this "spiders-web", particular attention was paid to the routes potential to practically accommodate bus priority measures and, thereby facilitate fast and reliable journey times.

The resulting spider web of route options for the entire study area is shown in **Figure 4.1** below.

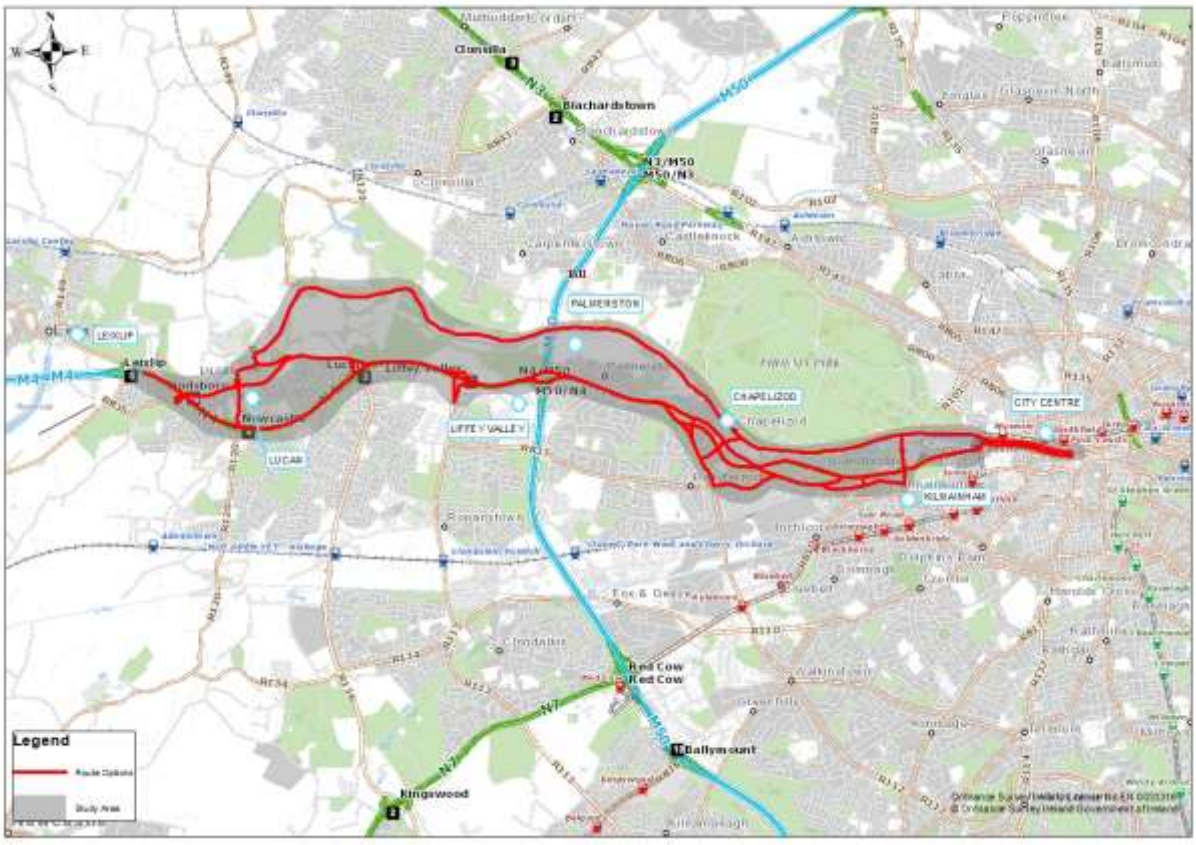

Figure 4.1: Spiders Web of Route Options

Once this spider web of routes was developed, it was narrowed down as part of the sifting process.

This process was a high level qualitative method based on experienced engineering judgement of the practicality and feasibility of providing a CBC along each route. This exercise identified options that would either not achieve the scheme objectives or would be subject to excessive impacts and/or cost to achieve these objectives, (e.g. excessive land-take, environmental impact etc.)

4.3 Stage 2: Multi-Criteria Analysis

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

The first step in the Stage 2 assessment was to combine shorter route options which passed the Stage 1 assessment, to form longer end-to-end routes within each study area section. Following this, an initial indicative scheme for each route option was determined based on the specific constraints along the route (e.g. bus lane in each direction with cycle lanes, bus lanes in each direction only, bus lane in one direction only etc.). Where necessary, a number of variant scheme options were considered and assessed as necessary.

The indicative scheme for each route option was then progressed to a multi-criteria analysis. The 'Common Appraisal Framework for Transport Projects and Programmes' published by the Department of Transport, Tourism and Sport (DTTAS), March 2016, requires schemes to undergo a 'Multi-Criteria Analysis' (MCA) under the following criteria:

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

Physical Activity has been scoped out of the multi-criteria analysis t at this stage as all route options are considered to promote physical activity equally and it is, therefore, not considered to be a key differentiator between route options. Project-specific route options assessment criteria have been established for the GDA CBC schemes by the NTA. This have been tailored to have commonality with the Common Appraisal Framework guidelines where practical.

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

Table 4.1: Assessment Criteria

Assessment Criteria	Assessment Sub-Criteria
1. Economy	1.a Capital Cost
	1.b Transport Reliability and Quality of Service
2. Integration	2.a Land Use Integration
	2.b Residential, Employment and Educational Catchments

	2.c Transport Network Integration
	2.d Cycling Integration
3. Accessibility & Social Inclusion	3.a Key Trip Attractors
	3.b Deprived Geographic Areas
4. Safety	4.a Road Safety
	4.b Pedestrian Safety
5. Environment	5.a Archaeology, Architectural and Cultural Heritage
	5.b Flora and Fauna
	5.c Soils and Geology
	5.d Hydrology
	5.e Landscape and Visual
	5.f Air Quality
	5.g Noise & Vibration
	5.h Land Use Character

4.3.1 Economy (1)

4.3.1.1 Capital Cost (1.a)

Capital cost estimates are determined from both the indicative infrastructure cost estimate and land acquisition cost. The methodology used, generally based on per-kilometre rates, is described below.

Indicative Infrastructure Cost Estimate

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

The indicative scheme design for each route was used to determine the extent of the works required to provide the required bus and cycle facilities. These works were categorised and grouped together and their assumed costs are shown in **Table 4.2** below.

All cost estimates quoted exclude VAT.

Table 4.2: Route Sections Infrastructure Cost Estimate Assumptions

Construction Category	Construction Works Assumptions	Cost
Major Road Construction	• Site Clearance • Services protection/diversion/relocation (power supply, telecoms, gas etc.) • Drainage • Major earthworks (embankments, retaining walls etc.) • Full pavement construction in large areas • Milling and overlay where required • Kerbs, footpaths, cycle tracks (removal and new) • Road lighting (replacement, cabling ducting etc.) • Road markings and signage • Street furniture • Landscaping • Boundary treatments • Accommodation works where required	€5,000,000 per km
Road Space Redistribution	• Site Clearance • Services protection/diversion/relocation (power supply, telecoms) • Limited earthworks • Minor drainage works • Full pavement construction in small areas • Milling and overlay where required • Kerbs, footpaths, cycle tracks (removal and new) • Road lighting (relocation, ducting etc.) • Road markings and signage • Street furniture • Landscaping • Boundary treatments • Accommodation works where required	€2,500,000 per km
Junctions	• Site Clearance • Services protection/diversion/relocation (power supply, telecoms) • Limited earthworks	€500,000 per junction

Construction Category	Construction Works Assumptions	Cost
	• Minor drainage works • Traffic signals (ducting, chambers, cabling, controller, signals etc.) • Kerbs, footpaths, cycle tracks (removal and new) • Road lighting (relocation, ducting etc.) • Road markings and signage • Street furniture • Landscaping • Boundary treatments • Accommodation works where required	
Alternative Cycle Route	• Site Clearance • Services protection/diversion/relocation (power supply, telecoms) • Limited earthworks • Minor drainage works • Kerbs, footpaths, cycle tracks (removal and new) • Road lighting (relocation, ducting etc.) • Road markings and signage • Street furniture • Landscaping • Boundary treatments • Accommodation works where required	€1,750,000 per km
Bus Stops	• Raised kerbs and platforms • Paving • Shelters • Real Time Passenger Information (RTPI) infrastructure • Street furniture	€50,000 per bus stop
N4 Pedestrian Bridge	• Provision of new pedestrian bridge over N4 including foundations, piers and all other ancillary works	€750,000 per bridge

Land Acquisition Cost Estimate

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

- The number of adjacent public/commercial/residential/industrial properties, from which land acquisition would be required as well as the extent (area) of land acquisition likely to be necessary.
- The costs associated with boundary/accommodation works.

For the purposes of route options comparison and assessment, the extent of land acquisition required for each route option is calculated by applying a typical cross-section to each option based on ordnance survey mapping and existing surveys where available. The typical cross-section used for this purposes is as follows:

- 3.0 m bus lane
- 3.0 m traffic lane
- 2.0 m footpath; and
- 2.0 m cycle track.

In some areas, the above standard widths were tailored where required on route options in order to deal with any constraints while ensuring the scheme objectives were still met.

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

The methodology typically adopted in calculating the land acquisition costs is very site specific (value of the property, costs of acquiring and moving to a new property etc.). However, for the purpose of this assessment, a high level assessment methodology has been used to develop a cost per square metre for private land acquisition based on valuations carried out by the NTA and TII for other public transport projects. Using this information, a rate of €1,500/m^2 has been applied to route options to derive an indicative cost for private land-take for all route options.

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

4.3.1.2 Transport Reliability and Quality of Service

Journey time

This sub-criterion assesses the extent to which journey time savings for public transport services can be achieved on each route. This is dependent on the provision of some or all of the following measures being implemented:

- Enhancement of existing bus lanes and/or provision of new bus lanes along road links
- Provision of bus lanes to stop lines at junctions
- Use of traffic signals to provide virtual priority (e.g. queue relocation)
- Removal of ‘pinch points’ for bus services along the route
- Rationalisation of existing bus stops in terms of location, indentation, spacing etc.

Journey times for each route option have been calculated using predicted average speeds for buses through each route. These predicted speeds are based on the amount of bus priority attainable on each route while also allowing for the nature of the roads within each route. Where no bus priority is possible, existing average speed data from buses was used, based on current automatic vehicle location information from Dublin Bus. In general, the following assumptions were used for evaluation:

- Maximum speed of 50 km/h reducing to 30 km/h within the City Centre areas.
- Dwell time of 20 seconds per stop on average
- Average delays of 30s per signalised junction and 15s per priority junction

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

Bus Priority

This sub-criterion is used to assess the level of bus priority attainable along each route. The level of priority is generally calculated based on the degree of road space given to dedicated bus lanes along the route along with the provision for buses at junctions. This information feeds into the journey time calculation discussed above.

4.3.2 Integration (2)

4.3.2.1 Land Use Integration (2.a)

This criterion identifies the extent to which a route supports or encourages planned future development or provide economic opportunities. As part of this assessment, cognisance was taken of the ability of each route to offer opportunities to regenerate particular streets or areas or enhance the urban environment in general.

The interaction of routes with Local Area Plans, masterplans, County Development Plans etc. are also considered under this criterion.

4.3.2.2 Residential, Employment and Educational Catchment (2.b)

This criterion compares the existing populations within 5, 10 and 15 minute walk catchments from bus stops and is representative of the number of potential users for a particular route option .The catchment contours are based on the locations accessible on foot within a 5, 10, and 15 minute walk of each bus stop, using the existing roads and paths in the vicinity of the stops. The assessment does not include future populations of zoned, but yet undeveloped residential development lands along route options. The analysis involved extracting 2011 population, employment and education statistics from the Central Statistics Office (CSO) 'small areas' dataset and 2011 POWSCAR data (Place of Work, School or College – Census of Anonymised Data). This information was subsequently used to calculate the number of people within the contours for each of the following headings:

- Residential population
- Employment destination population
- Education destination population

The employment and education populations are people who work and attend schools/colleges within the catchment, i.e. they may live outside the catchment but travel to it for these purposes.

The routes were not assessed in a simple quantitative way but were ranked by taking a holistic view of the overall catchment and using experienced judgement to determine the most beneficial routes.

4.3.2.3 Transport Network Integration (2.c)

This criterion identifies the possible links between each route and existing and proposed public transport modes. This includes the potential for efficient interchanges between the proposed bus services using the CBC and other transport modes such as Luas, rail stations, other bus routes etc. and how each route can maximise public transport usage.

Additionally, major effects on general traffic are also considered. While the provision of bus lanes may generally lead to some reduction in capacity for general traffic, some routes may have additional affects over and above this, which must be considered.

4.3.2.4 Cycling Integration (2.d)

This criterion identifies the integration of the proposed routes with the GDA Cycle Network Plan and the quality of infrastructure along the route options. Each route was assessed on its ability to provide the required cycling infrastructure in tandem with bus priority measures.

4.3.3 Accessibility and Social Inclusion (3)

4.3.3.1 Key Trip Attractors (3.a)

The key trip attractors within approximately 10 min walk distance from each route are identified in this criterion. The following land-uses have been considered as key trip attractors for the purposes of this assessment:

- Education (schools, universities, etc.)
- Retail and leisure centres (shopping centres, town centres, etc.)
- Health (hospitals, clinics, etc.)
- Employment (business parks, office developments etc.)

4.3.3.2 Deprived Geographic Areas (3.b)

This criterion assesses the impact of the CBC route options on the areas within 10 minute walk defined as “very deprived” and “deprived” in the Pobal Deprivation Index. RAPID areas (Revitalising Areas by Planning, Investment and Development) within the 10 minute walk boundary are also taken into consideration.

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

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

4.3.4 Safety (4)

4.3.4.1 Road Safety (4.a)

In general, it is likely that road accidents will be reduced along the CBC due to modal shift. However, the reduction in accidents is unlikely to vary between different route options. For the purposes of comparing routes, the number and type of junctions is used to assess road safety as this is an indication of the number of potential conflicts on each route. Accident data from the RSA is noted but is not used to differentiate between routes.

4.3.4.2 Pedestrian safety (4.b)

This criterion primarily considers the safety of passengers accessing stops along the routes. The safety of access, availability of footpaths and crossing facilities were all taken into account for evaluation of this item.

4.3.5 Environment (5)

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

- **Agronomy:** Given the urban/suburban nature of the proposed scheme and the assumption that buses will run on predominantly existing road infrastructure this aspect is not considered to be relevant to the assessment.

- **Hydrogeology:** Hydrogeology is not considered to be a determining factor in the selection of the preferred route option. Also at this stage of the design process it is not possible to determine the quality, type or duration of these impacts, particularly as the location and type of structures e.g. underpasses, bridges etc. is unknown.
- **Property/Land Acquisition:** This aspect has been considered separately as part of the Economy criterion in the overall multi-criteria analysis commensurate with the information available at the route option assessment stage.
- **Socio-economics:** Elements of socio-economics such as journey times, catchment analysis, transport integration, quality of service for cyclists etc. are assessed under other non-environmental criteria and are therefore considered and captured elsewhere as part of the multi-criteria analysis.

For all remaining environmental criteria, the potential impacts of route options are assessed at desktop study level. The environmental constraints considered are outlined in the following sections.

4.3.5.1 Archaeology, Architectural and Cultural Heritage (5.a)

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

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

Features considered included the following:

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

It is important to note that the proposed route will primarily travel on existing established road networks. Other than locations of potential significant widening of the existing road curtilage, it is currently not anticipated that adjacent structures and buildings will be impacted by the proposed CBC scheme (while acknowledging that the designation of, and protection afforded to a Protected Structure is not restricted to the structure itself but to all elements within its curtilage, e.g. coal cellars and boundary elements). Within the City Centre, the selection of a preferred route option will, in most instances involve the running bus services in the vicinity of numerous Protected Structures irrespective of which route section is preferred (archaeological, architectural and cultural heritage is only one of the criteria being considered as part of the MCA analysis).

4.3.5.2 Flora and Fauna (5.b)

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

A broad assessment of the likely impacts of each of the route options on the key ecological receptors was undertaken, with an indication as to which, if any, of these were likely to be significant, and at

what geographical level. The impacts were compared to allow an order of preference to be determined.

Features considered included the following (where relevant):

- Possible impacts on protected flora and fauna
- Identified designated ecological areas and other areas of ecological importance including ecological corridors and areas of green infrastructure
- Watercourses and fisheries waters.

It should be noted that the CBC routes generally make use of existing road corridors and, as such, are unlikely to have a major effect on Flora and Fauna in the majority of locations.

4.3.5.3 Soils and Geology (5.c)

The potential impact of routes on soil and geology as a result of land take and possible excavation is analysed in this criterion.

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

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

4.3.5.4 Hydrology (5.d)

This criterion focuses on the impact on surface water as a result of land take, especially on floodplains and floods zones. The flood risk for each route is also considered as part of this criterion.

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

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

4.3.5.5 Landscape and Visual (5.e)

This criterion assesses the possible effects of each route on the surrounding landscapes and streetscapes.

The assessment comprised the compilation of a desktop understanding of:

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

4.3.5.6 Air Quality (5.f)

The potential of each route to affect air quality as a result of widening, increased traffic etc. is assessed in this section.

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

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

It is important to note that the proposed route will primarily travel on existing established road networks. For the purposes of this assessment, air quality impact is quantified based on whether the road is moving closer to sensitive receptors i.e. road widening. However, any road widening would result in only marginal impacts to air quality at sensitive receptors and therefore the severity of any air quality impact would be minimal.

4.3.5.7 Noise and Vibration (5.g)

This criterion assesses the noise and vibration impact of each route, e.g. where road widening may bring traffic closer to sensitive receptors.

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

4.3.5.8 Land Use Character (5.f)

The effect of each route on the existing land use character is assessed in this section. This includes severance of land or effects to the viability of land to be used for its intended purpose or impacts on land use character through land-take, removal of parking and loading, etc.

4.3.6 Route Options Summary Table

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

The route options summary table for each study area is presented in **Appendix A.**

Route options have been compared based on a five point scale, ranging from having significant advantages to having significant disadvantages over other route options. **Table 4.3** shows the colour coding of the five point scale, with advantageous routes graded “dark green” and disadvantageous routes graded “red”.

Table 4.3: Route Options Colour Coded Ranking Scale

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

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

At the end of each study area section route options assessment, an overall Multi Criterion Appraisal (MCA) table is provided, bringing together each of the individual criterion assessments. This table is then summarised for each study area section under the main assessment criterion as set out in **Table 4.1**.

A qualitative appraisal of, and conclusions from, the route options assessment is then provided, highlighting the key issues considered in determining the recommended route option. It should be noted that a balanced approach is taken when assessing the preferred routes. All criteria are considered in undertaking the assessment and a lower ranking on one criterion will not necessarily mean that the route is not suitable.

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

5. Study Area Section 1: N4 Junction 5 (Celbridge/Leixlip) to N4 Junction 3 (Ballyowen/Lucan)

5.1 Stage 1: Route Options Assessment - Sifting

All of the feasible routes within the study area section are identified in **Figure 5.1** below. Although there are a number of possible, long end-to-end routes in the area, these have been subdivided in order to allow the maximum number of possible route combinations and to account for changes in character along roads, e.g. major changes in width etc.

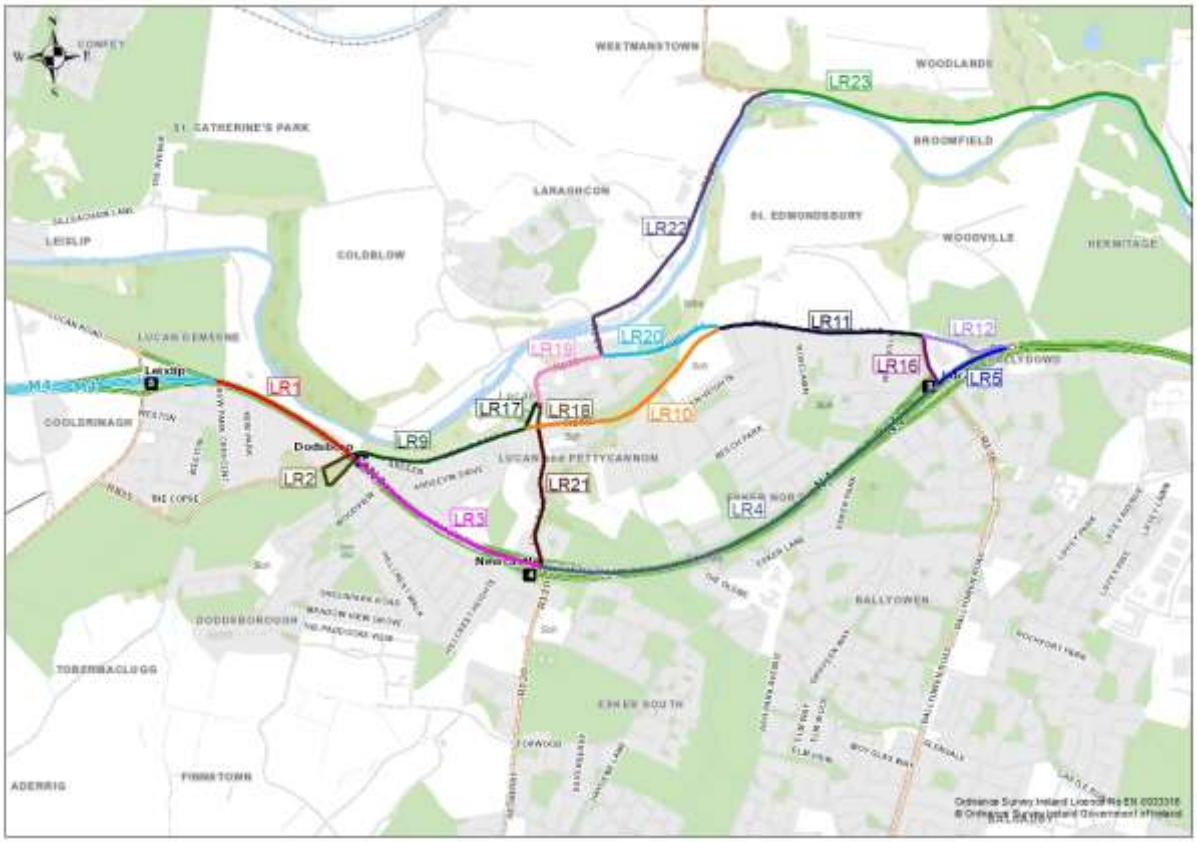

Figure 5.1: Section 1 Route Options

These routes were then assessed as part of a high level "sifting" process in order to determine their suitability for the CBC. This assessment is summarised in **Table 5.1** below.

Table 5.1: Section 1: N4 Junction 5 (Celbridge/Leixlip) to N4 Junction 3 (Ballyowen/Lucan) – Route Option Sifting (Stage 1) Summary

Route Option Number	Comments	Pass/Fail
LR1	Section of N4 between junctions 5 (Celbridge/Leixlip) and 4a (Dodsboro/Kew Park) with 3 all-vehicle lanes in both directions. There is an existing bus lane inbound throughout this route. No dedicated outbound bus lane exists for this route section; buses currently use a segregated side road with a number of accesses. Additional bus priority measures could feasibly be introduced.	Pass
LR2	Section of R835 (Celbridge Road) and L1018 (Millstream Road) from junction with N4 inbound off-road slip to N4 outbound. This route has 1 all-vehicle lane in both directions. Outbound bus priority facilities could be provided with land-take from surrounding green areas. There is, however, a pinch-point at the N4 underbridge where bus priority facilities would not be feasible.	Pass
LR3	Section of N4 between junctions 4a (Dodsboro/Kew Park) and 4 (Lucan/Adamstown) with 3 all-vehicle lanes in both directions. There is an existing bus lane inbound throughout this route. A dedicated outbound bus lane exists for a short section of this route before joining a segregated side road. Additional bus priority measures could feasibly be introduced.	Pass
LR4	Section of N4 between junctions 4 (Lucan/Adamstown) and 3 (Ballyowen/Lucan) with 3 all-vehicle lanes in both directions. There is an existing bus lane inbound throughout this route. A dedicated outbound bus lane exists for a section of this route and further facilities could feasibly be provided.	Pass
LR5	Section of N4 between junction 4 and slip road from Lucan with 3 all-vehicle lanes in both directions. There is an existing bus lane inbound throughout this route. No dedicated outbound bus lane exists for this route and provision of priority measures would be difficult. However, the delay experienced outbound along this route would not be significant and could therefore be used as a CBC.	Pass
LR9	Section of R835 (Leixlip Road) from N4 off ramp to junction with R120 (Adamstown Road) in Lucan. The majority of this route is 1 lane all-vehicle in both directions. There is approximately 250m of an existing bus lane in the inbound direction on the approach to the junction in Lucan. Further facilities may be feasible with land take from the green land to the north of the route but would require removal of an existing stone wall. This requires careful consideration of architectural and heritage concerns.	Pass

Route Option Number	Comments	Pass/Fail
LR10	Section of R835 (Lucan Road) from junction with R120 (Adamstown Road) to junction at Chapel Hill. This route has 1 all-vehicle lane in both directions for the entire route. Carriageway widths vary between approximately 7 and 8m. There is over 200m of linear, pay and display parking along the route, close to the village. This parking appears to be predominantly commercial in nature with a number of businesses located opposite. Bus facilities could possibly be introduced on the northern side of the route where there is an existing green belt but would require land take and possibly major engineering works due to a severe slope.	Pass
LR11	Section of R835 (Lucan Road) from junction at Chapel Hill to junction with R136 (Ballyowen Road). The majority of this route has 1 all-vehicle lane in both directions with an inbound bus lane. The existing carriageway width is close to 10m. Further bus priority facilities may be feasible for large sections of the route with land take, predominantly along the northern side of the route.	Pass
LR12	Section of R835 (Lucan Road) from junction with R136 (Ballyowen Road) to N4. This route has 1 all-vehicle lane in both directions before becoming a one-way slip road onto the N4. There is an existing bus lane for a short section of the route. Further bus facilities could feasibly be provided with land-take to the northern side of the route.	Pass
LR17	Section of R121 in Lucan village. This route is a one-way northbound, 1 all-vehicle lane link from the R835 (Leixlip Road) towards Lucan village. This route is quite narrow with pay and display parking on both sides for most of its length. This parking appears to be mainly commercial in nature with a number of business located along the route. It may be feasible to provide bus priority measures along this route in one direction only, however, the majority of parking would need to be removed.	Pass
LR18	Section of R109/R121 in Lucan village. This route is a one-way southbound, 1-2 all-vehicle lane link from the Lucan village to the crossroads of the R835/R120 (Lucan Road/Adamstown Road). The existing carriageway is currently quite narrow, less than 6m wide in places. It is feasible that bus priority measures in an outbound direction could be provided with land take in the green area along the western edge of the route.	Pass

Route Option Number	Comments	Pass/Fail
LR19	Section of R109/R121 (Main Street) from junction of LR17/LR18 to the mini-roundabout in Lucan village. This route consists of 1 all-vehicle lane in both directions with pay and display parking on one or both sides for the entire length of its route. The existing carriageway width varies from approximately 8-11m including the existing parking facilities. The parking in the area is extensively used and is a mixture of residential and commercial activity. It may be feasible to provide bus priority measures on this route in one direction only, however, large amounts of parking would have to be removed.	Pass
LR20	Chapel Hill road from mini-roundabout within Lucan village to junction with R835 (Lucan Road). This route consists of 1 all-vehicle lane in both directions with pay and display parking on the southern side for a large section of the route. The existing width of the road varies from approximately 7.5m to 10m including the parking bays. Removal of this parking could be considered to be permissible as it is less critical to the village centre and used less extensively. There are a number of pinch points where the width between building lines precludes the possibility of providing bus priority measures in both directions. It may be feasible to provide bus priority measures on this route in one direction only, however.	Pass
LR21	Section of R120 (Adamstown Road) from crossroads with R835 (Lucan Road) to N4 junction. This route is a narrow, rural road with 1 all-vehicle lane in both directions. The existing width is in the region of 6m to 7.5m. It is feasible that bus priority measures could be introduced in one direction along this route. It would be feasible for inbound buses only to use LR9 while this route could possibly service buses travelling outbound and thus, priority measures in one direction would be sufficient.	Pass
LR22	Section of R121 (Lower Lucan Road) between the mini-roundabout within Lucan village and the junction at Tinkers Hill. This route is predominantly a narrow, rural road with poor horizontal and vertical geometry. Vast areas of land-take would be required in order to provide bus priority along this route and the population served by it is minimal. Given these factors, the route is not considered a feasible one.	Fail
LR23	Section of L3103 (Lower Lucan Road) from the junction with the R121 to the M50 overbridge. As above, this route is predominantly a narrow, rural road with poor horizontal and vertical geometry. Vast areas of land-take would be required in order to provide bus priority along this route and the population served by it is minimal. Given these factors, the route is not considered a feasible one.	Fail

Following this Stage 1 'sifting' process 14 of the 16 routes assessed passed the initial analysis and were progressed to the next assessment stage. The remaining routes are shown in **Figure 5.2** below.

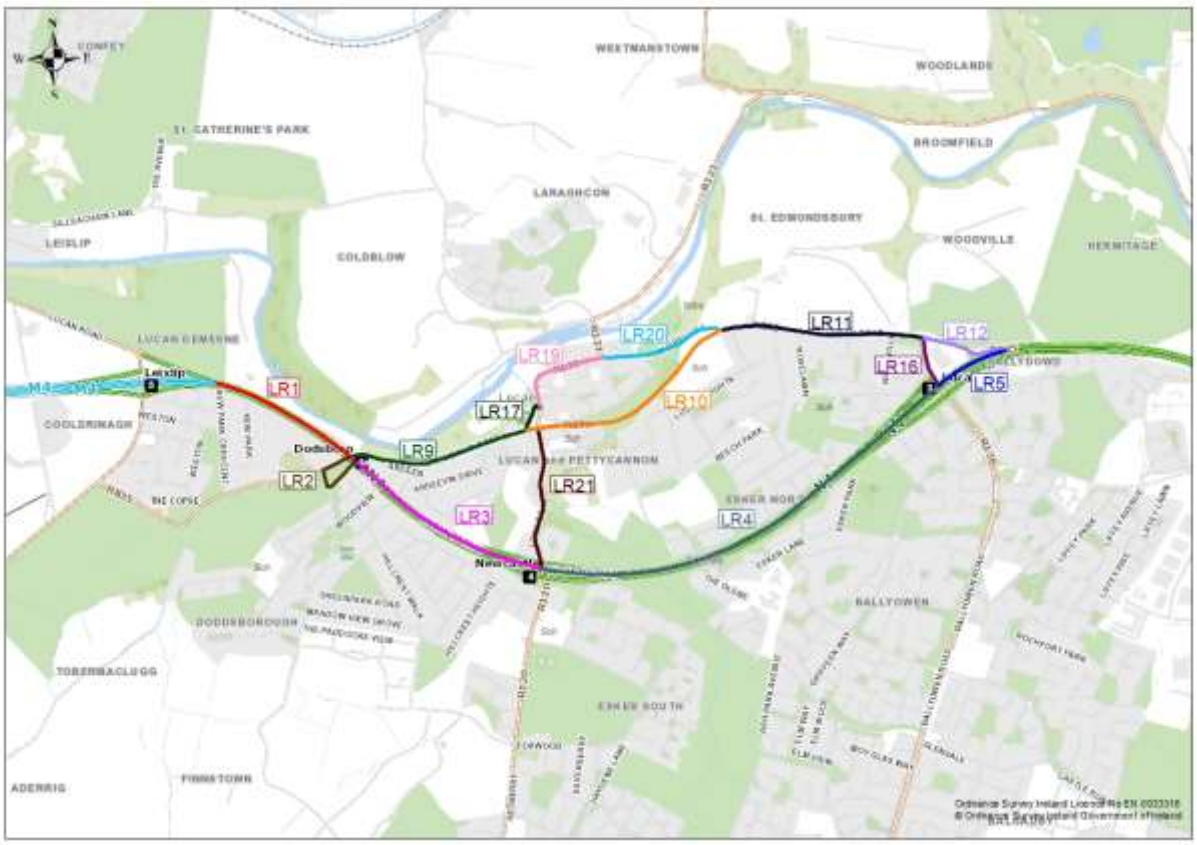

Figure 5.2: Section 1 Route Options Remaining After Stage 1 Sifting

5.2 Stage 2: Route Options Assessment – Multi-Criteria Analysis

For the purposes of the Stage 2 assessment, the remaining routes in this section were combined to form 5 distinct and cohesive route options through the area. These routes are labelled LN01 to LN05 and are discussed in detail in the following sections.

5.2.1 Route Option LN01

This route option is shown in **Figure 5.3** below.

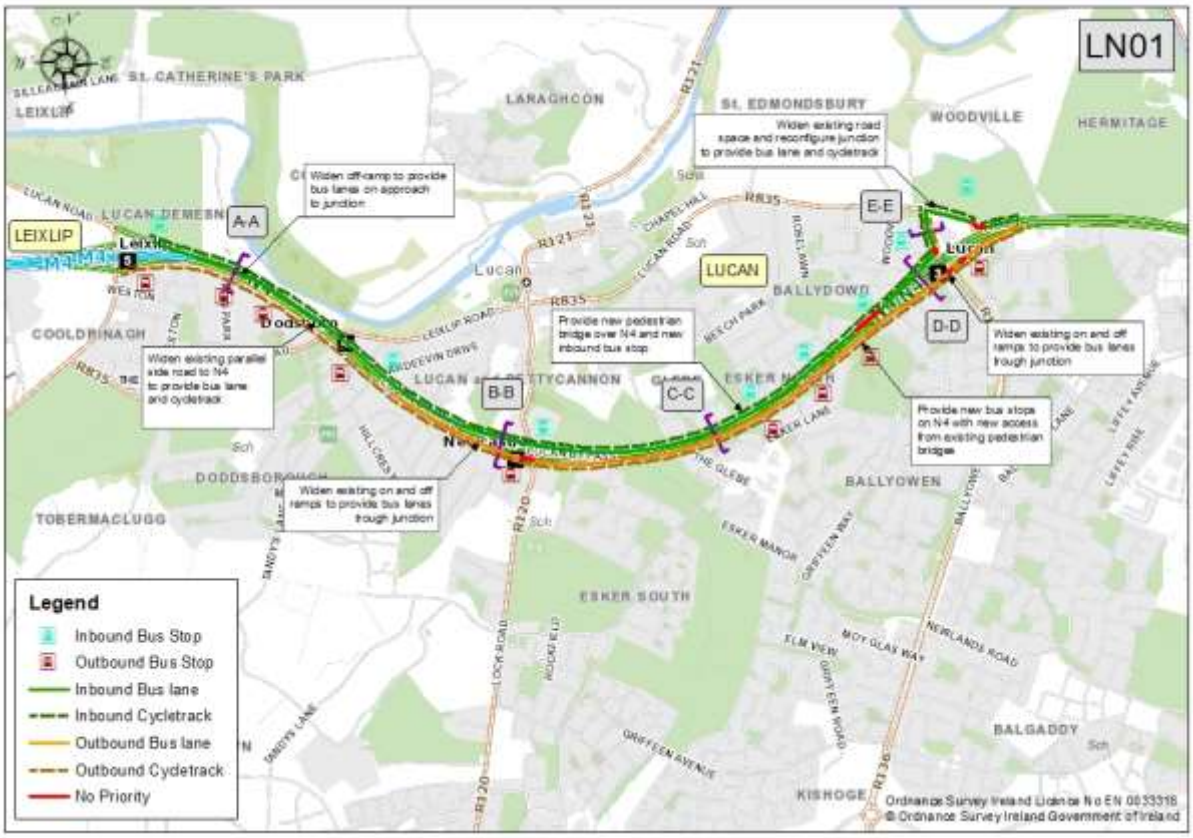

Figure 5.3: Route Option LN01 Indicative Scheme Design

In general, this route mostly uses the existing bus lanes and cycle tracks along the N4 where they exist. The route uses the on and off ramps at Junctions 3 (Ballyowen/Lucan), 4 (Lucan/Adamstown) and 5 (Celbridge/Leixlip) in order to maximise catchment as there are bus stops at these junctions.

Figure 5.4 below shows cross-section A-A where it is proposed that the CBC would use the existing side road parallel to the N4 outbound in order to access bus stops along this section. It is proposed to widen this existing side road to provide continuous footpath and cycle tracks along this section. This would require land take in the form of widening into the existing grass verges and embankments within the N4 road reservation, along with the provision of a new pedestrian and cyclist bridge over the Celbridge Road. Adjacent to the entrance of the Kew Park housing estate, a portion of a front garden of 1no. residential property and approx. ten parking spaces belonging to 1 no. commercial property, along with of a number of trees will be removed to facilitate the widening.

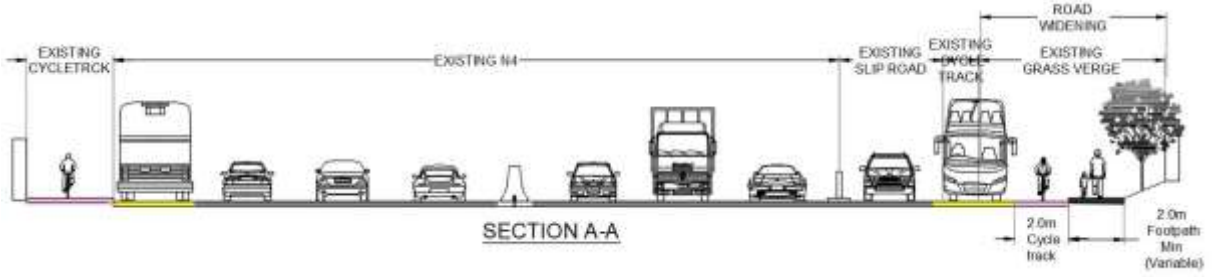

Figure 5.4: LN01 Cross-Section A-A

Figure 5.5 below shows cross-section B-B where the CBC would leave the N4 at Junction 4 (Lucan/Adamstown) by using the off-ramps before travelling through the junction and re-joining the N4 by using the on-ramps. There is currently bus lanes partway along these on and off ramps but it is proposed to extend these to and from the stop lines of the junction to increase bus priority along with upgrading the cycling facilities to achieve a dedicated cycle track with 2m minimum width where possible. This would be done by widening the ramps on the approaches to the junction by utilising the available grass verge. A new footpath is proposed to connect Cherbury Park Avenue with Beech Grove, along with a new pedestrian overbridge to connect these housing estates to Esker Park and Esker Glebe.

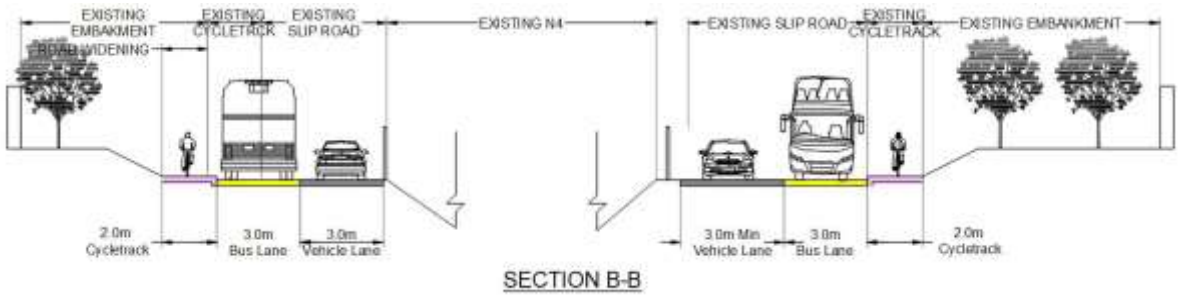

Figure 5.5: LN01 Cross-Section B-B

Cross-section C-C shown in **Figure 5.6** below is indicative of the majority of this route where buses and cyclists would use the existing bus lanes and cycle lanes along the N4.

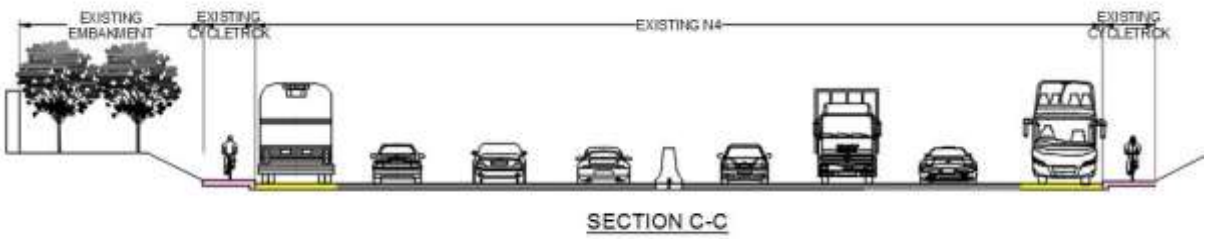

Figure 5.6: LN01 Cross Section C-C

The CBC is proposed to use the on and off-ramps at Junction 3 (Ballyowen/Lucan) similar to at Junction 4 (Lucan/Adamstown). Again, there are stretches of existing bus lane that are proposed to be extended to the stop lines by means of widening, as shown in **Figure 5.7** below. Widening of these ramps would include new retaining walls, embankments and similar engineering measures. Upgraded cycling facilities of 2m width would be accommodated by using the available grass verge.

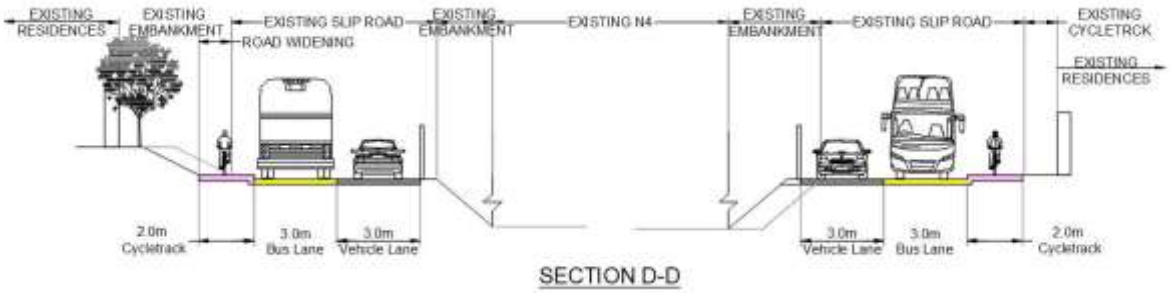

Figure 5.7: LN01 Cross Section D-D

While outbound buses would travel straight through Junction 3 (Ballyowen/Lucan) and re-join the N4 by using the on-ramp, inbound buses would turn left onto the R136 (Ballyowen Road) before turning right on the R835 (Lucan Road) and re-joining the N4 by means of the on-ramp there. Some

redistribution of existing road space is required along these roads to provide adequate bus priority measures and cycle facilities along the R136. This is shown in **Figure 5.8** below. Additionally, the junction between the R136 and R835 would be redesigned to provide for right turning buses.

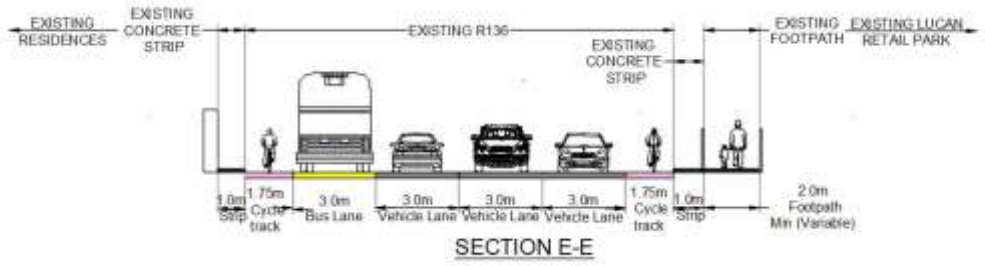

Figure 5.8: LN01 Cross Section E-E

As part of this proposed route, all of the existing bus stops would be upgraded while additional stops would be located along the N4 also. A new bus stop is proposed in the inbound direction, opposite the existing bus stop at Esker Lane, along with a new pedestrian bridge over the N4 at this location. A proposed new footpath linking Esker Park and Esker Lane will improve the accessibility and catchment of the CBC route to the local population. New stops are proposed in both directions at Willsbrook Park and Woodville Green, adjacent to the existing pedestrian bridge at this location. Furthermore new stops are proposed in both directions at Cherbury Park ave. and Esker Glebe along with an upgraded footbridge to accommodate new access ramps. In order to accommodate new bus stops and new/improved pedestrian overbridges land take from adjacent greens will be required. As a result a number of trees will be removed to facilitate this. The construction of these stops and safe pedestrian access is key to ensuring the full available catchment is captured by the CBC, both to the north and south of the N4. An additional stop for inbound buses along the R136 (Ballyowen Road) is also proposed to facilitate users that may walk northwards along the R136 from the large residential areas to the south.

Other issues considered as part of the analysis were:

- Journey time is approximately 8.5 – 9 minutes
- Route uses existing cycle tracks where possible and will provide new cycle tracks where widening is required
- Public land take required for widening of on and off-ramps but no private land take required
- Use of existing facilities for long sections reduces capital cost required

5.2.2 Route Option LN02

This route option is shown in **Figure 5.9** below.

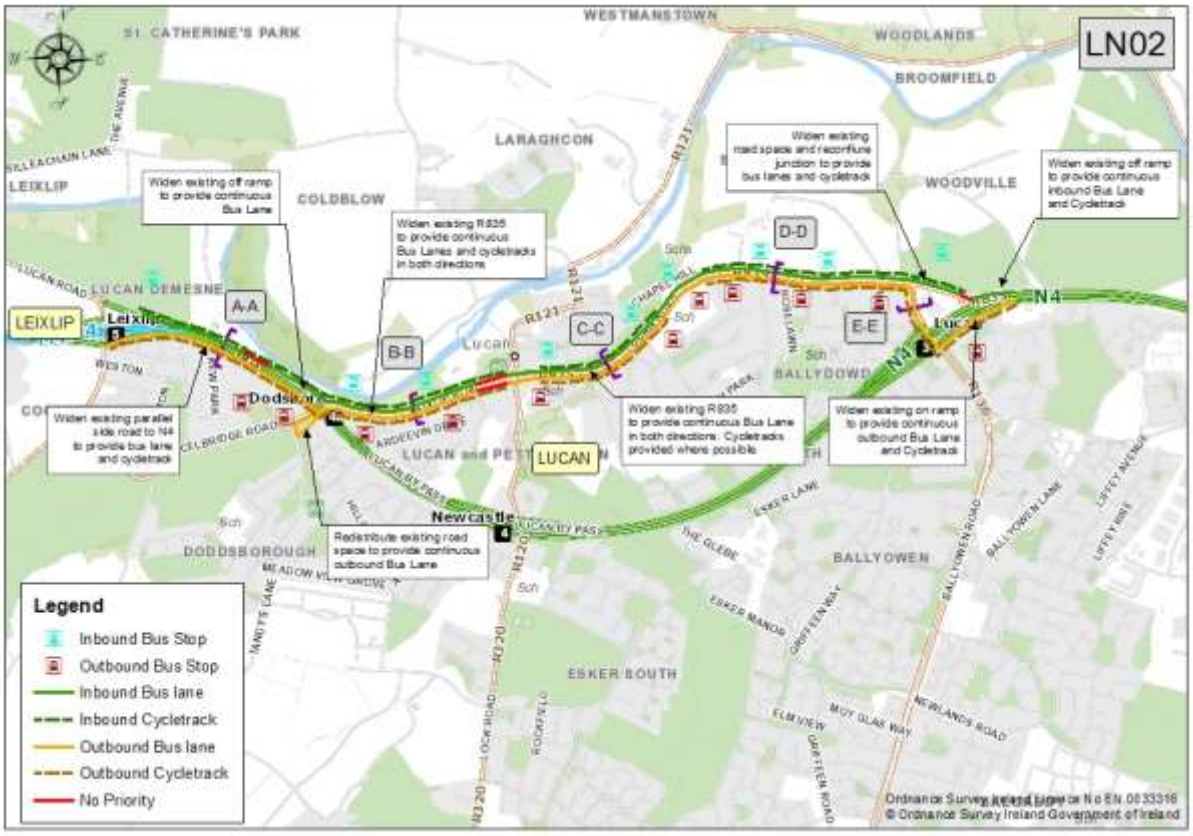

Figure 5.9: Route Option LN02 Indicative Scheme Design

This route, in general, travels along the N4 and R835 (Leixlip Road/Lucan Road) along its length. The route is similar to LN01 from the Leixlip junction on the N4 before diverting onto the R835 towards Lucan. Inbound buses would use the off-ramp at Junction 4a (Dodsboro/Kew Park) while outbound buses travel around a loop on the R835 under the N4 and onto the N4 side road via Dodsborough Road. Some widening of the off-ramp would be required to provide bus priority facilities while redistribution of the existing road space is required to provide the outbound bus facilities. Cross section A-A shown above is the same as **Figure 5.4** for LN01.

Extensive widening is required to provide two way bus lanes and cycle tracks along the R835 (Leixlip Road) between the off-ramp junction to the junction with the R120 (Adamstown Road) close to Lucan Village. This widening would require large amounts of land-take and the removal of a large stone wall from the Italian Ambassador's residence. The proposed cross-section in **Figure 5.10** below shows the widening required.

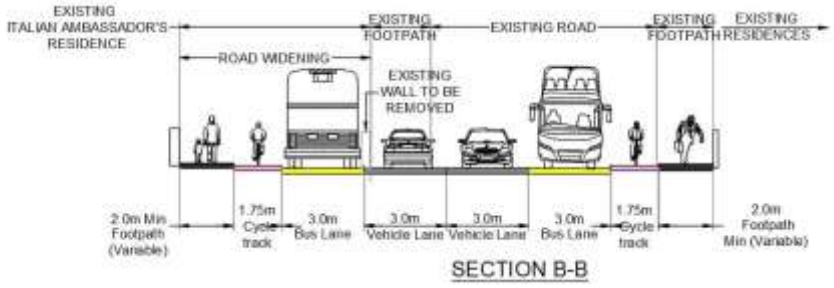

Figure 5.10: LN02 Cross Section B-B

It is not feasible to provide bus lanes on the approach to the junction with the R120 (Adamstown Road), which would cause some delays to buses. From the R120 junction to the junction with Chapel Hill it is proposed to provide bus lanes and cycle tracks in both directions along the R835 (Lucan Road). This requires widening in most locations, including new embankments, retaining walls and extensive removal of trees through the section adjacent to Sarsfield Park as shown in **Figure 5.11** below. Existing street parking on the Lucan Road between the Adamstown Road (R120) and the Brookvale Road will be removed to accommodate the provision of bus lanes and cycle tracks in two directions.

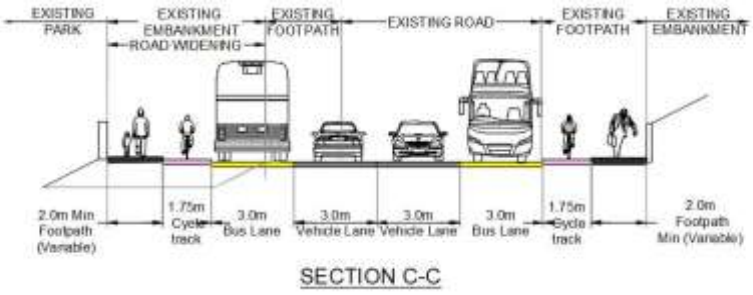

Figure 5.11: LN02 Cross Section C-C

Widening is also required between Chapel Hill and the R136 (Ballyowen Road) junction in order to provide bus lanes and cycle tracks. Private land take to the north of the existing road is required in a number of locations along this section as illustrated in **Figure 5.12** below. The majority of this land take is from existing green fields.

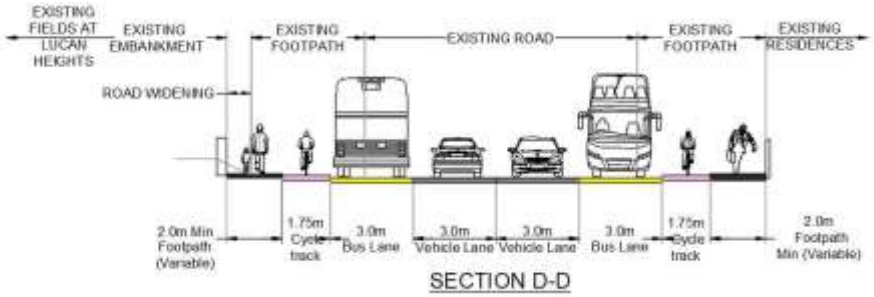

Figure 5.12: LN02 Cross Section D-D

Similar to LN01, inbound buses would travel through the junction with the R136 before re-joining the N4 using the on-ramp. Outbound buses would leave the N4 via the off-ramp at Junction 3 (Ballyowen/Lucan) before turning right on the R136 (Ballyowen Road) and then left on the R835 (Lucan Road). Section E-E indicated above would therefore be as **Figure 5.8** for LN01.

Other issues considered as part of the analysis were:

- Journey time is approximately 10.5 – 13 minutes
- New cycle tracks are proposed where possible but there are some sections where shared bus and cycle facilities are required due to space constraints
- Existing bus stops to be upgraded
- Public land take and large areas of private land take required for widening
- The Italian Ambassador's residence is a protected structure

5.2.3 LN03 Route Option

This route option is shown in **Figure 5.13** below.

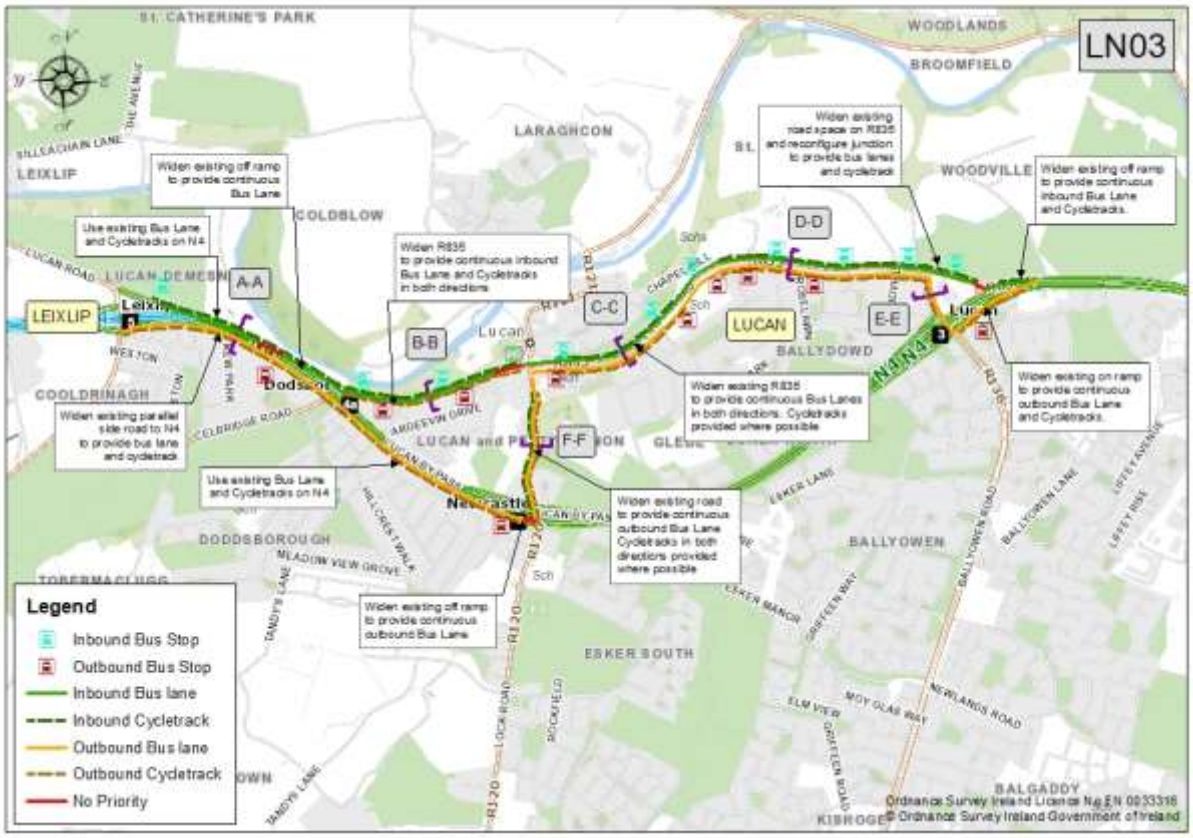

Figure 5.13: Route Option LN03 Indicative Scheme Design

This route option is similar to LN02 except for the section between N4 Junction 4a (Dodsboro/Kew Park) and the junction of the R835 (Lucan Road) and R120 (Adamstown Road). This route option proposes that inbound buses would use the R835 (Leixlip Road) between these junctions, while outbound buses would turn left on the R120 (Adamstown Road) before making a right turn and re-joining the N4 using the on-ramp at Junction 4 (Lucan/Adamstown).

Although there is an existing bus lane along a stretch of the R835 (Leixlip Road) in this location, further widening is required to provide a continuous bus facility for inbound buses along with cycle tracks. Dedicated 2m wide cycle tracks will be provided where possible. Similar to route option LN02, this would require removal of the existing stone wall and land take from the Italian Ambassador's residence. There is insufficient space to provide bus priority facilities on the approach to the R120 (Adamstown Road) junction due to space constraints. **Figure 5.14** below shows a typical cross-section along this road.

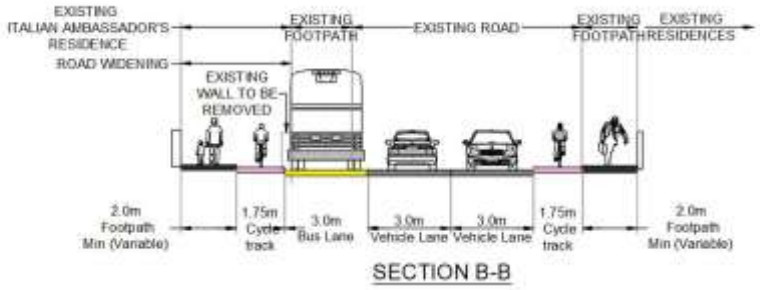

Figure 5.14: LN03 Cross Section B-B

It is proposed to provide a one-way bus lane with cycle tracks in both directions along the R120 (Adamstown Road) for outbound buses with widening required along most of this road. There is considerable public and private land take required to facilitate this widening, although the majority is taken from green fields. A number of stone walls would be removed as part of this process. A significant number of trees either side of the R120 (Adamstown Road) would be removed to facilitate the widening. A typical cross-section along the R120 is shown in **Figure 5.15** below.

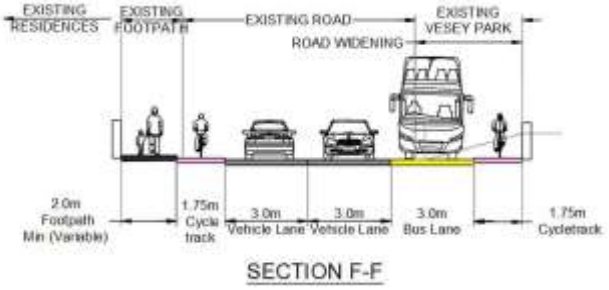

Figure 5.15: LN03 Cross Section F-F

Sections A-A, C-C, D-D and E-E are the same as sections in **Figure 5.4, 5.11, 5.12 and 5.8** for LN01 and LN02.

Other issues considered as part of the analysis were:

- Journey time is approximately 10 – 13 minutes
- New cycle tracks are proposed where possible but there are some sections on the R835 and R120 where shared bus and cycle facilities are required due to space constraints
- Existing bus stops to be upgraded
- Public land take and large areas of private land take required for widening
- The Italian Ambassador's residence is a protected structure
- As inbound and outbound buses do not use the same route, the overall potential catchment is greatly reduced

5.2.4 Route Option LN04

This route option is shown in **Figure 5.16** below:

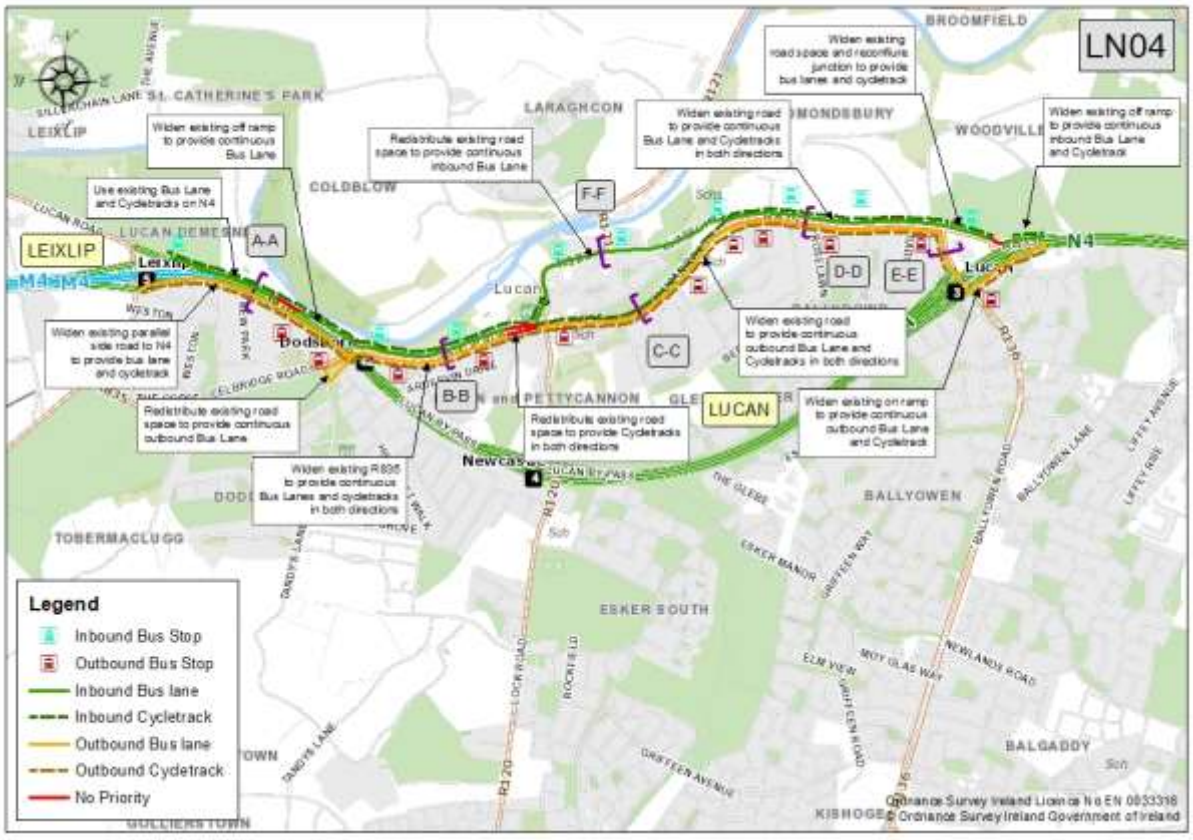

Figure 5.16: Route Option LN04 Indicative Scheme Design

This route option is similar to LN02 except inbound buses travel directly through Lucan Village by turning left on the R109 (Main Street) and straight along Chapel Hill rather than staying on the R835 (Lucan Road). Redistribution of the existing road space is required in order to facilitate the inbound bus lane on this route. This would also result in the loss of a considerable number of car parking spaces to both local residents and businesses in this area. **Figure 5.17** below shows a typical section in this area.

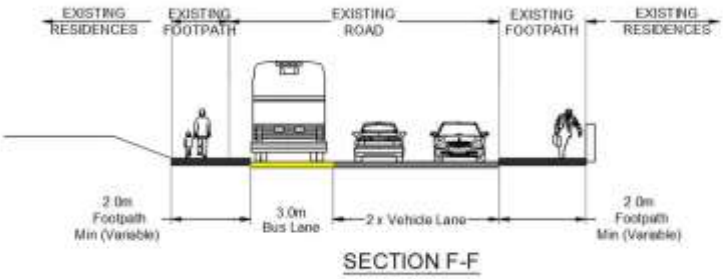

Figure 5.17: LN04 Cross-Section F-F

Public land take would be required along the R835 (Lucan Road) between the R120 (Adamstown Road) and Chapel Hill junctions in order to provide the outbound bus lane along with cycle tracks in both directions. Cycle tracks will be 2m in width where possible. As there is only a one-way bus lane along this section, it is feasible to provide cycle tracks in both directions along its entire length. In comparison to LN02 and LN03, engineering measures such as embankments and retaining walls

along this road would also be reduced due to the narrower proposed cross section as shown in **Figure 5.18** below.

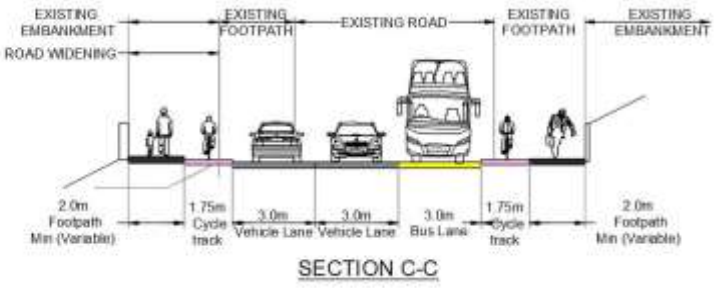

Figure 5.18: LN04 Cross-Section C-C

Sections A-A, B-B, D-D and E-E are the same as sections in **Figure 5.4, 5.10, 5.12 and 5.8** for LN01 and LN02.

Other issues considered as part of the analysis were:

- Journey time is approximately 11.5 – 13.5 minutes
- New cycle tracks are proposed where possible but are not feasible along the R109 and through Lucan Village
- Existing bus stops to be upgraded
- Public land take and large areas of private land take required for widening
- The Italian Ambassador's residence is a protected structure
- Route serves Lucan Village directly in one direction
- As inbound and outbound buses do not use the same route, the overall potential catchment is reduced

5.2.5 Route Option LN05

This route option is shown in **Figure 5.19** below.

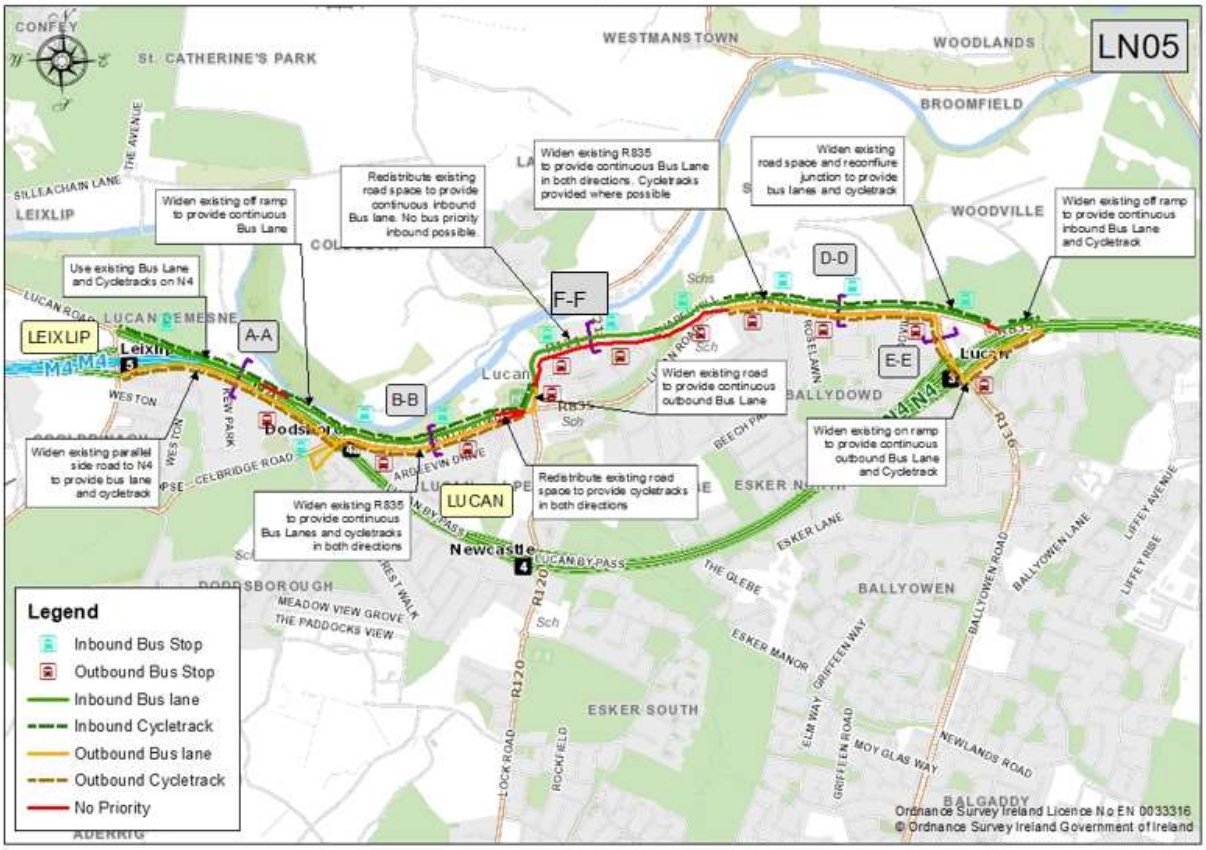

Figure 5.19: Route Option LN05 Indicative Scheme Design

This option is similar to LN04 except that both inbound and outbound buses would travel directly through Lucan Village. Due to space constraints, only a one-way bus lane for inbound buses can be provided in this section. This results in no bus priority for outbound buses and, given the existing average speed data in this area, it is likely that buses travelling in this direction would experience significant delay. Provision of an inbound bus lane, would also result in the loss of a considerable number of car parking spaces to both local residents and businesses in this section. All cross sections are the same as sections in previous route options LN01, LN02, LN03 and LN04. Route option LN05 does not provide cycle facilities through Lucan Village.

Other issues considered as part of the analysis were:

- Journey time is approximately 11.5 – 18.5 minutes
- New cycle tracks are proposed where possible but are not feasible along the R109 and through Lucan Village
- Existing bus stops to be upgraded
- Public land take and large areas of private land take required for widening
- The Italian Ambassador's residence is a protected structure
- Route serves Lucan Village directly in both directions

5.2.6 Section 1: Route Options Assessment Summary

The Stage 2 Route Options Assessment – Multi Criteria Analysis summary tables for this section are include in **Appendix A1**. The relative ranking of the route options for each assessment sub-criteria is shown in **Table 5.2** below:

Table 5.2: Section 1 Route Options Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	LN01	LN02	LN03	LN04	LN05
Economy	Capital Cost					
	Transport Reliability and Quality of Service					
Integration	Land Use Integration					
	Residential, Employment and Educational Catchments					
	Transport Network Integration					
	Cycling Integration					
Accessibility & Social Inclusion	Key Trip Attractors					
	Deprived Geographic Areas					
Safety	Road Safety					
	Pedestrian Safety					
Environment	Archaeology, Architectural and Cultural Heritage					
	Flora and Fauna					
	Soils and Geology					
	Hydrology					
	Landscape and Visual					
	Air Quality					
	Noise & Vibration					

Assessment Criteria	Assessment Sub-Criteria	LN01	LN02	LN03	LN04	LN05
	Land Use Character					

Route Option LN01 is preferable under the majority of criteria, particularly in terms of capital cost, reliability and environment. Much of this can be attributed to the fact that large sections of the route use existing bus lanes and therefore this route options requires considerably less construction.

The key issue for LN01 is the provision of new bus stops along the N4 in order to maximise the catchment for the CBC. Although the scheme would still rank well if these stops are were not included, there would be a reduction in the realistic catchment area for bus services.

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

Under 'Safety' there is nothing to differentiate between each route option regarding road safety. The only sub-criteria under which route option LN01 is not preferable is pedestrian safety. The reason for this is that the proposed new stops along the N4 could be considered to be slightly more hazardous than other routes due to the nature of this road and its 80 km/h speed limit. However, given that there are currently bus stops along this route, and the proposed bus stop locations are adjacent to new and existing pedestrian bridges, it is not considered to be an insurmountable issue.

In terms of 'Environment', route option LN01 has the least overall impact due its low land acquisition, therefore having a lesser impact on flora & fauna, cultural heritage, hydrology and land use character when compared to all the other route options.

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

Table 5.3: Section 1: Route Options Assessment Summary (Main Criteria)

Assessment Criteria	LN01	LN02	LN03	LN04	LN05
Economy					
Integration					
Accessibility & Social Inclusion					
Safety					
Environment					

Based on the assessment undertaken, LN01 provided the most benefits and advantages out of all the options. Route option LN01 is therefore the preferred route for the following reasons:

- It's comparatively low capital cost coupled with the opportunity for journey time reliability and bus service efficiency;
- Provides good cycling integration
- Better able to service overall population catchments in the sectors of residential, employment and educational.
- It has comparatively lower potential to impact on the environment across all sub criteria

Based on the multi-criteria analysis undertaken for this section of the study area, route option **LN01** is the preferred route option for Section 1: N4 Junction 5 (Celbridge/Leixlip) to N4 Junction 3 (Ballyowen/Lucan).

6. Study Area Section 2: N4 Junction 3 (Ballyowen/Lucan) to Kennelsfort Road Upper

6.1 Stage 1: Route Options Assessment - Sifting

All of the feasible routes within the study area section are identified in **Figure 6.1** below. Although there are a number of possible, long end-to-end routes in the area, these have been subdivided in order to allow the maximum number of possible route combinations and to account for changes in character along roads, e.g. major changes in width etc. Route LR23 is included in this section also as it passes through both Section 1 and Section 2.

Figure 6.1: Section 2 Route Options

These routes were then assessed as part of a high level "sifting" process in order to determine their suitability for the CBC. This assessment is summarised in **Table 6.1** below.

Table 6.1: Section 2: N4 Junction 3 (Ballyowen/Lucan) to Kennelsfort Road Upper – Route Option Sifting (Stage 1) Summary

Route Option Number	Comments	Pass/Fail
LR6	Section of N4 between Lucan slip road and Junction 2 (Fonthill/Liffey Valley) with 3 all-vehicle lanes in both directions. Existing bus lane inbound throughout this route. A dedicated outbound bus lane exists for a short section of this route before joining a segregated side road. Further priority measures would be difficult to provide. However, the delay experienced outbound along this route would not be significant and could therefore be used as a CBC.	Pass
LR7	Section of N4 between Junction 2 (Fonthill/Liffey Valley) and Junction 1 (M50 northbound/southbound) with 3 all-vehicle lanes in both directions. There are existing bus lanes both inbound and outbound on the majority of this route.	Pass
LR8	Section of N4 through free-flow junction over the M50 with 2 all-vehicle lanes in both directions. There are no bus priority measures currently existing along this route but could feasibly be introduced. However, this would require removal of an existing all-vehicle lane and would require careful consideration of the traffic impact on the N4/M50. The delay experienced along this route in both directions is not overly significant and it could therefore be used as a CBC.	Pass
LR13	Slip road off of N4 to R113 (Fonthill Road). This route has 1 all-vehicle lane and a bus/cycle lane for its entire length. The existing facilities provide ample priority for buses.	Pass
LR14	Section of R113 (Fonthill Road) at N4 on and off slips. There are 2 all-vehicle lanes in both directions throughout this route. Bus lane facilities are feasible on this route. However, this route is unnecessarily circuitous and serves very little population. As a result it is not considered to be suitable for the CBC.	Fail
LR15	Slip road from R113 (Fonthill Road) on to N4. This route has 1 all-vehicle lane for the majority of its route. Bus priority facilities could feasibly be provided with some alterations to the existing layout.	Pass
LR23	Section of L3103 (Lower Lucan Road) from the junction with the R121 to the M50 overbridge. As above, this route is predominantly a narrow, rural road with poor horizontal and vertical geometry. Vast areas of land-take would be required in order to provide bus priority along this route and the population served by it is minimal. Given these factors, the route is not considered a feasible one.	Fail

Following this Stage 1 'sifting' process 5 of the 7 routes assessed passed the initial analysis and were progressed to the next assessment stage. The remaining routes are shown in **Figure 6.2** below.

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

6.2 Stage 2: Route Options Assessment – Multi-Criteria Analysis

For the purposes of this Stage 2 assessment, the remaining routes in this section were combined to form 2 distinct routes through the area. These routes are labelled PM01 and PM02 and are discussed in detail in the following sections.

6.2.1 Route Option PM01

This route option is shown in **Figure 6.3** below.

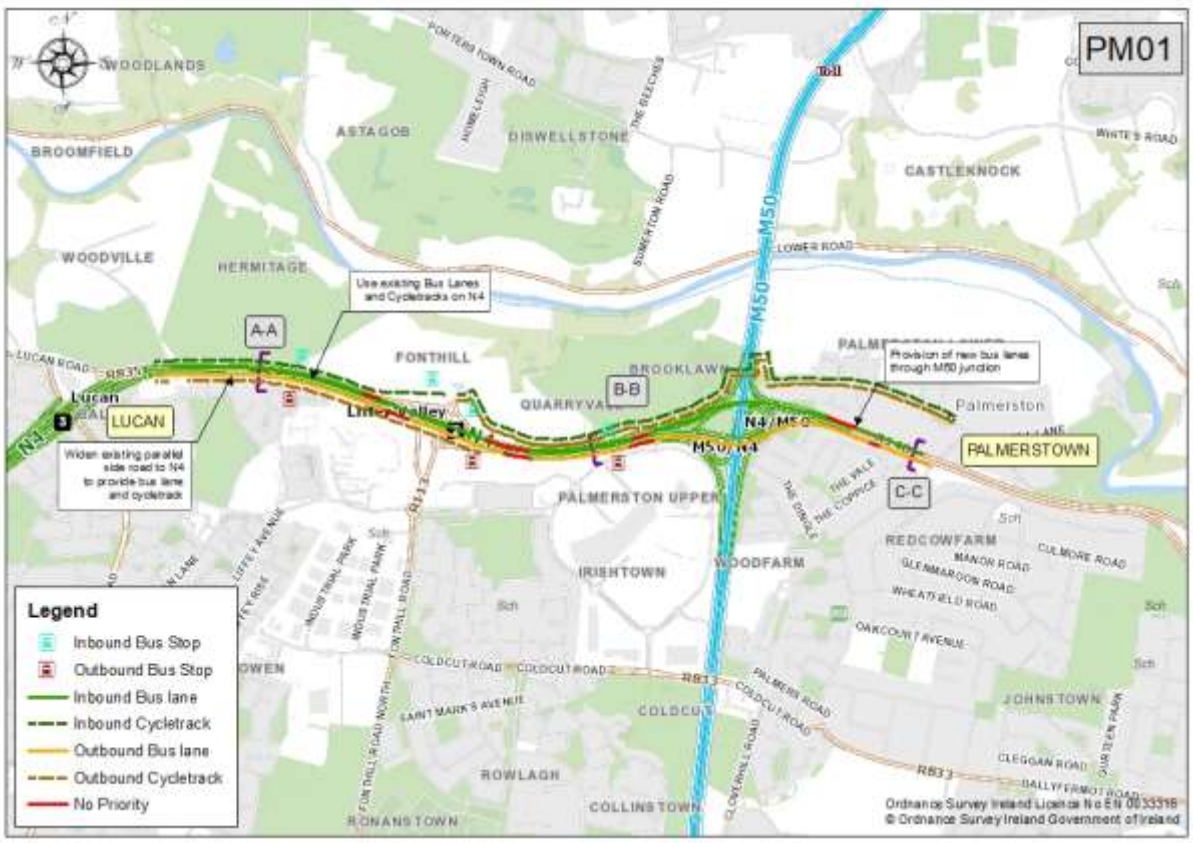

Figure 6.3: Route Option PM01 Indicative Scheme Design

In general, this route involves using the existing bus lanes and cycle tracks along the N4 for most of its length. Inbound there is a continuous bus lane from N4 Junction 3 (Ballyowen/Lucan) to the approach to the M50 junction. Outbound there is a continuous bus lane from the M50 junction to just after Junction 2 (Fonthill/Liffey Valley) where the buses will continue along a parallel side road before joining the on-ramp at Junction 3 (Ballyowen/Lucan). It is proposed to widen this existing side road to provide continuous bus and cycle tracks along its length. Dedicated 2m wide cycle tracks are proposed where possible. This requires land take from the back of residential and commercial premises along this section of the route. An existing carpark exit for the Foxhunter Bar and Restaurant would be impacted to cater for the added width of the proposed 2m wide footpath. Small areas of back gardens belonging to two residential properties in Hermitage Way and a small amount of residential car parking belonging to Latouka Apartments would be required to facilitate widening. Furthermore at locations of land take a number trees will be removed. **Figure 6.4** below shows this proposed arrangement.

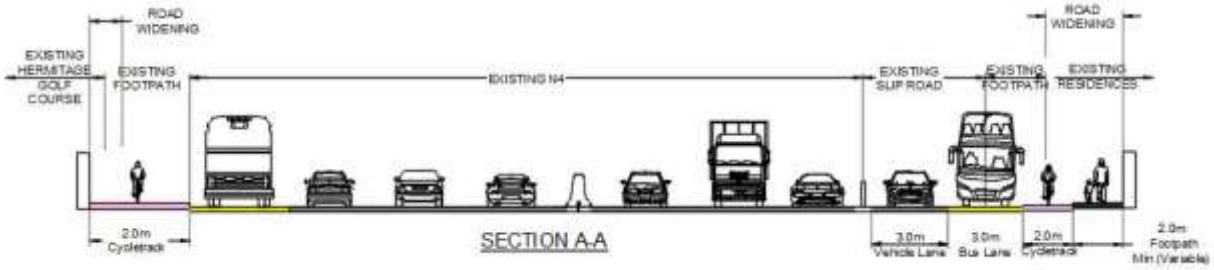

Figure 6.4: PM01 Cross-Section A-A

Figure 6.5 below shows the typical cross-section for much of this route where buses would use the existing bus lanes along the N4. From the merge of Junction 2 (Fonthill/Liffey Valley) with the N4 to the N4 diverge with the M50 cyclists would be accommodated by traveling along the access road for The King's Hospital, sharing space with local traffic and traffic accessing the hospital. After approximately 850m, cyclists can re-join an existing shared pedestrian/two-way cycle path that continues onto the old Lucan Road via an existing pedestrian/cyclists bridge that traverses the M50. Outbound cyclists would travel this route in the reverse direction and continue to travel along the R113, under the N4 and ascend up the pedestrian/two-way cycle path adjacent to the N4 off ramp and join the outbound cycle track on the N4. Toucan crossings are proposed at points where cyclists require to cross.

Exiting pedestrian footbridges along this section adjacent to Month Andrew Court and prior to the Inbound N4/M50 diverge will be maintained and modified to cater to for the extra width as a result of increased pedestrian and cyclist facilities. Land take attributed to these improvements will be accommodated by the adjacent available public green space.

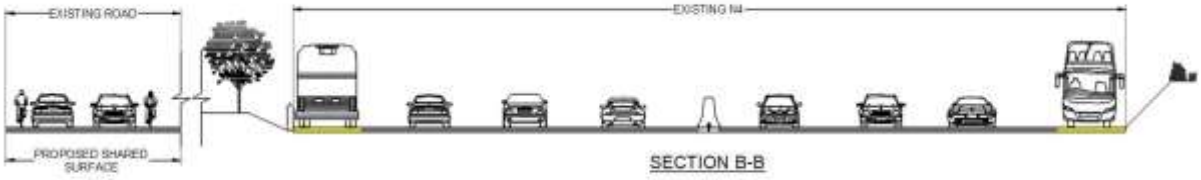

Figure 6.5: PM01 Cross-Section B-B

Bus lanes are proposed through the N4/M50 junction by the removal of an existing all-vehicle lane in certain sections, however, two lanes of all-vehicle traffic are maintained through the majority of the junction.

It is proposed to extend the existing bus lanes in both directions on the R148 (Chapelizod Bypass) towards the M50 junction. Buses would then use these extended bus lanes to the stop line at the Kennelsfort Road junction. **Figure 6.6** below shows the cross-section on approach to this junction.

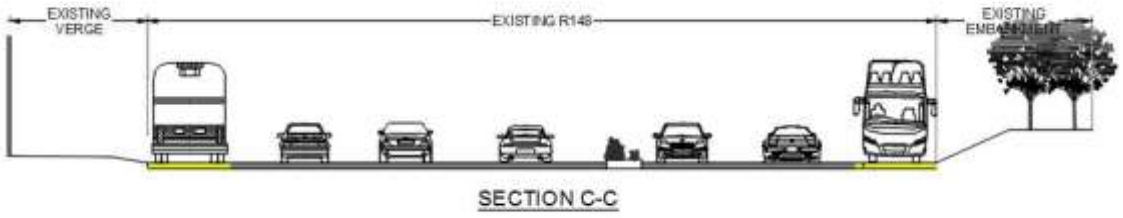

Figure 6.6: PM01 Cross-Section C-C

Other issues considered as part of the analysis were:

- Journey time is approximately 6 – 7 minutes
- Use existing cycle tracks along N4
- Existing bus stops to be upgraded
- Buses must cross merge and diverge lanes at N4 Junction 2 (Fonthill/Liffey Valley)
- Cyclists to use side road for cycle network continuity

6.2.2 Route Option PM02

This route option is shown in **Figure 6.7** below.

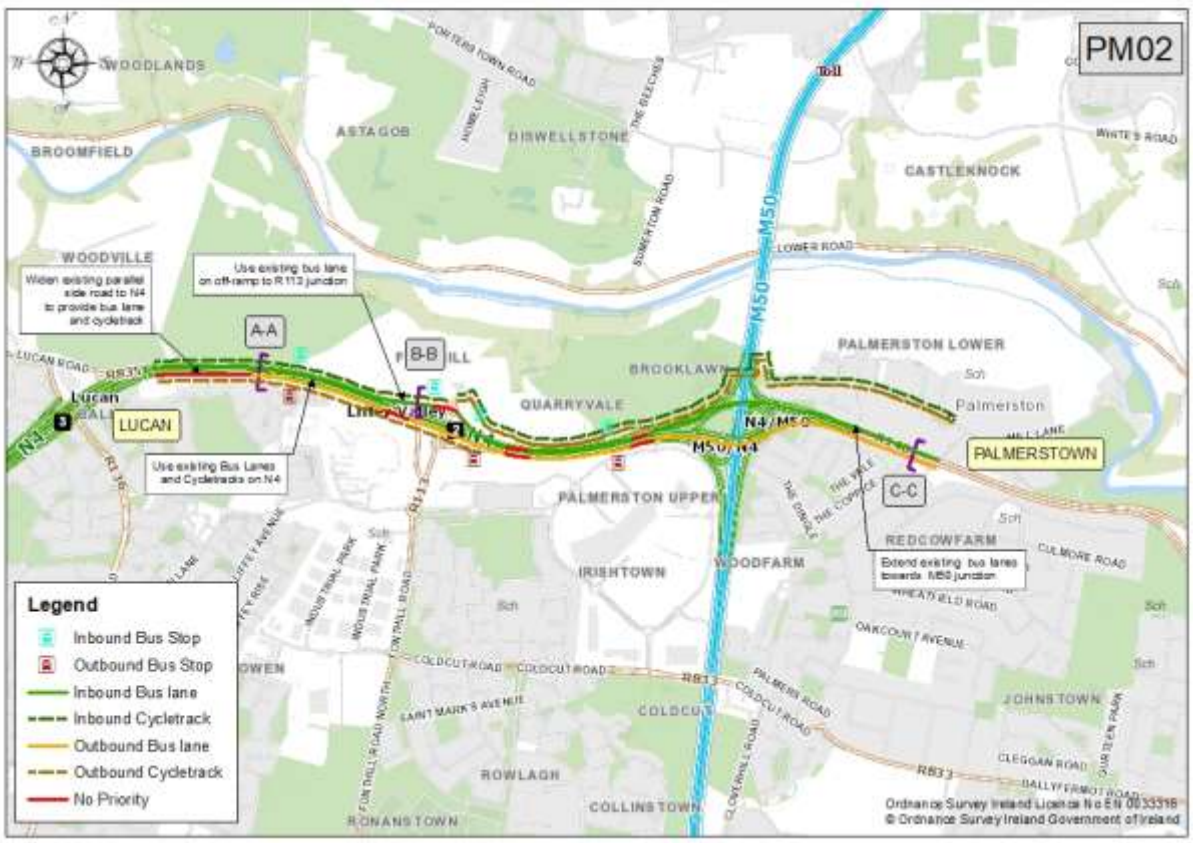

Figure 6.7: Route Option PM02 Indicative Scheme Design

This route is the same as PM01 except for a diversion of inbound buses off the N4 via the off-ramp at Junction 2 (Fonthill/Liffey Valley) before re-joining the N4 again via the on-ramp. It is proposed to extend the existing bus lane and provide an upgraded cycle track on the off-ramp towards the roundabout junction with the R113 (Fonthill Road) as shown in **Figure 6.8** below. A bus lane is proposed on the on-ramp from the R113 to the N4 to ensure priority for buses accessing back on to the N4. The use of this diversion allows for interchange opportunities with services using the R113 (Fonthill Road) and allows more direct access to Hermitage Medical Clinic and Fonthill Retail Park. To accommodate a cycle track on the off-ramp from the N4, land take using the available grassed verge will used.

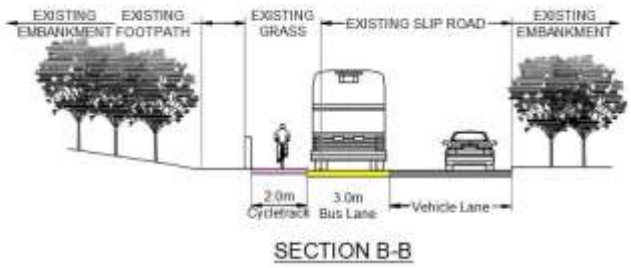

Figure 6.8: PM02 Cross-Section B-B

Sections A-A and C-C are the same as sections in **Figure 6.4 and 6.6** in PM01.

Other issues considered as part of the analysis were:

- Journey time is approximately 7– 8 minutes
- Use existing cycle tracks along N4
- Existing bus stops to be upgraded
- No land take required
- Additional opportunities for interchanges and to serve areas such as Fonthill Retail Park

6.2.3 Section 2: Route Options Assessment Summary

The Stage 2 Route Options Assessment – Multi Criteria Analysis summary tables for this section are include in **Appendix A2**. The relative ranking of the route options for each assessment sub-criteria is shown in **Table 6.2** below:

Table 6.2: Section 2: Route Options Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	PM01	PM02
Economy	Capital Cost		
	Transport Reliability and Quality of Service		
Integration	Land Use Integration		
	Residential, Employment and Educational Catchments		
	Transport Network Integration		
	Cycling Integration		
Accessibility & Social Inclusion	Key Trip Attractors		
	Deprived Geographic Areas		
Safety	Road Safety		
	Pedestrian Safety		
Environment	Archaeology, Architectural and Cultural Heritage		
	Flora and Fauna		
	Soils and Geology		
	Hydrology		

Assessment Criteria	Assessment Sub-Criteria	PM01	PM02
	Landscape and Visual		
	Air Quality		
	Noise & Vibration		
	Land Use Character		

There is little to separate the route options in most respects. PM01 has marginally quicker journey times but the diversion of PM02 and a bus stop along the off-ramp at Junction 2 (Fonthill/Liffey Valley) allows for more possible integration with existing bus services or a future feeder and orbital services. Additionally, this stop allows access to retail and industrial areas in Fonthill as well as serving more deprived areas, albeit these are only within the 15 minutes' walk catchment.

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

Table 6.3: Section 2: Route Options Assessment Summary (Main Criteria)

Assessment Criteria	PM01	PM02
Economy		
Integration		
Accessibility & Social Inclusion		
Safety		
Environment		

Although the assessment has shown that there is little difference between the options, route option PM02 is the preferred option for the following reasons:

- Performs marginally better in terms of servicing population catchment
- Performs marginally better in terms of providing more trip attracters

Based on the multi-criteria analysis undertaken for this section of the study area, route option **PM02** is the preferred route option for Section 2: N4 Junction 3 (Ballyowen/Lucan) to Kennelsfort Road Upper.

7. Study Area Section 3: Kennelsfort Road Upper to Con Colbert Road

7.1 Stage 1: Route Options Assessment - Sifting

All of the feasible routes within the study area section are identified in **Figure 7.1** below. Although there are a number of possible, long end-to-end routes in the area, these have been subdivided in order to allow the maximum number of possible route combinations and to account for changes in character along roads, e.g. major changes in width etc.

Figure 7.1: Section 3 Route Options

These routes were then assessed as part of a high level "sifting" process in order to determine their suitability for the CBC. This assessment is summarised in **Table 7.1** below.

Table 7.1: Section 3 Kennelsfort Road Upper to Con Colbert Road – Route Option Sifting (Stage 1) Summary

Route Option Number	Comments	Pass/Fail
CR1	Section of R148 (Chapelizod Bypass) between Kennelsfort Road junction and Chapelizod off-ramp slip road. This route consists of 2 all-vehicle lanes with additional bus lanes in both directions for the entire route. Bus facilities could be further improved in the outbound direction with remarking of the road. This route is designated as a primary cycle route and facilities for cyclists would need to be considered when assessing this route.	Pass
CR2	Section of R148 (Chapelizod Bypass) between Chapelizod off-ramp slip and junction with R833 at Con Colbert Road. This route mostly consists of 2 all-vehicle lanes with additional bus lanes in both directions. The inbound section of this route and outbound to the Kylemore on-ramp have recently been remarked to increase bus lane widths. Further improvements to the bus lane outbound from the Kylemore slip road are feasible.	Pass
CR9	Section of R109 (Lower Road) from junction with Tower Road to junction with Main Street in Chapelizod. This route consists of a narrow, rural road with 1 all-vehicle lane in both directions and poor horizontal and vertical geometry. There is very little scope for providing bus priority measures along this route given the number of dwellings adjacent to the road on one side and the proximity of the River Liffey to the other for large sections of the route. Additionally, the population served by this route is relatively small, all of which make it unsuitable for a CBC.	Fail
CR10	Section of R109 (Chapelizod Road) from junction in Chapelizod village to junction with R111 at South Circular Road. This route generally consists of a wide (approximately 9m wide in most locations) regional road with 1 all-vehicle lane in both directions. There is an existing outbound bus lane along the route for approximately 800m on the approach to Chapelizod village. Further bus priority measures in one direction could possibly be provided within the existing carriageway extents, while measures in both directions could feasibly be provided with land-take from the surrounding green areas. As this route is designated as a primary cycle route, additional width may be required. The delay experienced along this route is minimal and as such is suitable for a CBC.	Pass

Route Option Number	Comments	Pass/Fail
CR12	Section of R112 (Lucan Road) from junction with R148 (Chapelizod Bypass) to junction with Chapelizod Hill Road. This route generally consists of a standard regional road with an approximately 7.5m wide carriageway and 1 all-vehicle lane in both directions. There is an existing bus lane inbound for about 500m of the route while part of the route is a one-way slip lane from the R148. It may be possible to extend these dedicated bus priority measures inbound but land-take from a number of residential properties would be required.	Pass
CR13	Section of St. Laurence's Road from junction with St. Laurence's Grove. This is a narrow urban road with 1 all-vehicle lane in both directions. There is residential parking along this route. Although some of this may be relocated to the rear of the properties, some cannot and there is no space to provide driveways on this property. This, coupled with the fact that the width from building line to building line is too narrow to allow bus priority facilities in addition to vehicular traffic means that this route is unsuitable for a CBC.	Fail
CR14	Section of St. Laurence's Road from junction at St. Laurence's Grove to junction with R833 (Ballyfermot Road). This is a narrow urban road with 1 all-vehicle lane in both directions. The existing carriageway width is, in general, 7m or less and would require large areas of land take to widen to allow bus priority measures to be constructed. Additionally, the route passes under the R148 (Chapelizod Bypass) and this underbridge forms a pinch point that could not be altered. This, in conjunction with the poor vertical geometry for sections of this route and the lack of feasible connecting routes indicates that this route is unsuitable for a CBC.	Fail
CR15	Section of R833 (Ballyfermot Road) from junction with St. Laurence's Road to junction with Landen Road. This route is a relatively wide, regional road with 1-all vehicle lane in both directions along with advisory cycle lanes. The current carriageway width is approximately 9m in most locations. There is some scope for providing bus priority facilities with some land take from the green area to the north of the route. However, there is limited space between building lines on approach to the junction with Landen Road and bus priority facilities may only be feasible in one direction at this location. This route is designated as a secondary cycle route and facilities for cyclists would need to be considered.	Pass

Route Option Number	Comments	Pass/Fail
CR16	Section of R833 (Ballyfermot Road) from junction with Landen Road to junction with Sarsfield Road. This route is a very wide regional road with 2 all-vehicle lanes in both directions, separated by a grass margin along with advisory cycle lanes. There is an existing bus lane outbound on this route. The existing carriageway width in this area is approximately 20m and thus, bus priority measures on the inbound side of the link would be feasible within the carriageway extents. This route is designated as a secondary cycle route and facilities for cyclists would need to be considered.	Pass
CR17	Section of R833 (Ballyfermot Road) from junction with Sarsfield Road to junction with R148 (Chapelizod Bypass). This route consists of a wide approach road with 2 all-vehicle lanes approaching the R148 inbound and a wide slip road off from the R148 outbound. These are separated by a grass median and significantly diverge close to the R148. Given the existing width of the carriageway in both directions, it is feasible that bus priority measures could be provided within the extents of the existing roadway.	Pass
CR23	Kylemore slip road from R112 (Kylemore Road) onto R148 (Chapelizod Bypass). This route is a one-way 1 all-vehicle lane on-ramp. The existing carriageway width is approximately 6.5m. A one-way bus priority facility is feasible on this route by taking land from the adjacent green area and widening the existing road.	Pass
CR24	Section of R112 (Kylemore Road) from roundabout junction with R833 at Ballyfermot Road to junction with R109 at Lucan Road. This route generally consists of a wide (approximately 9m) regional road with 1 all-vehicle lane in both directions. A large section of this route is adjacent to green areas while the remainder has a large road reservation as a result of wide footpaths. There is a pinch-point of about 14.5m at the existing R148 underbridge, however, a footpath is only required on one side of the road at this location, resulting in sufficient space being available. It is feasible that bus priority measures could be provided along this route. This route is designated as a secondary cycle route and facilities for cyclists would need to be considered.	Pass

Route Option Number	Comments	Pass/Fail
CR25	Section of R883 (Ballyfermot Road) from roundabout junction with R112 at Kylemore Road to junction with St. Laurence's Road. This route is a relatively wide regional road for the majority of its length, with 1 all-vehicle lane both directions along with cycle lanes. There is a very short stretch of bus lane in the outbound direction on approach to the roundabout at Kylemore Road. Bus priority facilities may be feasible for the majority of this route with some land-take required from adjacent green areas. However, there is a pinch-point on the approach to St. Laurence's Road where the land take may be required from commercial premises. This route is designated as a secondary cycle route and facilities for cyclists would need to be considered.	Pass
CR26	Chapelizod Hill Road from junction with R112 at Kylemore Road to junction with R109 at Lucan Road. This route is a narrow local road with a one-way section beneath the R148 (Chapelizod Bypass) underbridge. This bridge has a clearance of 2.8m which is insufficient to allow buses to use this route and as such is not suitable for a CBC.	Fail
CR27	Section of R109 (Chapelizod Road) from junction with St. Laurence's Road to junction with Main St. in Chapelizod. This route is a relatively narrow regional road with 1 all vehicle lane in both directions. The existing bridge over the River Liffey has a width of less than 7m and there is not opportunity to provide bus priority measures through this pinch point. Bus priority facilities may be feasible through the rest of the route, although land-take form commercial premises would be required. This route is designated as a primary cycle route, which may require additional space also. An ITS solution could feasibly reduce any delays experienced at the bridge pinch-point and as such this route is considered to be suitable for a CBC.	Pass

Following this Stage 1 'sifting' process 11 of the 15 routes assessed passed the initial analysis and were progressed to the next assessment stage. The remaining routes are shown in **Figure 7.2** below.

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

7.2 Stage 2: Route Options Assessment – Multi-Criteria Analysis

For the purposes of this Stage 2 assessment, the remaining routes in this section were combined to form 3 cohesive routes between Kennelsfort Road Upper and Con Colbert Road. These are labelled CZ01 to CZ03. Given that it was not possible to form various routes from point to point in this section due to severance by the River Liffey, routes end approximately along a north-south line through the R148/Con Colbert Road junction.

7.2.1 Route Option CZ01

This route option is shown in **Figure 7.3** below.

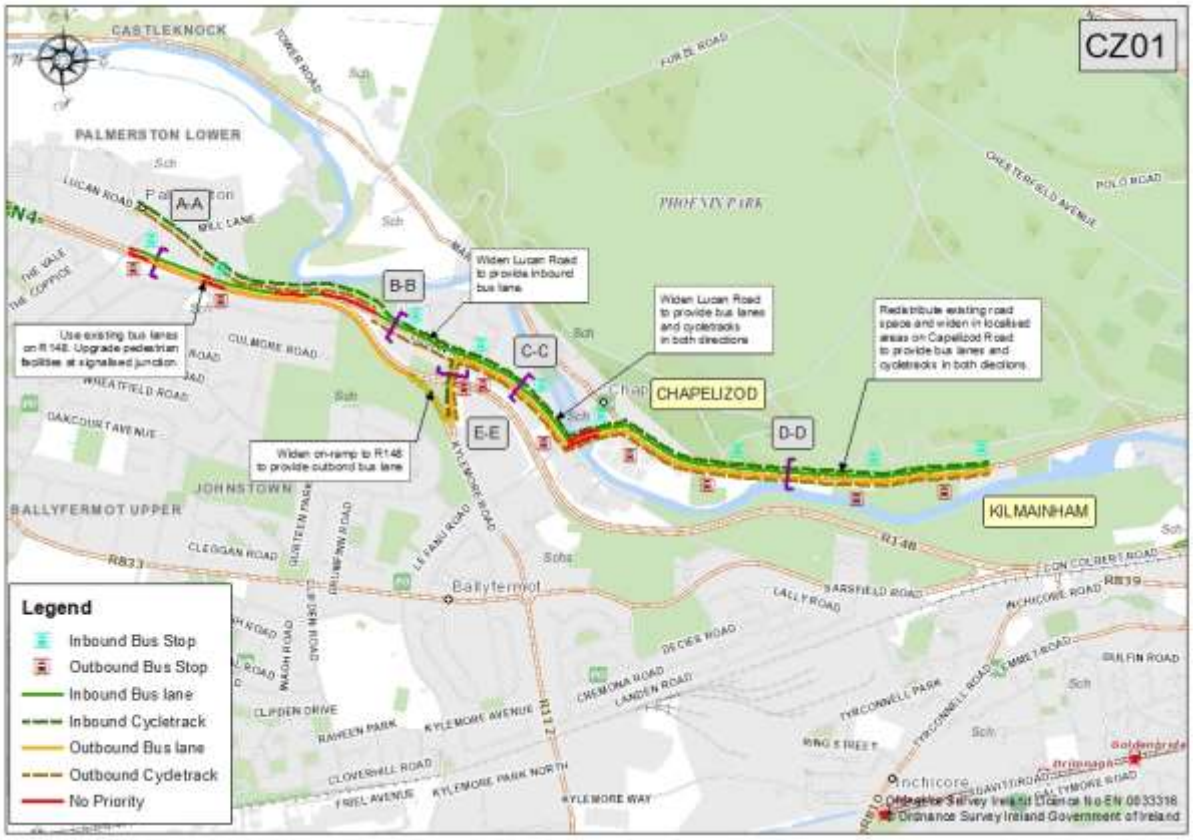

Figure 7.3: Route Option CZ01 Indicative Scheme Design

This route uses the existing bus lanes on the R148 (Chapelizod Bypass) as shown in Figure 7.4 below before leaving that road and travelling through Chapelizod. Some upgrades of the existing junctions at Kennelsfort Road and The Oval are required to improve pedestrian safety. This includes the introduction of signalised crossings at these junctions.

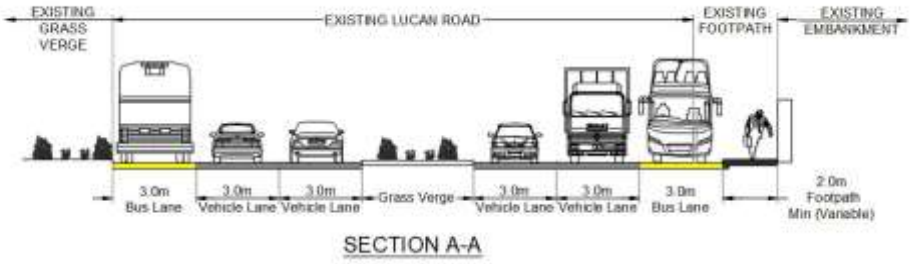

Figure 7.4: CZ01 Cross-Section A-A

Inbound buses divert off the R148 (Chapelizod Bypass) using the slip road to the Lucan Road. It is not possible to provide a bus lane along a section of this slip road due to the proximity of building lines. Buses would then use the existing bus lane from the end of this slip road to the junction with the R112 (Kylemore Road). Some land take is required from private residences (portion of front gardens) and car parking belonging to The West country Hotel in order to provide cycle tracks in both directions along this section of road as shown in **Figure 7.5** below. Dedicated cycle tracks of 2m width are proposed where possible.

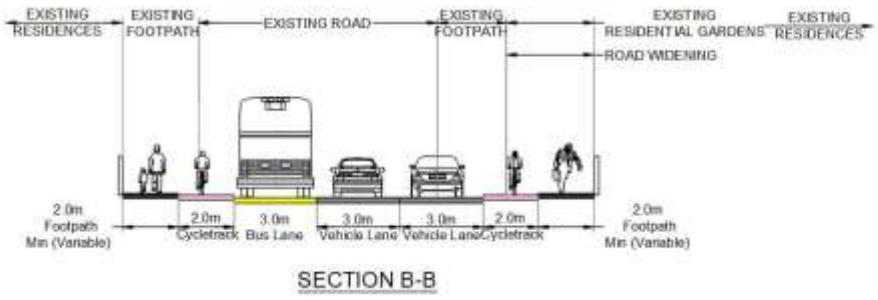

Figure 7.5: CZ01 Cross-Section B-B

Outbound buses would turn left from the Lucan Road onto the R112 (Kylemore Road) before turning right onto the R148 (Chapelizod Bypass) on-ramp from the Kylemore Road. A one-way bus lane and cycle tracks in both directions would be provided on the R112 as shown in **Figure 7.6** along with a new one-way bus lane on the R148 on-ramp itself.

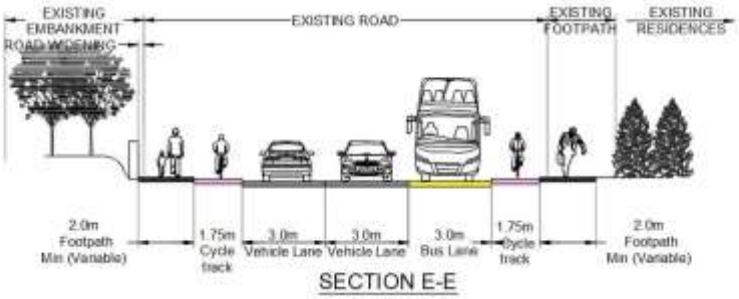

Figure 7.6: CZ01 Cross-Section E-E

Bus lanes and cycle tracks are provided in both directions on Lucan Road between the R112 (Kylemore Road) and Chapelizod Road junctions as shown in **Figure 7.7**. Road widening is required for this entire section in order to provide these facilities with large areas of land take from private residences required. A significant number of gardens that are on embankment belonging to existing residents would be required to accommodate the route option and would also require further regrading of already very steep driveways.

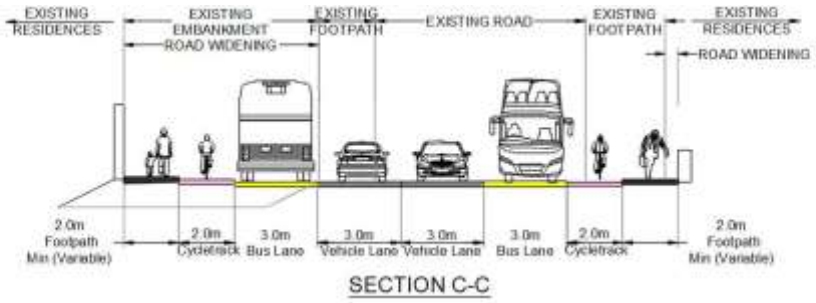

Figure 7.7: CZ01 Cross-Section C-C

The route then travels along Chapelizod Road to its end point. Bus lanes and cycle tracks are proposed in both directions along this section except over the existing bridge over the River Liffey at Chapelizod Village. It is not feasible to provide any additional facilities at this location due to lack of space on this bridge and average speeds of buses currently using this route suggest that delays are often experienced in this location. Both public and private land take is required along Chapelizod Road in order to provide all facilities, generally affecting the side closest to the River Liffey and various sports clubs in that area. There are a significant numbers of trees in the proposed land take that would be removed to accommodate the widening. A typical section along this road is shown in **Figure 7.8** below.

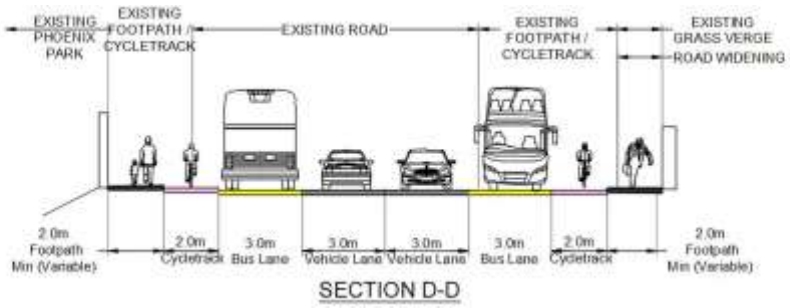

Figure 7.8: CZ01 Cross-Section D-D

Other issues considered as part of the analysis were:

- Journey time is approximately 11.5 – 13.5 minutes
- Cycle tracks provided in most locations
- Existing bus stops to be upgraded
- Large areas of land take required, much of it from residential properties

7.2.2 Route Option CZ02

This route option is shown in **Figure 7.9** below.

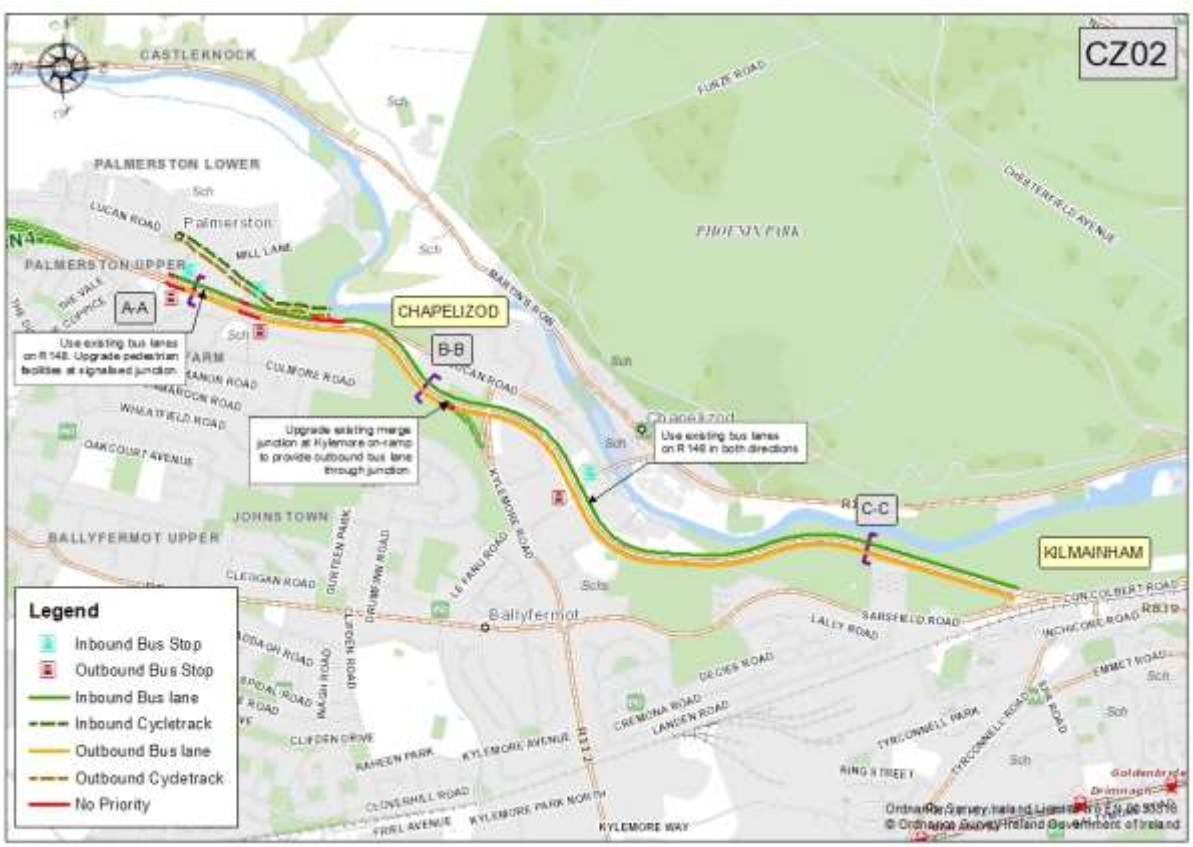

Figure 7.9: Route Option CZ02 Indicative Scheme Design

This route remains on the R148 (Chapelizod Bypass) for its entire length, using the existing bus lanes along this road. These bus lanes have recently been upgraded to the required standard and works to the junction at Kylemore Road to provide bus priority are due to be completed in the near future. **Figure 7.10** below indicates the proposed cross-section along the R148 at this merge junction while **Figure 7.11** gives a typical section along the route. Similar to CZ01, upgrades to the existing Kennelsfort Road and The Oval junctions are required to improve pedestrian safety. In particular, it is proposed to provide a new at-grade pedestrian crossing at the Kennelsfort Road junction.

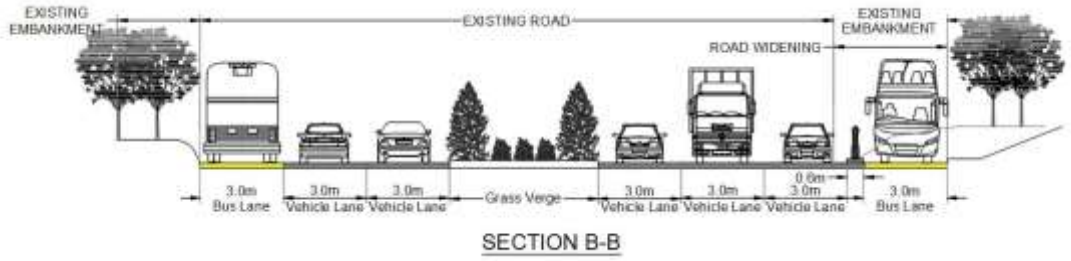

Figure 7.10: CZ02 Cross-Section B-B

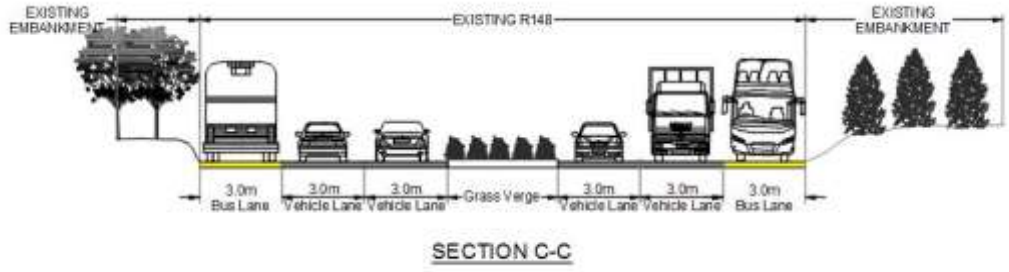

Figure 7.11: CZ02 Cross-Section C-C

For the majority of the route option cycling facilities are not proposed, as the route is not included in the GDA Cycle Network Plan and significant land take would be required along both sides of the Chapelizod Bypass to implement cycling facilities. Inbound cyclists would travel along a proposed new shared surface (pedestrian/two-way cycle path) on the Lucan Road and continue down the off-ramp for Chapelizod village (R112). Cyclists would continue to travel onto the Chapelizod Road and re-join the CBC route at the junction of South Circular Road (R111)/Chapelizod Bypass (R148). Outbound cyclists would travel this route in the reverse direction.

It is also proposed to widen locally at the junction of the R148 and the Kylemore Road on-ramp. This would allow bus lanes to be provided continuously through this merge and would include provision of traffic signals to control traffic entering the R148 from the Kylemore on-ramp.

In order to increase the population catchment of the preferred route, two bus stops (inbound and outbound) are proposed adjacent to the Chapelizod Hill Road along with proposed ramped pedestrian access. Key trip attractors such as Ballyfermot Training Centre and Chapelizod Village will directly benefit from the proposed bus stops. A new pedestrian crossing adjacent to the bus stops is also proposed to improve accessibility and safety for pedestrians using the CBC.

Section A-A is the same as **Figure 7.4** in CZ01.

Other issues considered as part of the analysis were:

- Journey time is approximately 7 – 8 minutes
- Cycle tracks not provided as this route is not included in the GDA Cycle Network Plan
- Existing bus stops to be upgraded

- Use of existing bus lanes for most of the route greatly reduces capital cost
- Public land take required only if upgrade to Kylemore on-ramp junction is required

7.2.3 Route Option CZ03

This route option is shown in **Figure 7.12** below.

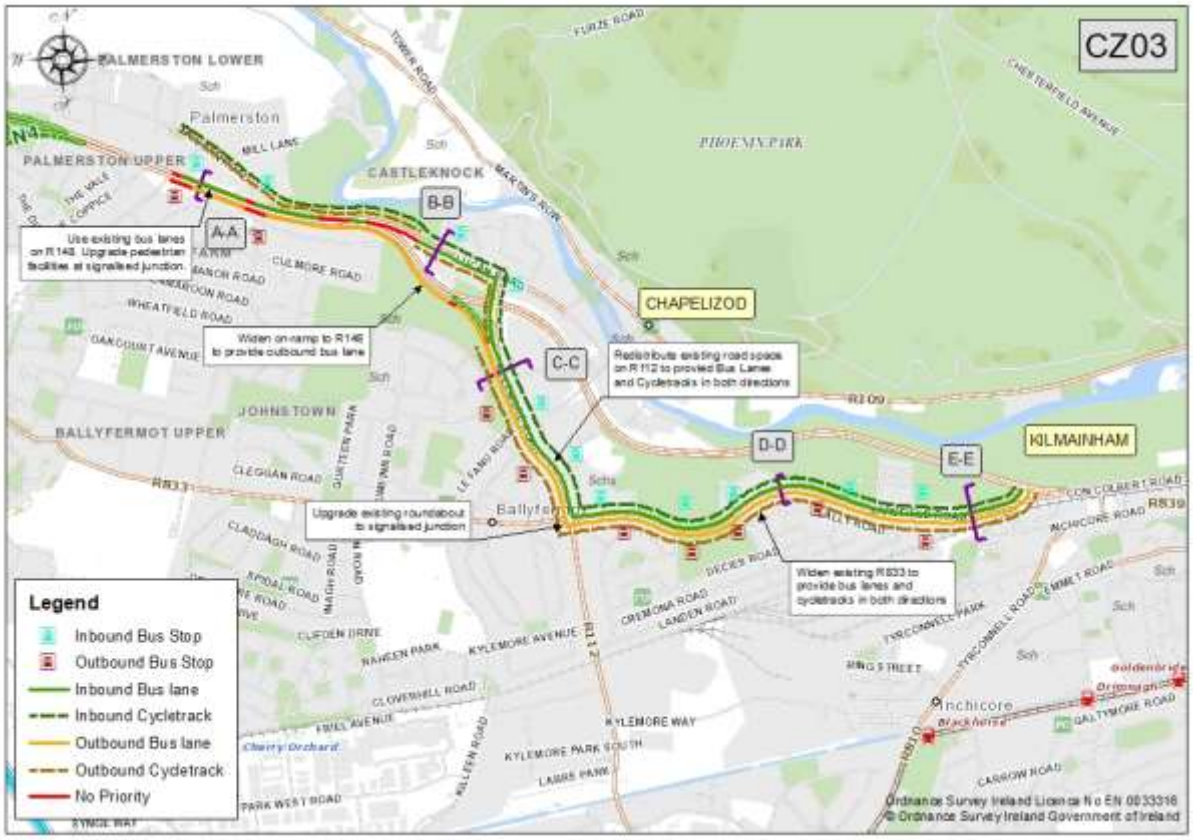

Figure 7.12: Route Option CZ03 Indicative Scheme Design

This route travels along the R148 (Chapelizod Bypass) before diverting to the R112 (Kylemore Road) and Ballyfermot Road (R833) and re-joining the R148 at Con Colbert Road junction.

Similar to Route Option CZ01, inbound buses travel down the off-ramp to the Lucan Road from the R148 while outbound buses access the R148 using the on-ramp from the Kylemore Road. The same layout in terms of bus lane provision is proposed for CZ03 and cross-sections A-A and B-B are the same as **Figure 7.4 and 7.5** in Route Option CZ01.

The route in then travels along Kylemore Road (R112) to its junction with Ballyfermot Road (R833) at a large roundabout. It is proposed to provide bus lanes and cycle tracks in both directions along this section of road by redistributing the existing road space as shown in **Figure 7.13** below. Dedicated cycle tracks of 2m minimum width where possible are proposed. Upgrading the existing roundabout junction to a signalised junction will allow for bus priority and safer pedestrian and cyclist facilities. Bus lanes will be provided right up to the stop lines. The Kylemore Road from Le Fanu Road to the Ballyfermot Road has a number of schools that use on street parking. This parking would be removed in order to accommodate the proposed scheme. As a result it would be difficult to redistribute this parking elsewhere on the school grounds.

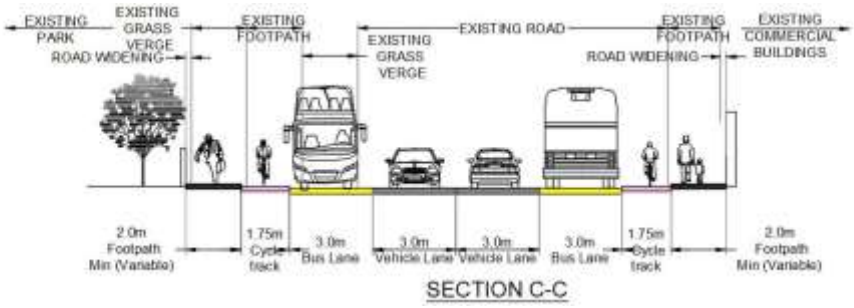

Figure 7.13: CZ03 Cross-Section C-C

The route then travels along Ballyfermot Road and Sarsfield Road to the Con Colbert Road junction with the R148. Bus lanes and cycle tracks in both directions are proposed along the entire section as shown in **Figure 7.14**. Small portions of front gardens from a number of private residences is required north-east of the O'Hogan Road. Widening and public land take would be required from Longmeadows Park to accommodate a bus lane, dedicated cycle track (2m wide) and pedestrian footpath (2m minimum where possible).

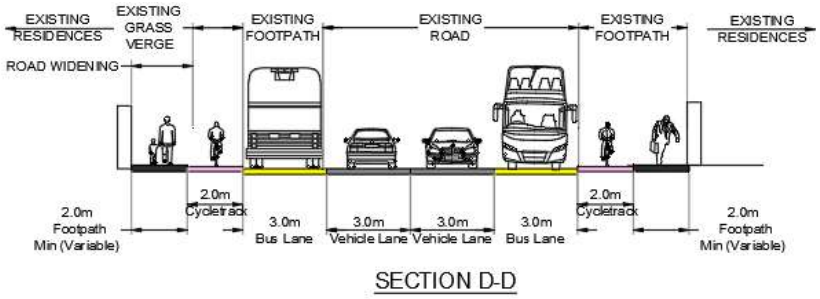

Figure 7.14: CZ03: Cross-Section D-D

Bus lanes and cycle tracks are provided by redistribution of road space as shown in **Figure 7.15** below on the Sarsfield Road.

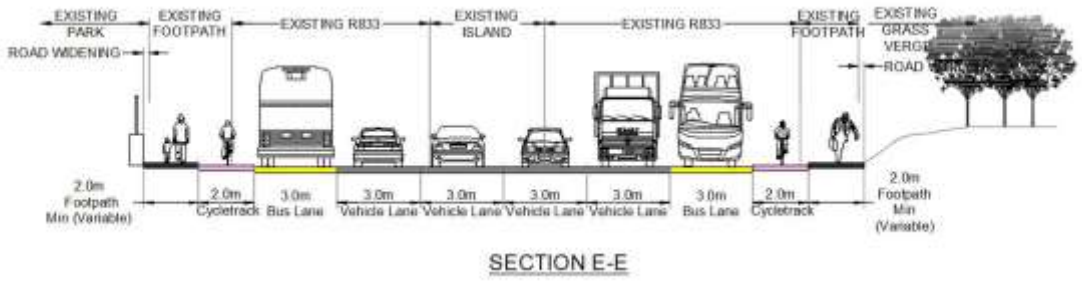

Figure 7.15: CZ03 Cross-Section E-E

Other issues considered as part of the analysis were:

- Journey time is approximately 14 – 15 minutes
- Cycle tracks provided where required by GDA Cycle Network Plan or alternative route
- Existing bus stops to be upgraded
- Some land take required from private residences and public park

7.2.4 Section 3: Route Options Assessment Summary

The Stage 2 Route Options Assessment – Multi Criteria Analysis summary tables for this section are include in **Appendix A3**. The relative ranking of the route options for each assessment sub-criteria is shown in Table 7.3 below:

Table 7.3: Section 3: Route Options Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	CZ01	CZ02	CZ03
Economy	Capital Cost			
	Transport Reliability and Quality of Service			
Integration	Land Use Integration			
	Residential, Employment and Educational Catchments			
	Transport Network Integration			
	Cycling Integration			
Accessibility & Social Inclusion	Key Trip Attractors			
	Deprived Geographic Areas			
Safety	Road Safety			
	Pedestrian Safety			
Environment	Archaeology, Architectural and Cultural Heritage			
	Flora and Fauna			
	Soils and Geology			
	Hydrology			
	Landscape and Visual			
	Air Quality			
	Noise & Vibration			

Assessment Criteria	Assessment Sub-Criteria	CZ01	CZ02	CZ03
	Land Use Character			

Route Option CZ02 ranks well relative to the other options under most criteria. In particular, it is by far the best option in terms of capital cost and reliability due to the use of the existing bus lanes along the Chapelizod Bypass.

The catchments for CZ01 and CZ03 are larger, however, CZ03 overlaps significantly with the Liffey Valley – Christchurch CBC and there are significant disadvantageous to CZ01 in terms of land take and environmental issues. Although use of the bypass limits the number of bus stops on CZ02 and therefore reduces the available catchment, this is outweighed by the other benefits.

In terms of 'Accessibility & Social Inclusion' both route options CZ01 and CZ03 serve far more trip attractors than CZ02. However there is little to differentiate between the three routes in terms of servicing deprived geographical areas.

In terms of 'Safety' route option CZ02 offers better road safety of the other route options as it has less junctions and fewer traffic accidents.

In terms of 'Environment', there is little to differentiate between the route options of CZ02 and CZ03. However route option CZ02 has no land acquisition and therefore has little or no impact on the existing land use.

A summary of the assessment and relative ranking of route options against the five main assessment criteria is shown in Table 7.4 below.

Table 7.4: Section 3: Route Options Assessment Summary (Main Criteria)

Assessment Criteria	CZ01	CZ02	CZ03
Economy			
Integration			
Accessibility & Social Inclusion			
Safety			
Environment			

Based on the assessment undertaken, route option CZ02 appears to offer more benefits over other options. Route option CZ02 is therefore preferred for the following reasons:

- It's comparatively low capital cost coupled with the opportunity for journey time reliability and bus service efficiency;
- It provides the safest route regarding road safety
- It provides a good combination of both transport network integration and cycling integration when compared to the other options
- It has less impact on the environment compared to other options.

Based on the multi-criteria analysis undertaken for this section of the study area, route option **CZ02** is the preferred route option for Section 3: Kennelsfort Road Upper to Con Colbert Road.

8. Study Area Section 4: Con Colbert Road to City Centre

8.1 Stage 1: Route Options Assessment - Sifting

All of the feasible routes within the study area section are identified in **Figure 8.1** below. Although there are a number of possible, long end-to-end routes in the area, these have been subdivided in order to allow the maximum number of possible route combinations and to account for changes in character along roads, e.g. major changes in width etc.

Route Option CR10 is included in both Section 2 and 3 as it travels through both.

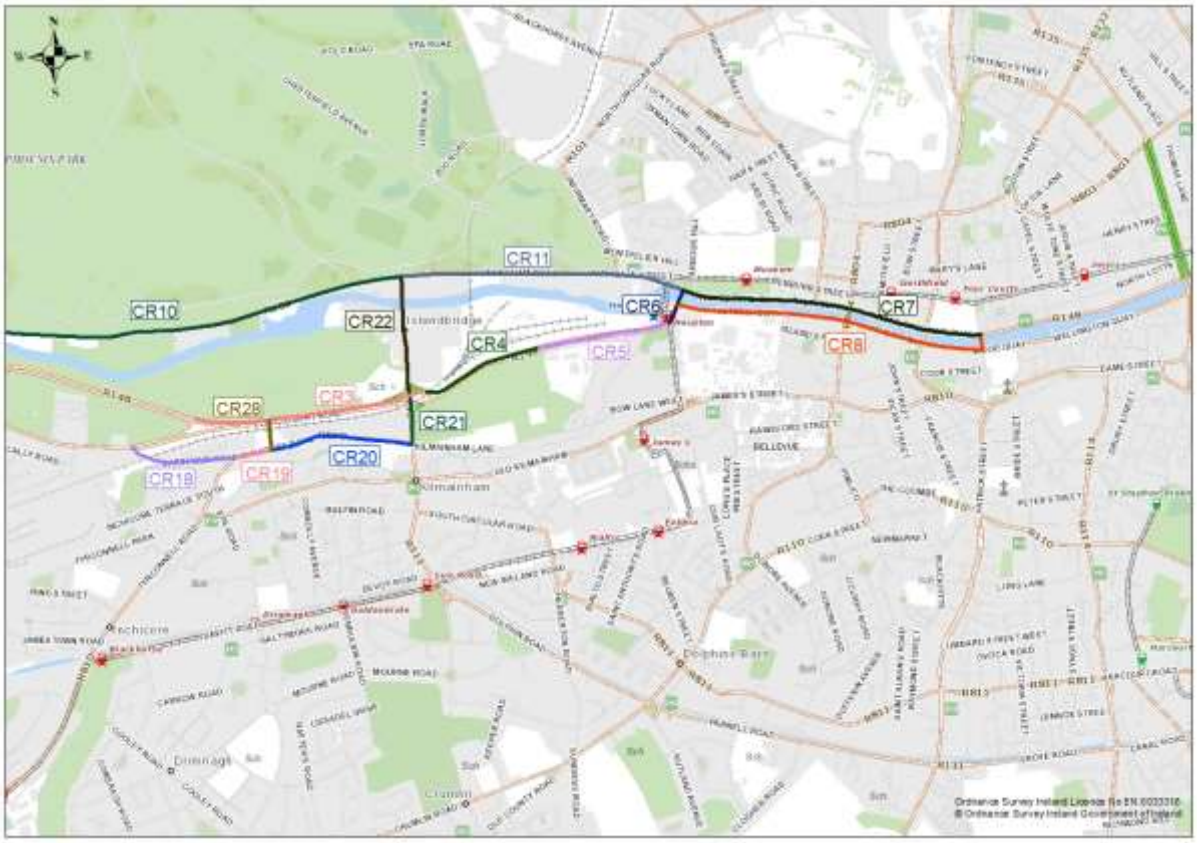

Figure 8.1: Section 4 Route Options

These routes were then assessed as part of a high level "sifting" process in order to determine their suitability for the CBC. This assessment is summarised in **Table 8.1** below.

Table 8.1: Section 3 Con Colbert Road to City Centre – Route Option Sifting (Stage 1) Summary

Route Option Number	Comments	Pass/Fail
CR3	Section of R148 (Chapelizod Bypass) from junction with R833 (Con Colbert Road) to junction with R111 at South Circular Road. The majority of this route consists of 2 all-vehicle lanes in both directions with additional bus lanes. The outbound bus lane is not continuous for a short section but further improvements for bus priority in this location are feasible.	Pass
CR4	Section of R148 (St. John's Road West) from junction with R111 (South Circular Road) to junction at Royal Hospital Kilmainham. This route consists of 1 all-vehicle lane and a bus lane inbound and 2 all-vehicle lanes and a bus lane outbound separated by a narrow margin and large level difference. Additional ITS measures for bus priority may be feasible on this route at junctions.	Pass
CR5	Section of R148 (St. John's Road West) from junction at Royal Hospital Kilmainham to Heuston Station. This route consists of 1 all-vehicle lane and a bus lane inbound and 2 all-vehicle lanes outbound. Bus priority measures could be implemented outbound by converting 1 lane into a bus lane but would need careful consideration given the impact on traffic exiting the city centre. There is very limited scope for additional land-take along this route.	Pass
CR6	Section of R148 (St. John's Road West) from Heuston Station to Wolfe Tone Quay. This route consists of 2 all-vehicle lanes in both directions up to the junction with Victoria Quay. The route uses then traverses the Frank Sherwin Bridge, which is a wide, one-way route with no clearly defined lanes. Bus priority measures could be introduced inbound by means of road markings, while outbound is subject to the same concerns as CR5.	Pass
CR7	Section of North Quays from Frank Sherwin Bridge to Fr. Matthews Bridge. This route consists of 1 to 2 all-vehicle lanes with a wide bus lane. As existing bus priority measures currently exist along the entire route it is considered suitable for a CBC. Further bus priority measures may be provided here subject to the overall plan for Dublin City Centre traffic. This route is currently designated as a primary cycle route and as such, additional space for cyclists would also be required.	Pass

Route Option Number	Comments	Pass/Fail
CR8	Section of South Quays from Fr. Matthews Bridge to Frank Sherwin Bridge. This route generally consists of 2 all-vehicle lanes and a bus lane, except for a short section between Liam Mellow's Bridge and James Joyce Bridge and on approach to Heuston Station, where no bus lanes are present. Further bus priority measures to ensure this bus lane is continuous may be feasible subject to consideration of the impact on traffic leaving the Quays area.	Pass
CR10	Section of R109 (Chapelizod Road) from junction in Chapelizod village to junction with R111 at South Circular Road. This route generally consists of a wide (approximately 9m wide in most locations) regional road with 1 all-vehicle lane in both directions. There is an existing outbound bus lane along the route for approximately 800m on the approach to Chapelizod village. Further bus priority measures in one direction could possibly be provided within the existing carriageway extents, while measures in both directions could feasibly be provided with land-take from the surrounding green areas. As this route is designated as a primary cycle route, additional width may be required. The delay experienced along this route is minimal and as such is suitable for a CBC.	Pass
CR11	Section of R109 (Conyngham Road) from junction with R111 (South Circular Road) to junction to Frank Sherwin Bridge. This route generally consists of a wide regional road with 1 all-vehicle lane in both directions with a number of additional turning lanes. There is an existing inbound bus lane along the route except for a short section between the main entrance to the Phoenix Park at Chesterfield Avenue and Infirmary Road. Creating a continuous bus lane inbound and providing bus facilities outbound may be feasible by redistribution of road space subject to consideration of traffic impacts. This route is designated as a primary cycle route and as such additional space may be required.	Pass

Route Option Number	Comments	Pass/Fail
CR18	Sarsfield Road from junction with R833 (Ballyfermot Road) to junction with R839 at Inchicore Road. This route consists of 1 one-way all vehicle lane with a contra flow bus lane. The existing carriageway width varies from 7m up to 10m. However, there is a considerable volume of parking along this route that is predominantly residential in nature. As a result, vehicles using this route are forced to cross into the contra flow bus lane on a number of occasions, impacting the usefulness and reliability of that facility. This existing parking may possibly be relocated to the rear of these residential properties. The limited space available along the route means that land-take is not an option. Further bus priority measures may be difficult to provide in this location although removing parking would increase journey speed. Given that the connecting routes in this area are not feasible, this route is not considered to be suitable for this CBC. This route is designated as a secondary cycle route and facilities for cyclists would need to be considered.	Fail
CR19	Section of R839 (Inchicore Road) from junction with Sarsfield Road to junction with Memorial Road. This route consists of 1 all-vehicle lane in both directions and is relatively wide at approximately 9m. However, there is on-road parking on one side of the route that is residential in nature. This parking cannot be relocated and the properties have no space for driveways. As a result, there is limited scope for land-take and bus priority measures along this route are not feasible. This route is designated as a secondary cycle route and facilities for cyclists need to be considered.	Fail
CR20	Section of R839 (Inchicore Road) from Memorial Road to R111 at South Circular Road. This route is one-way in the outbound direction, with 1 all-vehicle lane and a two-way cycle lane. There is on-road parking for a long stretch of the route that is residential in nature. This parking cannot be relocated and the properties have no space for driveways. The feasibility of providing bus priority facilities is minimal on this route given the inability to remove the parking and the limited space available even with large areas of land-take. Additionally, a section of the route from the junction with the R111 has recently been considerably narrowed and traffic calmed. This route is designated as a secondary cycle route and facilities for cyclists need to be considered.	Fail

Route Option Number	Comments	Pass/Fail
CR21	Section of R111 (South Circular Road) from junction with R839 (Inchicore Road) to junction with R148 (Chapelizod Road). This route generally consists of 1 all-vehicle lane in both directions with turning lanes developed along its route. Advisory cycle lanes are also present. The existing carriageway is wide, at approximately 12m in most locations. Provision of bus priority measures are feasible in this location although some land-take may be required. However, given that the accessibility of this route depends on CR18 and CR19 it is not considered a feasible route for this CBC.	Fail
CR22	Section of R111 (South Circular Road) from junction with R148 (Con Colbert Road) to junction with R109 at Conyngham Road. This route consists of 1 all-vehicle lane in both directions with advisory cycle lanes. The existing carriageway varies in width considerably, with a pinch point at the bridge over the River Liffey. It may be feasible to provide bus priority facilities for long sections of this route, however, they could not be provided over the bridge owing to the lack of space. Given the connectivity of this route, it is considered to be suitable for a CBC.	Pass
CR28	Section of R839 (Memorial Road) from junction with Inchicore Road to junction with R148 (Con Colbert Road). This route is one-way with 2 all-vehicle lanes. The existing carriageway is quite narrow at less than 7m in most locations with a pinch-point at a railway overbridge. This route is designated as a secondary cycle route. Given the lack of accessibility of this route and the narrowness at the pinch point outlined above, it is not considered to be suitable for a CBC.	Fail

Following this Stage 1 'sifting' process 5 of the 7 routes assessed passed the initial analysis and were progressed to the next assessment stage. The remaining routes are shown in **Figure 7.2** below.

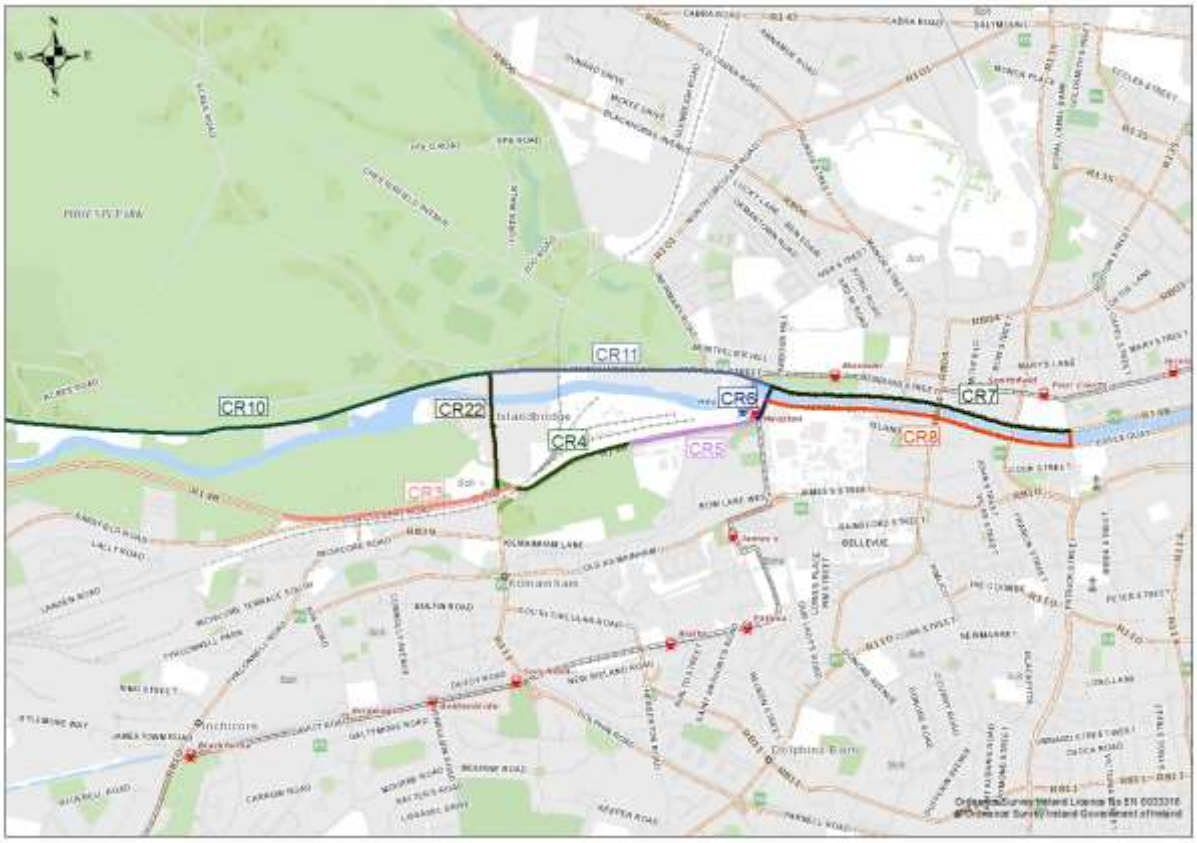

Figure 8.2: Section 4 Route Options Remaining After Stage 1 Sifting

8.2 Stage 2: Route Options Assessment – Multi-Criteria Analysis

Following the sifting process, the remaining routes in this section were combined to form 4 cohesive routes between Con Colbert Road and the City Centre. These are labelled CT01 to CT04 and are discussed in the followings sections. In general these routes all use the North and South Quays to access the core of the City Centre and as a result the routes are brought to the quays and will tie into the various proposed schemes that form part of the transport strategy for Dublin City Centre.

8.2.1 Route Option CT01

This route option is shown in **Figure 7.3** below.

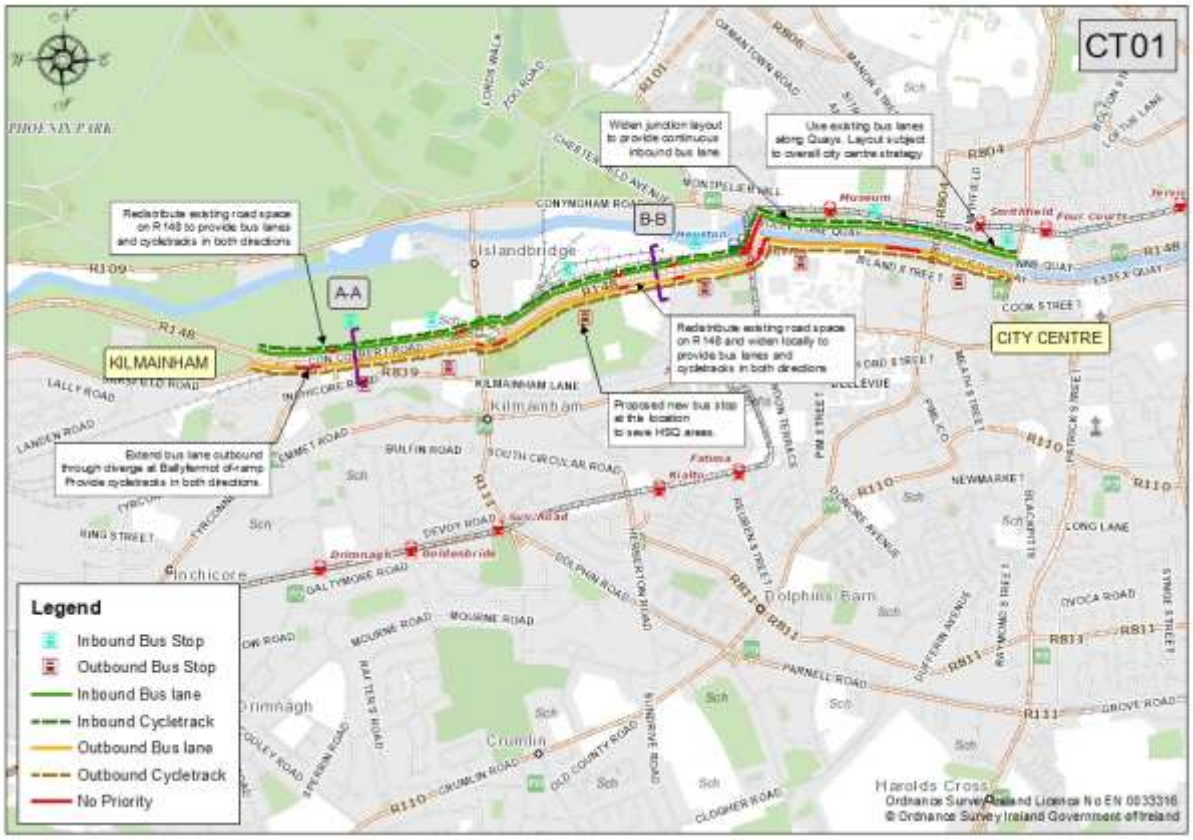

Figure 7.3: Route Option CT01 Indicative Scheme Design

This route travels along the R148 (St. John's Road West) from Con Colbert Road to the City Centre via the North and South Quays. Bus lanes and cycle tracks are proposed along the entire route except at some localised areas through junctions.

Between Con Colbert Road and the R111 (South Circular Road), these facilities are provided along the R148 by means of redistributing the existing road space as shown in **Figure 7.4** below. New cycle tracks are proposed as part of this route along with redesigning the existing diverge off-ramp junction to allow for bus priority. Dedicated cycle tracks of 2m minimum width (where possible) along with 2m wide footpaths (where possible) are proposed.

In *Study Area Section 3: Kennelsfort Road Upper to Con Colbert Road* the cyclists in the preferred option (CZ02) have the option to re-join the CBC at the Con Colbert Road (R148)/South Circular Road (R111). Cycling facilities, 2m wide, on either side are proposed to extend approx. 60m back on the South Circular Road from the northern approach to its junction with Con Colbert Road.

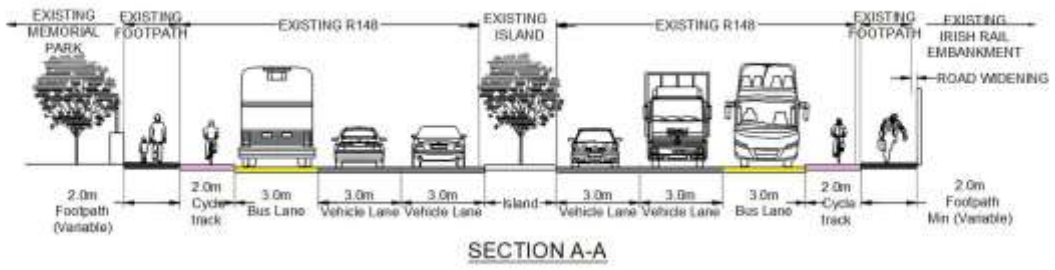

Figure 7.4: CT01 Cross-Section A-A

Some redesign of the junction between the R148 and R111 is required in order to provide bus priority through the junction along with cycle tracks. Bus lanes and cycle tracks would be provided up to the stops lines. The number of all-vehicle lanes will be maintained as far as practical in order to ensure traffic capacity at this key junction is not overly reduced.

From this junction to the quays, bus lanes and cycle tracks are provided along the R148 (St. John's Road West) by means of redistributing road space as shown in **Figure 7.5**. In general, this will require a reduction in the median on either sides and the central median, resulting in the removal of a number of trees in the areas adjacent to the Royal Hospital Kilmainham and Heuston Station. Dedicated cycle tracks and footpaths of 2m minimum width will be provided where possible. One all-vehicle lane inbound and two all-vehicle lanes outbound will be maintained in order to allow traffic exiting the city to do so as in the current situation.

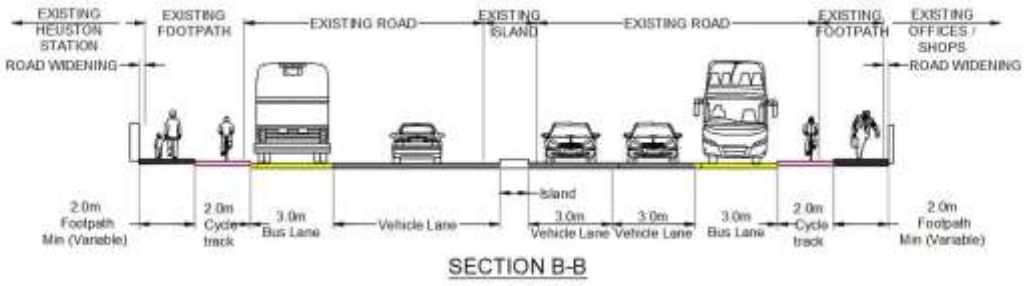

Figure 7.5: CT01 Cross-Section B-B

Some land take is required on the approach to the junction of the R148 and South Quays in order to provide bus priority to the stop line. This land would be taken from green space adjacent to the Luas line at Heuston Station. Inbound buses would then travel along the existing bus lanes on the North Quays and outbound buses along the South Quays, subject to changes as part of the overall strategy for Dublin City Centre. In order to facilitate the extra space required for a proposed outbound bus lane and a cycle track in both directions, the existing taxi queuing lane outside Heuston Station will be removed. An increased area for taxi waiting could be accommodated within the Station.

Other issues considered as part of the analysis were:

- Journey time is approximately 13 – 16 minutes
- Cycle tracks provided where required by GDA Cycle Network Plan
- Existing bus stops to be upgraded and new bus stops provided opposite Royal Hospital Kilmainham
- Direct transport links with Heuston Station and Red Line Luas
- Some existing parking and taxi ranks along the R148 in the vicinity of Heuston Station would be removed in order to accommodate the bus and cycle facilities
- Some public land take required

8.2.2 Route Option CT02

This route option is shown in **Figure 7.6** below.

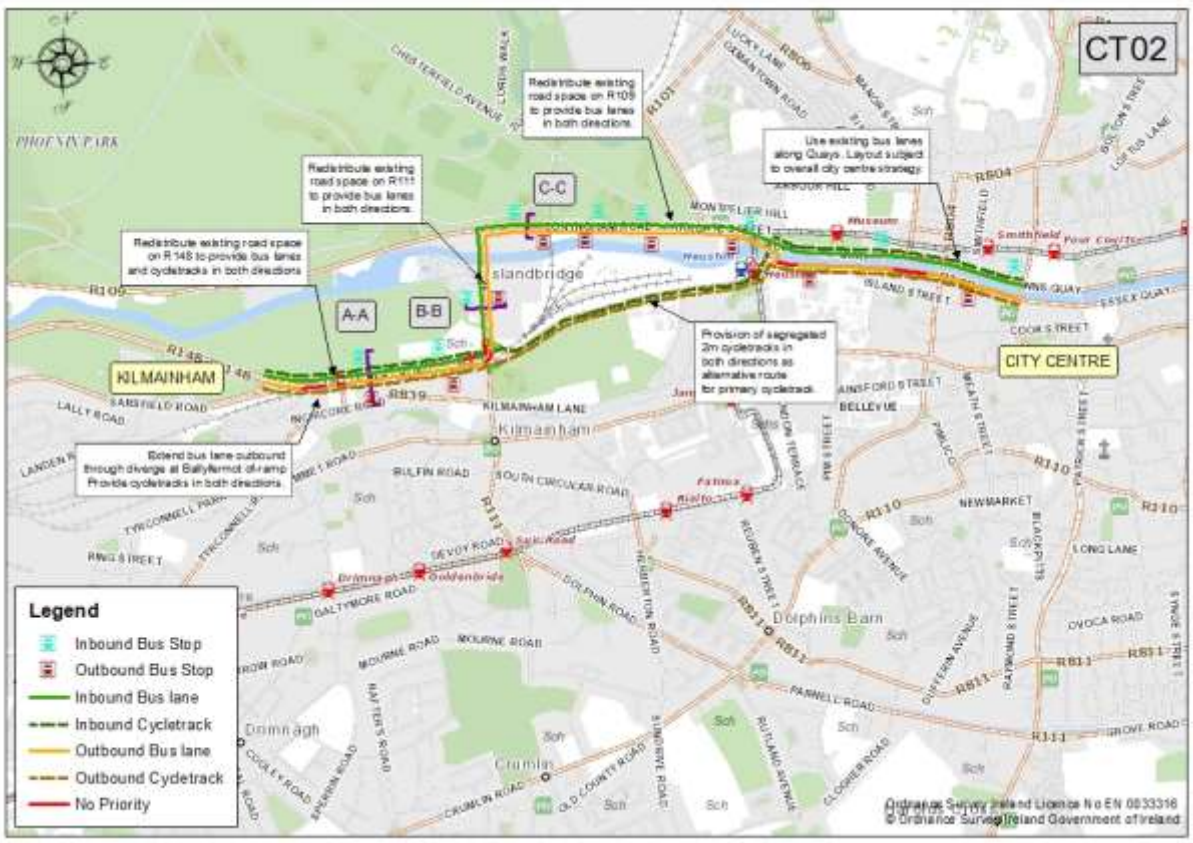

Figure 7.6: Route Option CT02 Indicative Scheme Design

This route is the same as CT01 from Con Colbert Road to the R111 (South Circular Road) junction. From here it travels along the R111 and R109 (Conyngham Road) adjacent to the Phoenix Park before joining the quays. Section A-A is the same as **Figure 7.4** in CT01.

Bus lanes in both directions are proposed along both the R111 (South Circular Road) and R109 (Conyngham Road) by means of redistributing the existing road space. Currently there is restricted on street parking available along the length of this route. This parking would be removed in order to accommodate priority bus lanes. There are also a number of mature trees along this section and would be required to be removed. **Figure 7.7** shows the proposed cross-section along the South Circular Road (R111), while a typical cross-section along Conyngham Road (R109) is shown in **Figure 7.8**. Currently there is restricted on street parking available along the majority of the outbound section of Conyngham Road (R109). This parking would be removed in order to accommodate priority bus lanes either side along its length.

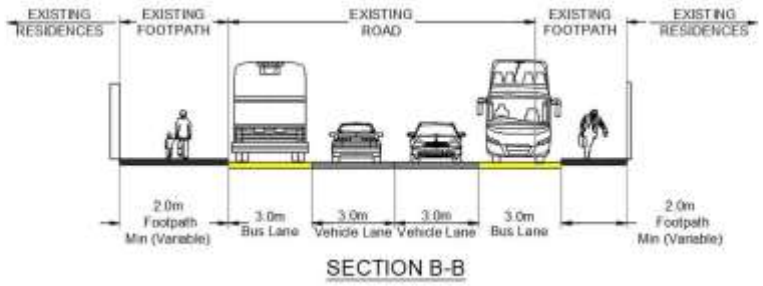

Figure 7.7: CT02 Cross-Section B-B

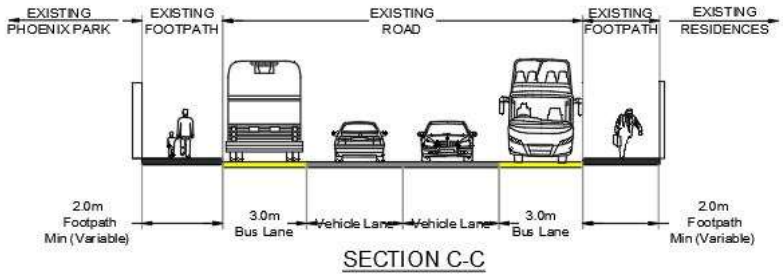

Figure 7.8: CT02 Cross-Section C-C

Similar to CT01, inbound buses would then travel along the existing bus lanes on the North Quays and outbound buses along the South Quays, subject to changes as part of the overall strategy for Dublin City Centre.

Both the section of the R111 and R109 are currently designated as primary cycle routes but there is insufficient space to provide cycle tracks alongside bus lanes along these routes due to the proximity of building lines and the Phoenix Park. New cycle tracks are, therefore, proposed along the R148 (St. John's Road West) from the R111 (South Circular Road) junction to the quays as an alternative to primary cycle route. In order to facilitate the extra space required for a proposed cycle track in both directions, the existing taxi queuing lane outside Heuston Station will be removed. An increased area for taxi waiting could be accommodated within the Station.

Other issues considered as part of the analysis were:

- Journey time is approximately 16.5 – 17.5 minutes
- Cycle tracks provided where required by GDA Cycle Network Plan or alternative provided
- Alternative cycle route for cyclists on R109 not possible due to inability to provide cycle tracks along R111
- Existing bus stops to be upgraded
- Transport links with Heuston Station and Red Line Luas within short walking distance
- Some existing parking and taxi ranks along the R148 in the vicinity of Heuston Station would be removed in order to accommodate the bus and cycle facilities
- Some public land take required

8.2.3 Route Option CT03

This route option is shown in **Figure 7.9** below.

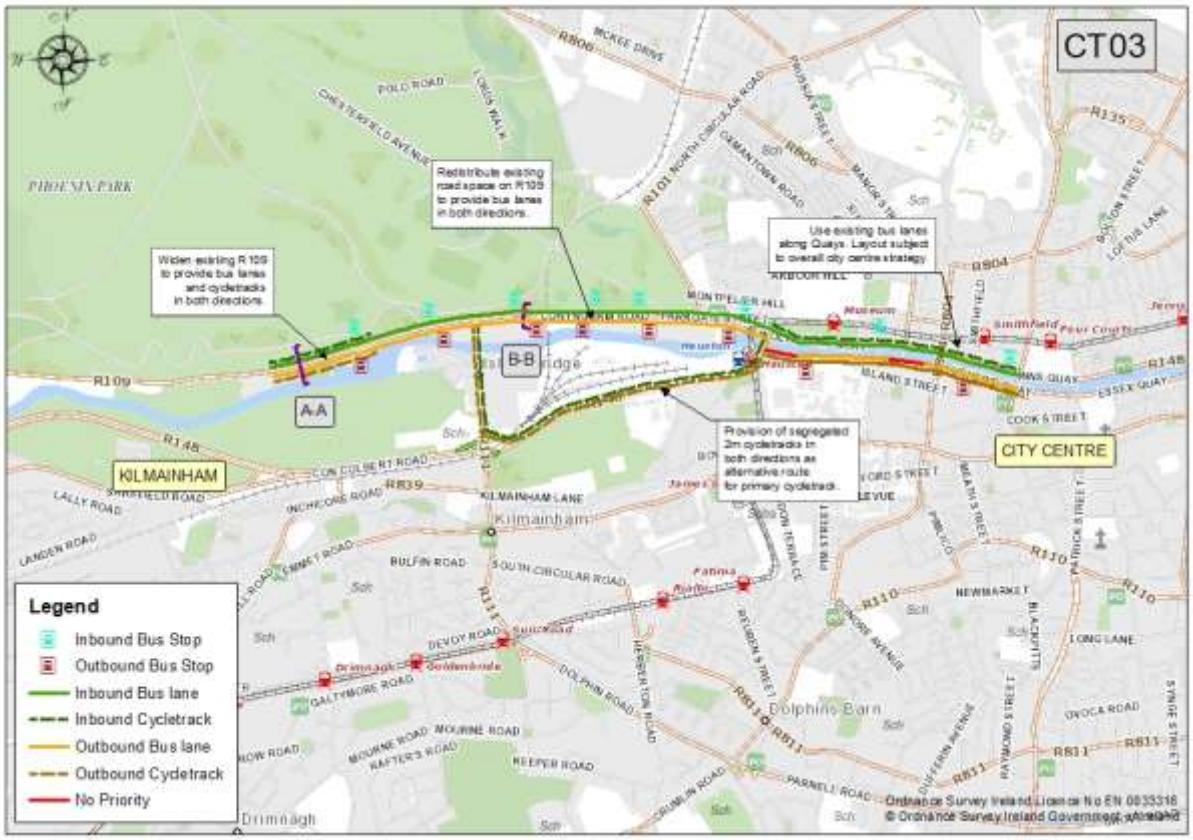

Figure 7.9: Route Option CT03 Indicative Scheme Option

This route option begins at the end point of Route Option CZ01 from *Study Area Section 3: Kennelsfort Road Upper to Con Colbert Road*. It travels along the R109 (Conyngham Road) until joining the quays. Bus lanes in both directions are proposed along the entire length of this route. Due to the proximity of building lines, cycle tracks cannot be provided for 320m on the inbound approach to the junction with R111 (South Circular Road) and through to the quays. To accommodate cyclists on this route, it is proposed to provide new cycle tracks on the R111 (South Circular Road) and R148 (St. John's Road West) as an alternative primary cycle route. Existing road space will be distributed along this length to accommodate the proposed cycle facilities.

Some land take from private owners (portions of front gardens and boundary walls) would be required in order to provide the required cross-section as shown in Figure 7.10. The typical cross-section along the R109 for most of this route is the same as **Figure 7.8** in CT02.

In order to facilitate the extra space required for a proposed cycle track in both directions, the existing taxi queuing lane outside Heuston Station will be removed. An increased area for taxi waiting could be accommodated within the Station.

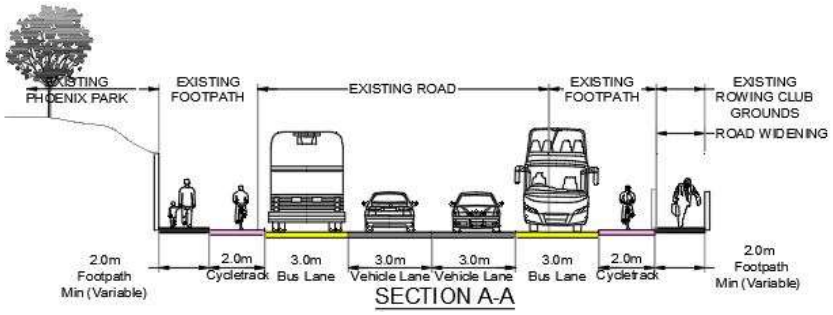

Figure 7.10: CT03 Cross-Section A-A

As with all of the routes in this section, inbound buses would then travel along the existing bus lanes on the North Quays and outbound buses along the South Quays, subject to changes as part of the overall strategy for Dublin City Centre.

Other issues considered as part of the analysis were:

- Journey time is approximately 13 – 14 minutes
- Cycle tracks provided where required by GDA Cycle Network Plan or alternative provided except short section where shared bus and cycle lane is required
- Alternative cycle route is circuitous
- Existing bus stops to be upgraded
- Transport links with Heuston Station and Red Line Luas within short walking distance
- Some existing parking would be removed on the R109 and R148 in order to accommodate the bus and cycle facilities
- Some private land take required
- Route option only available if buses travel through Chapelizod

8.2.4 Route Option CT04

This route option is shown in **Figure 7.11** below.

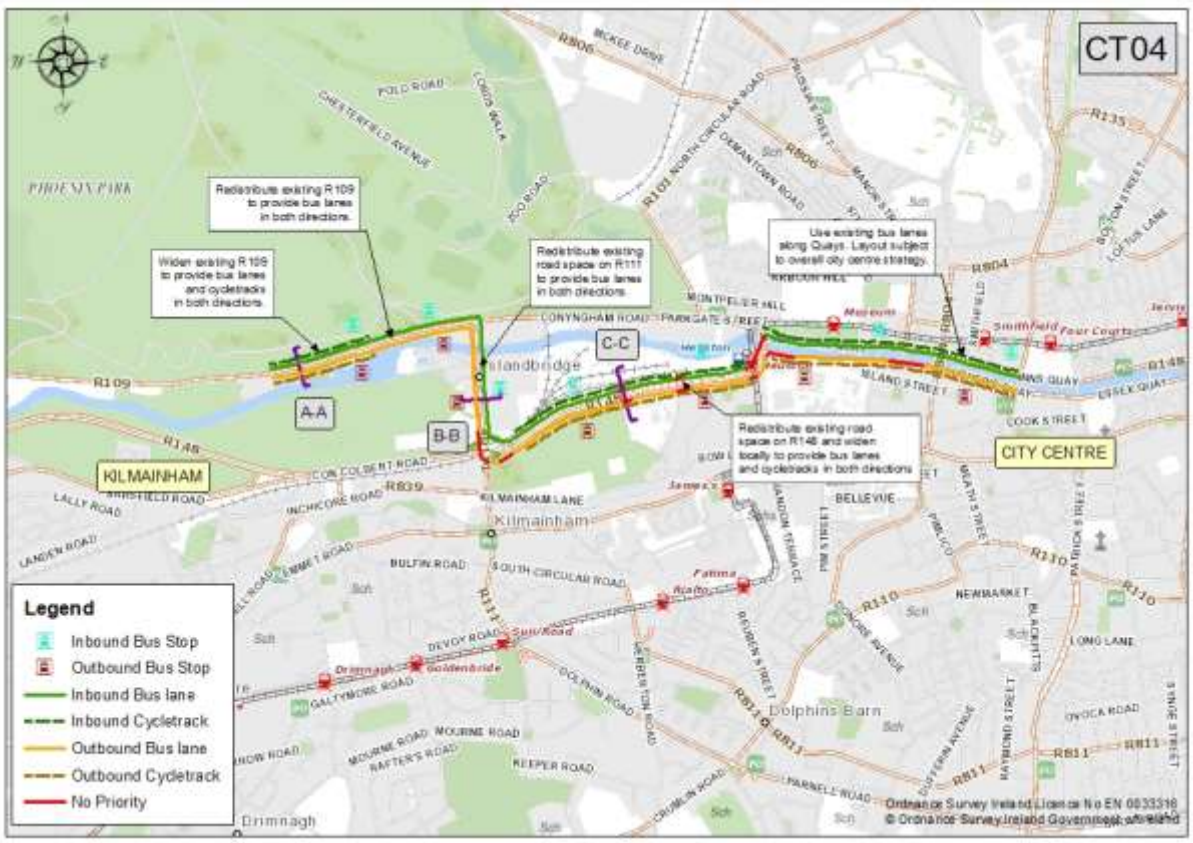

Figure 7.11: Route Option CT04 Indicative Scheme Design

This route option also begins at the end point of Route Option CZ01 from *Study Area Section 3: Kennelsfort Road Upper to Con Colbert Road.* From here, it travels along the R109 (Chapelizod Road) to the R111 (South Circular Road) junction same as route option CT03, with the same issues of required land take and shared bus and cycle facilities being necessary. The route then travels along the R111 (South Circular Road) before using the R148 (St. John's Road West) to access the quays. Issues with these roads regarding removal of parking and trees are the same as the ones discussed in route options CT01 and CT02. In order to facilitate the extra space required for a proposed outbound bus lane and a cycle track in both directions at Heuston Station, the existing taxi queuing lane will be removed. An increased area for taxi waiting could be accommodated within the station.

Section A-A is the same as per **Figure 7.10** in CT03, section B-B is the same as per **Figure 7.7** in CT02 and section D-D is the same as per **Figure 7.5** in CT01.

Other issues considered as part of the analysis were:

- Journey time is approximately 15.5 – 16.5 minutes
- Cycle tracks provided where required by GDA Cycle Network Plan provided except short section where shared bus and cycle lane is required on R109 and on R111 where no cycle tracks are feasible
- Existing bus stops to be upgraded
- Direct transport links with Heuston Station and Red Line Luas

- Some existing parking and taxi ranks along the R148 in the vicinity of Heuston Station would be removed in order to accommodate bus and cycle facilities
- Some private land take required
- Route option only available if buses travel through Chapelizod

8.2.5 Section 4: Route Options Assessment Summary

The Stage 2 Route Options Assessment – Multi Criteria Analysis summary tables for this section are include in **Appendix A4**. The relative ranking of the route options for each assessment sub-criteria is shown in Table 8.2 below:

Table 8.2: Section 4 Route Options Assessment Summary (Sub-Criteria)

Assessment Criteria	Assessment Sub-Criteria	CT01	CT02	CT03	CT04
Economy	Capital Cost				
	Transport Reliability and Quality of Service				
Integration	Land Use Integration				
	Residential, Employment and Educational Catchments				
	Transport Network Integration				
	Cycling Integration				
Accessibility & Social Inclusion	Key Trip Attractors				
	Deprived Geographic Areas				
Safety	Road Safety				
	Pedestrian Safety				
Environment	Archaeology, Architectural and Cultural Heritage				
	Flora and Fauna				
	Soils and Geology				
	Hydrology				
	Landscape and Visual				

Assessment Criteria	Assessment Sub-Criteria	CT01	CT02	CT03	CT04
	Air Quality				
	Noise & Vibration				
	Land Use Character				

Given the amount of overlap between the various routes within this section, they are similar in many ways. However, CT01 stands out as being more beneficial in a number of key criteria. As this is the most direct route, it has the quickest journey time and the provision of bus lanes in almost all locations ensures it is also reliable.

In terms of 'Economy', there is not much to differentiate between the different route options. Route option CT01 represents the cheapest solution as it has the least land acquisition (as no private land needs to be acquired) and infrastructure costs. Route option CT03 is the most expensive as it impacts on a number of properties and requires the acquisition of private land. Route option CT04 overlaps option CT01 from the junction of R148 and R111 to the quays, but requires extra route widening costs towards the inbound portion of that option. Route option CT02 has the highest infrastructural costs as it has more costs associated with distribution of existing road space.

CT01 is also beneficial in terms of cycling integration as it provides cycle tracks along its entire length without interfering with the proposed primary routes on the R111 (South Circular Road) and R109 (Conyngham Road). As a result it is significantly better than the other options in this regard.

Under 'Accessibility and Social Inclusion', route options CT01 and CT02 serve more key trip attractors, such as Inchicore and other areas to the south-west of the city centre within 15 minutes' walk while CT03 and CT04 generally do not.

Overall in terms of 'Safety', no one route option has a particular advantage over another.

In terms of 'Environmental' route options CT01 and CT02 have the most advantages overall when compared to the other options. However CT01 rank marginally better than CT02 in the sub criteria of Hydrology as there is a risk of flooding to a portion of that route.

Table 8.3: Section 4 Route Options Assessment Summary (Main Criteria)

Assessment Criteria	CT01	CT02	CT03	CT04
Economy				
Integration				
Accessibility & Social Inclusion				
Safety				
Environment				

Based on the assessment undertaken, route option CT01 appears to offer more benefits over other options. Route option CT01 is therefore preferred for the following reasons:

- It's comparatively lower capital cost coupled with the opportunity for journey time reliability and bus service efficiency;
- Offers full cycle track provision its route
- It has less impact on the environment compared to other options.

Based on the multi-criteria analysis undertaken for this section of the study area, route option **CT01** is the preferred route option for Section 4: Con Colbert Road to City Centre.

9. Emerging Preferred Route

9.1 Introduction

Sections 5 to 8 of this report present the detailed appraisal of the potential route options for each of the four study areas. Route options identified as part of the "spiders-web" analysis were assessed in accordance with the methodology as set out in Section 4 including a sifting process and detailed multi-criteria analysis.

Combining the preferred route options for each of these sections gives the end-to-end Emerging Preferred Route (EPR). This section of the report describes the emerging preferred route and the concept scheme design development. Concept scheme design drawings are included in **Appendix B**.

9.2 Recommended Preferred Route

The Emerging Preferred Route is shown in **Figure 9.1** below and is described in this section in the Lucan to City Centre direction.

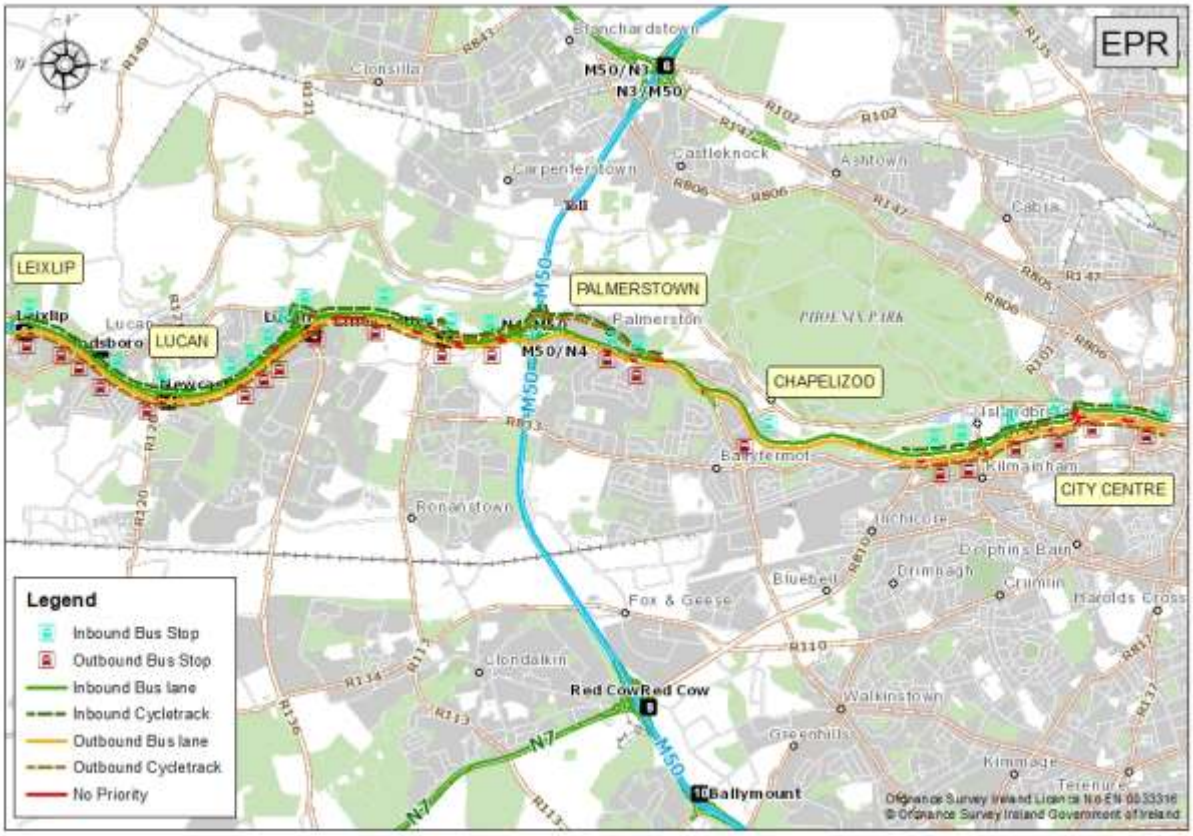

Figure 9.1: Emerging Preferred Route

The CBC commences at the Junction 5 (Celbridge/Leixlip) on the N4 by way of the on and off-ramps. The route then joins the N4. Buses would divert off the N4 via the on and off-ramps at Junction 4 (Lucan/Adamstown) and travel through said junction before re-joining the N4. Inbound buses would divert off the N4 again at Junction 3 (Ballyowen/Lucan) before turning left on to the R136 (Ballyowen Road) and right onto the R835 (Lucan Road) before re-joining the N4 again. Outbound buses would travel straight through the R136 junction via the on and off-ramps.

From there, the route travels along the N4 to Junction 2 (Fonthill/Liffey Valley), where inbound buses would divert via the off-ramp, through the roundabout and back onto the N4 at the on-ramp. Outbound

buses would continue through this junction on the N4 with no diversion. From there the route stays on the N4, travelling straight through the M50/N4 free-flow junction on the R148 (Chapelizod Bypass).

The proposed route then follows the R148 (Chapelizod Bypass/St. John's Road West) all the way from the M50 to the Quays area in the City Centre, travelling through junctions with Kennelsfort Road Upper, The Oval and South Circular Road (R111). From here, inbound buses would travel over Frank Sherwin Bridge before turning right onto Wolfe Tone Quay while outbound buses would use Victoria Quay before turning left on the R148 (St. John's Road West). Buses would then travel along the north and south quays to access the City Centre.

9.3 Route Catchments

The residential catchment areas for the Emerging Preferred Route for 5, 10 and 15 minutes' walk are shown in **Figure 9.2**.

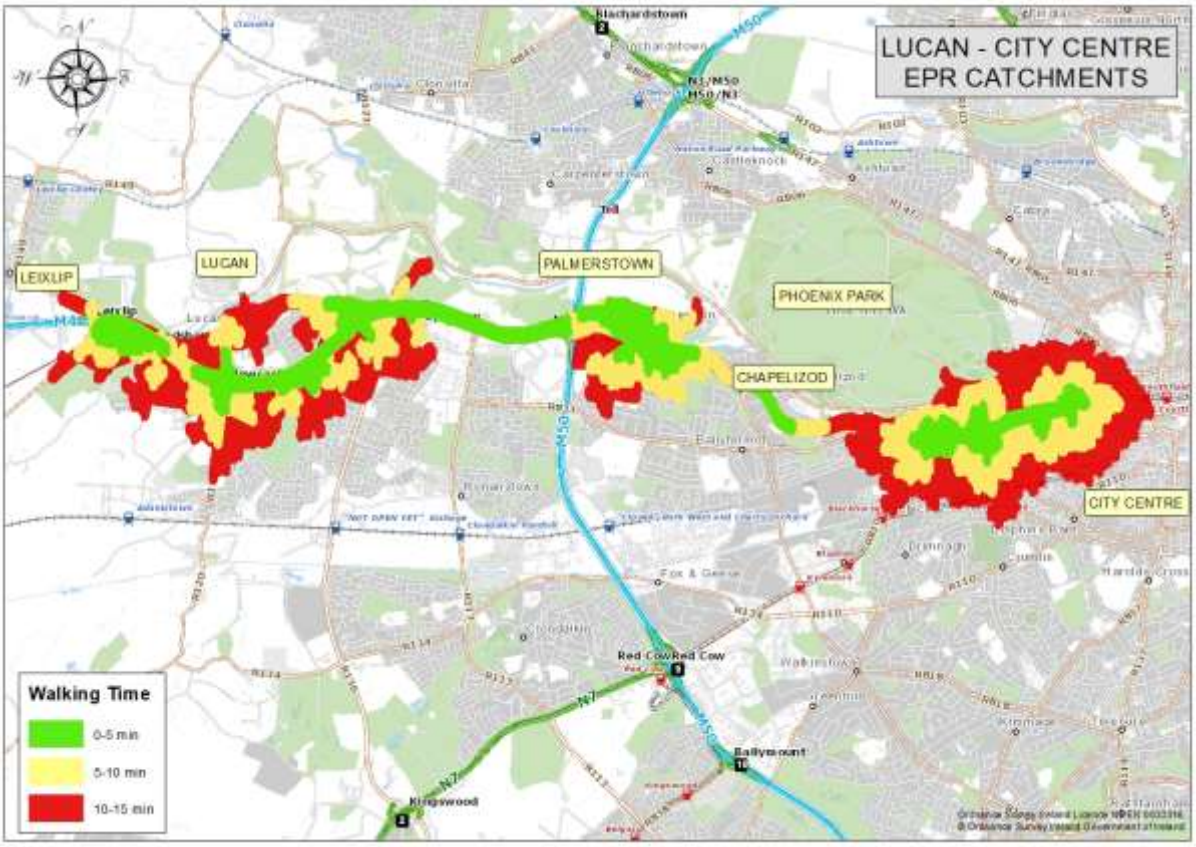

Figure 9.2: EPR Walking Catchments

Table 9.1 below shows the data for these catchments in numerical format for the residential, employment and education populations. These have been derived from 2011 Census data

Table 9.1: EPR Catchments

Walk Distance From Stops	Residential Population	Employment Population	Education Population
0 – 5 mins	19268	16966	3535
5 – 10 mins	30193	18199	3373
10 – 15 mins	37056	25409	14448
15 mins (total)	**86517**	**60574**	**21356**

9.4 Concept Scheme Design Sections Descriptions

9.4.1 Section 1: N4 Junction 5 (Celbridge/Leixlip) to N4 Junction 3 (Ballyowen/Lucan)

Length of Scheme Section: *3.9km*

Indicative Infrastructure Cost: *€17.1m*

Indicative Land Acquisition Cost: *€1.2m*

Total Indicative Cost of Scheme Section: *€18.3m*

This section begins at N4 Junction 5 (Celbridge/Leixlip). In the inbound direction, it is proposed to retain the existing layout on the on-ramp from the junction to the N4 with buses using the existing bus lane that begins half way along this ramp. A new bus lane is provided on the off-ramp from the N4 on the approach to the junction with a left turn pocket for general traffic also provided.

Between Junction 5 (Celbridge/Leixlip) and Junction 4 (Lucan/Adamstown) it is proposed that buses and cyclists use the existing bus lane and cycle track along the N4 in the inbound direction. In the outbound direction, buses would use the existing bus lane where possible, before using the existing side road parallel to the N4. It is proposed to provide bus and cycle facilities on this side road by widening into the grassed verge areas adjacent to it. However, some areas of private land take are required with residential (1 no.), commercial properties (1no.) and a number of trees affected by the proposed scheme. Publicly owned land will be required to accommodate a new pedestrian and cyclist bridge over the Celbridge Road. New bus lanes and cycle tracks are provided on the approach to the junctions between the off-ramps in both directions and the R120 (Adamstown Road). This requires widening of the existing road with a new left turn pocket lane provided in both cases.

From Junction 4 (Lucan/Adamstown) to Junction 3 (Ballyowen/Lucan), buses and cyclists would again use the existing bus lanes and cycle tracks along the N4 in both directions. A new bus stop is proposed in the inbound direction, opposite the existing bus stop at Esker Lane, along with a new pedestrian bridge over the N4 at this location. A proposed new footpath linking Esker Park and Esker Lane will improve the accessibility and catchment of the CBC route to the local population. New stops are proposed in both directions at Willsbrook Park and Woodville Green, adjacent to the existing pedestrian bridge at this location. Furthermore new stops are proposed in both directions at Cherbury Park ave. and Esker Glebe along with an upgraded footbridge to accommodate new access ramps. Bus lanes and cycle tracks are provided at the off-ramps on the approach to the junctions with the R136 (Ballyowen Road) in both directions. This requires widening in both cases along these on-ramps with a new left turn pocket provided in the outbound direction. To facilitate the outbound widening at the on-ramp, a number of young trees will be removed. Additionally, it is proposed to provide a bus lane and cycle track along the on-ramp from the R136 to the N4 in the outbound direction by means of road markings.

In the inbound direction, a bus lane and upgraded cycle facilities are provided along the R136 (Ballyowen Road) from the off-ramp junction to the junction with the R835 (Lucan Road). In general, this is done by redistributing the existing road space with some minor changes to kerb lines. The

existing junction is modified to provide a right turning bus lane to the stop line along with a left turn pocket for general traffic. A new bus stop is proposed along this section for inbound buses which requires a set back of the existing boundary wall at Woodville Avenue for a short length. The inbound bus lane travels along the R835 (Lucan Road) from this junction to the roundabout junction on the approach to the N4 is extended for the entire length of this section along with a new cycle track by means of widening into the existing green space to the north of the road.

It is proposed to upgrade all existing bus stops with raised kerbs, shelters, Real Time Passenger Information (RTPI) etc.

9.4.2 Section 2: N4 Junction 3 (Ballyowen/Lucan) to Kennelsfort Road Upper

Length of Scheme Section: *3.6km*

Indicative Infrastructure Cost: *€2.7mm*

Indicative Land Acquisition Cost: *€2.8mm*

Total Indicative Cost of Scheme Section: *€5.5m*

From N4 Junction 3 (Ballyowen/Lucan), it is proposed to utilise the existing bus lanes and cycle tracks along the N4 where they are available.

Inbound buses and cyclists would travel along the existing bus lanes and cycle tracks from Junction 3 (Ballyowen/Lucan) to Junction 2 (Fonthill/Liffey Valley) where they would divert at the off-ramp. It is proposed to extend the existing bus lane on this off-ramp to the stop line at the signal controlled roundabout and provide a new cycle track and shared surfaces. This would be done be relocating the existing kerb line. A new bus lane is proposed on the on-ramp from the R113 to the N4 by means of road markings.

Outbound buses between Junction 2 (Fonthill/Liffey Valley) and 3 (Ballyowen/Lucan) would utilise the existing bus lane on the N4 before diverting onto the existing parallel side road just after St. Loman's Hospital. It is proposed to provide a new bus lane and cycle tracks in this section by widening the existing side road, necessitating land take from adjacent residences (13 no.) and commercial (1 no.) properties. Along the length of the land take there is a number of trees that would need to be removed to facilitate the widening.

Buses in both directions would travel along the existing bus lanes from Junction 2 (Fonthill/Liffey Valley) to the M50 junction. New road markings will be provided through the M50 junction and will continue along the R148 from the M50 to the Kennelsfort Road junction. A new inbound bus stop is proposed on the N4 before the merge with the Junction 2 (Fonthill/Liffey Valley) and can be accessed via proposed shared surface and toucan crossings.

A combination of proximity of building lines (local business 'Murry's Inn' would need to be acquired and demolished to accommodate proposed cycle facility) at the inbound merge of Junction 2 (Fonthill/Liffey Valley) with the N4 and the prospect of cyclists traversing the M50, an alternative cycle route is proposed. Inbound cyclists at Junction 2 (Fonthill/Liffey Valley) would travel along the access road for The King's Hospital, sharing space with local traffic and traffic accessing the hospital. After approximately 850m, cyclists can re-join an existing shared pedestrian/two-way cycle path that continues onto the Old Lucan Road via an existing pedestrian/cyclist bridge that traverses the M50. From here cyclists can re-join the CBC route via Kennelsfort Road Lower. Outbound cyclists would travel this route in the reverse direction and would re-join the N4 by travelling along the R113 (under the N4) and merging with the N4 using the existing cycle track on the off-ramp at Junction 2 (Fonthill/Liffey Valley). New toucan crossings will be provided in order to facilitate this movement.

Bus priority is proposed on the M50/N4 interchange for the inbound and outbound bus movements on the N4. This bus priority is in the form of a bus lane on both the inbound and outbound bridges. The additional bus lane starts on the N4 approach to the M50 overbridge after the M50 northbound diverge and continues for 720m until it meets the M50 merge, after the interchange. This bus lane replaces one of two traffic lanes on the approach to the overbridge, however the existing two traffic lanes are

returned on the bridge to the existing merge east of the interchange. The additional outbound bus lanes runs for 910m and starts after the M50 southbound diverge replacing one traffic lane through the bridge until it ties into the existing bus lane prior to the M50 merge to the N4.

Peak hour inbound and outbound traffic levels east of the M50 interchange on the Chapelizod bypass are recorded at 2,500 and 2,600 vehicles per hour including buses and taxis. Assuming 30% of these turn left onto or off M50 the remaining traffic figure will be accommodated on the single traffic lane and bus lane. Similarly peak hour inbound and outbound traffic levels west of the M50 interchange on the N4 are recorded at 2,500 and 2,600 vehicles per hour including buses and taxis. Assuming 30% of these turn left onto or off M50 the remaining traffic figure will be accommodated on the single traffic lane and bus lane.

It is proposed to upgrade all existing bus stops with raised kerbs, shelters, Real Time Passenger Information (RTPI) etc.

9.4.3 Section 3: Kennelsfort Road Upper to Con Colbert Road

Length of Scheme Section: *3.7km*

Indicative Infrastructure Cost: *€6.2m*

Indicative Land Acquisition Cost: *€0m*

Total Indicative Cost of Scheme Section: *€6.2m*

It is proposed for the CBC to generally utilise the existing, recently upgraded bus lanes along the R148 (Chapelizod Bypass) between Kennelsfort Road and Con Colbert Road.

The junctions at Kennelsfort Road Upper and The Oval would be upgraded to increase pedestrian safety and access. This would include new pedestrian crossings and footpaths. In particular, it is proposed to provide a new at-grade pedestrian crossing at the Kennelsfort Road junction.

It is also proposed to widen locally at the junction of the R148 and the Kylemore Road on-ramp. This would allow bus lanes to be provided continuously through this merge and would include provision of traffic signals to control traffic entering the R148 from the Kylemore on-ramp.

In order to increase the population catchment of the preferred route, two bus stops (inbound and outbound) are proposed adjacent to the Chapelizod Hill Road along with proposed ramped pedestrian access. Key trip attractors such as Ballyfermot Training Centre and Chapelizod Village will directly benefit from the proposed bus stops. A new pedestrian crossing adjacent to the bus stops is also proposed.

Inbound cyclists would travel along a proposed new shared surface (pedestrian/two-way cycle path) on the Lucan road and continue down the off-ramp for Chapelizod village (R112). Cyclists would continue to travel onto the Chapelizod Road and re-join the CBC route at the junction of South Circular Road (R111)/Chapelizod Bypass (R148). Outbound cyclists would travel this route in the reverse direction.

It is proposed to upgrade all existing bus stops with raised kerbs, shelters, RTPI etc.

9.4.4 Section 4: Con Colbert Road to City Centre

Length of Scheme Section: *3.3km*

Indicative Infrastructure Cost: *€10.2m*

Indicative Land Acquisition Cost: *€0m*

Total Indicative Cost of Scheme Section: *€10.2m*

It is proposed to redistribute the existing road space by means of kerb relocation along the R148 (Chapelizod Bypass) from Con Colbert Road junction to the South Circular Road in order to provide dedicated cycle tracks in both directions. Some widening is required along the outbound side of the

R148 between the off and on-ramps at Con Colbert Road to allow a continuous bus lane to be provided through this location.

The existing junction between the R148 and the R111 (South Circular Road) would be reconfigured by realigning the existing kerbs in order to provide bus lanes and cycle tracks through the junction. This would require some local carriageway widening in places.

From the R111 junction to the junction at Victoria Quay, it is proposed to realign the existing kerbs to provide bus lanes and cycle tracks in both directions. This requires widening of the carriageway into the central median in some locations. The existing inbound grassed verge has a number of trees that will be removed in order to facilitate the proposed scheme. Similarly the existing outbound footpath from the South Quays to Military Road on the R148 may require a number of trees to be removed in order to facilitate the proposed scheme.

It is proposed to provide new bus stops along the R148 (St. John's Road West) opposite the Royal Hospital Kilmainham in order to provide for Heuston South Quarter and the surrounding areas.

From this junction to the Victoria Quay junction, it is proposed to realign all kerbs with some local widening also being necessary adjacent to the Heuston Luas stop in order to provide bus lanes and cycle tracks.

Buses would then travel inbound along the north quays while outbound buses would use the south quays. No concept scheme has been prepared along these quays as they are subject to the overall Dublin City Centre strategy and a number of other schemes in this area, which are currently being progressed.

In order to facilitate the extra space required for a proposed outbound bus lane and a cycle track in both directions, the existing taxi queuing lane will be removed outside Heuston Station. An increased area for taxi waiting could be accommodated within the station.

9.5 Concept Scheme Design Summary

9.5.1 Proposed Infrastructure

The Emerging Preferred Route is 14.5km long from end to end. The concept scheme design included in Appendix B shows the extent of the infrastructure proposed to deliver this CBC.

The existing bus priority infrastructure along the EPR is approximately 75% (10.9km) in the inbound direction and only 53% (7.7km) in the outbound direction. The proposed scheme would improve bus priority infrastructure to 99% (14.4km) in the inbound direction and 97% (14.1km) in the outbound direction. In general, the proposed scheme will provide increased bus priority through junctions, particularly the key junctions at the R111, Con Colbert Road, Kylemore Road, the M50 interchange, R136 and R120 junctions on the N4. This increased priority will ensure journey time reliability and reduce delays.

In addition to bus priority, upgraded cycle facilities are proposed along the R148 from Con Colbert Road to the quays area, which constitutes secondary cycle route no. 6A. The existing cycle tracks along the N4 forming part of primary cycle route no. 6 will also be maintained and upgraded in a number of locations. Dedicated cycle tracks of 2m minimum width in accordance with the National Cycling manual will be provided where possible. Pedestrian safety would also be improved at a number of junctions due to signalised crossings, provision of a new pedestrian footbridge over the N4 and improvements to pedestrian access to the existing footbridges. Footpaths of 2m minimum width will be provided along the route where possible.

As part of the proposed scheme, seven new bus stops are recommended along the N4: one inbound opposite the existing outbound bus stop at Esker Lane, one either side of the N4 adjacent to Willsbrook Park, one either side at Cherbury Park ave., one at the junction of R136 and Lucan Rd and one inbound adjacent to the on-ramp at Junction 2 (Fonthill/Liffey Valley) on the N4. A new pedestrian bridge is proposed at the Esker Lane stops while the new stops at Willsbrook Park would be serviced by the existing pedestrian bridge. The provision of these stops is critical to the viability of the

catchment for this CBC as it allows it to serve large population areas both to the north and south of the N4 in the Lucan area.

Similarly there are four stops recommended along the Chapelizod Bypass R148: one either side where Chapelizod Hill Road crosses underneath the Chapelizod Bypass and one either side adjacent to the Royal Hospital Kilmainaham. A new pedestrian crossing is proposed adjacent to the new bus stops on the Chapelizod Bypass, along with ramped pedestrian access to improve both pedestrian safety and accessibility. These proposed stops will improve the CBC's integration criteria, by increasing the residential, employment and educational catchments regarding the area of Chapelizod the area around Heuston Station.

9.5.2 Cost Estimate

A high level cost estimate was prepared based on the concept scheme design discussed above. From this, the proposed CBC scheme infrastructure cost is expected to be approximately €40m - €45m.

9.5.3 Scheme Benefits

The majority of current bus routes such as the 66, 67 and 25 travel through Lucan Village directly. The provision of the new bus stops along the N4 makes the CBC a viable option for buses to stay on the N4 rather than travelling through Lucan Village, thus avoiding congestion in the area. From Junction 3 (Ballyowen/Lucan) on the N4 to the City Centre, the proposed route follows that of the existing 25A service. Although there is already considerable bus priority infrastructure along the proposed route, the proposed scheme provides further priority through a number of key junctions which will also reduce delays and ensure reliability.

Existing average travel times for the 25 and 25A routes were calculated by using the Automatic Vehicle Location (AVL) data provided by Dublin Bus and are compared to the proposed travel times in **Table 9.1 and Table 9.2** below. This reflects the benefits of an uncongested network. Therefore a bus priority network allows buses to move along the route quicker and with more reliable journey times. For comparison reasons N4 Junction 5 (Celbridge/Leixlip) to N4 Junction 3 (Ballyowen/Lucan) is compared to bus route 25, and the proposed section from Junction 3 (Ballyowen/Lucan) on the N4 to the City Centre is compared to route 25A.

Table 9.1: Inbound Travel Time Comparison

Route Section	Peak Hour Existing Travel Time (Mins)	Proposed Travel Time (Mins)
N4 Junction 5 (Celbridge/Leixlip) to N4 Junction 3 (Ballyowen/Lucan)	18:40	08:41
N4 Junction 3 (Ballyowen/Lucan) to Kennelsfort Road	10:47	05:46
Kennelsfort Road to Con Colbert Road	06:49	06:49
Con Colbert Road to City Centre	12:26	12:42
Total Travel Time	**48:42**	**33:58**

Table 9.2: Outbound Travel Time Comparison

Route Section	Peak Hour Existing Travel Time (Mins)	Proposed Travel Time (Mins)
City Centre Con to Colbert Road	12:07	12:20
Con Colbert Road to Kennelsfort Road	08:28	06:45
Kennelsfort Road to N4 Junction 3 (Ballyowen/Lucan)	08:03	05:35
N4 Junction 3 (Ballyowen/Lucan) to N4 Junction 5 (Celbridge/Leixlip)	16:06:	08:10
Total Travel Time	**44:44**	**32:50**

In reference to GDA Cycle Network Plan, the scheme will provide 5.1km of upgraded primary cycle route no. 6. Works will involve the provision of dedicated cycle tracks ensuring a minimum width of 2m is achieved where possible. This section includes the N4 from Junction 5 (Celbridge/Leixlip) to Junction 2 (Fonthill/Liffey Valley) and links Leixlip, Co. Kildare to Liffey Valley and further beyond to the city centre.

It will also deliver 3km of new and upgraded secondary cycle route no. 6A. Works will include the provision of dedicated cycle tracks ensuring a minimum width of 2m is achieved where possible. This cycle route runs from the junction of Con Colbert Road/Chapelizod Bypass and continues along St Johns Road West. From here inbound cyclists link up with the primary cycle route no. 5 on Wolf Tone Quay. For outbound cyclists route no. 6A begins on Bridgfoot Street, continues onto Victoria Quay where it joins St Johns Road West.

The proposed scheme has added improvements for pedestrians at a number of junctions along with increased number of pedestrian crossings.

10. Next Steps

This report has identified an emerging preferred route for the bus infrastructure along this CBC for which a concept design has been developed.

The next project stage (The development of a Preliminary Design) will further refine and update the initial concept design along the route. Further account will be taken of likely public transport service levels, particularly the bus service patterns and any changes to the overall bus network which may arise from the separate bus network review process. The proposals will be amended, if and as required, to integrate any resultant changes. The Preliminary Design will define the final practically achievable scheme for the CBC, taking into account more detailed studies of constraints, impacts and environmental assessment required at a local level.

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

This Preliminary Design will form the basis of the planning consent process for the scheme, which will require a development consent application to be made directly to An Bord Pleanala, due to the nature and extent of the proposed works.

Appendix A – Stage 2 Route Options Assessment Summary Tables

Appendix A1 – MCA Section 1: N4 Junction 5 (Celbridge/Leixlip) to N4 Junction 3 (Ballyowen/Lucan)

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
Economy	Capital Cost	***Total Indicative Cost:*** €18.3m ***Indicative Scheme Infrastructure Works Cost:*** (€17.1m) • Use existing bus lanes and cycle tracks along N4. • Widen existing on and off ramps at R120 and R136 junctions to extend bus lanes to stop lines along with provision of cycle tracks. • Widen existing parallel side road at N4 to provide bus, cycle and pedestrian facilities. • Provide new	***Total Indicative Cost:*** €30.2m ***Indicative Scheme Infrastructure Works Cost:*** (€19.4m) • Use existing bus lanes along N4 where available. • Widen existing parallel side road at N4 to provide bus, cycle and pedestrian facilities. • Provide new pedestrian/cyclist bridge over Celbridge Road. • Widening of off-ramp from N4 at Junction 4a (Dodsboro/Kew Park) to provide	***Total Indicative Cost:*** €32.9m ***Indicative Scheme Infrastructure Works Cost:*** (€23.5m) • Use existing bus lanes along N4 where available. • Widening of off-ramp from N4 at Junction 4a (Dodsboro/Kew Park) to provide inbound bus lane and cycle track • Widen existing parallel side road at N4 to provide bus, cycle and pedestrian facilities. • Provide new pedestrian/cyclist	***Total Indicative Cost:*** €33.6m ***Indicative Scheme Infrastructure Works Cost:*** (€22.7m) • Use existing bus lanes along N4 where available. • Widening of off-ramp from N4 at Junction 4a (Dodsboro/Kew Park) to provide inbound bus lane and cycle track • Widen existing parallel side road at N4 to provide bus, cycle and pedestrian facilities. • Provide new pedestrian/cyclist	***Total Indicative Cost:*** €28.1m ***Indicative Scheme Infrastructure Works Cost:*** (€18m) • Use existing bus lanes along N4 where available. • Widening of off-ramp from N4 at Junction 4a (Dodsboro/Kew Park) to provide inbound bus lane and cycle track • Widen existing parallel side road at N4 to provide bus, cycle and pedestrian facilities. • Provide new pedestrian/cyclist

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
		pedestrian/cyclist bridge over Celbridge Road. • Redistribute road space on R136 and R835 to provide continuous inbound bus lane • Alteration to existing junction at R136 and R835 • Upgrade existing bus stops • Provide new bus stops along N4 in both directions adjacent to existing pedestrian bridge • Provide new inbound bus stop along N4 along with new pedestrian overbridge	inbound bus lane and cycle track • Redistribute road space on R835 and L1018 to provide outbound bus lane • Widen R835 where required to provide bus lanes and cycle tracks in both directions, including removal of existing large stone wall, new retaining walls and embankments as necessary. • Redistribution of road space on R136 to provide outbound bus lane • Widen off-ramp from N4 Junction 3 (Ballyowen/Lucan) to provide bus lane top stop line. • Alteration to junction	bridge over Celbridge Road. • Widen R835 where required between off-ramp and R120 junction to provide inbound bus lanes and cycle tracks in both directions, including removal of existing large stone wall. • Widen R835 as required from R120 junction to R136 junction to provide bus lanes and cycle tracks in both directions where possible. • Widen R120 between R835 junction and N4 to provide outbound bus lane and cycle tracks in both directions where	bridge over Celbridge Road. • Redistribute road space on R835 and L1018 to provide outbound bus lane • Widen R835 where required between off-ramp and R120 junction to provide bus lanes and cycle tracks in both directions, including removal of existing large stone wall as necessary. • Widen R835 as required from R120 junction to Chapel Hill junction to provide outbound bus lane and cycle tracks in both directions where possible. • Widen R835 as	bridge over Celbridge Road. • Redistribute road space on R835 and L1018 to provide outbound bus lane • Widen R835 where required between off-ramp and R120 junction to provide bus lanes and cycle tracks in both directions, including removal of existing large stone wall as necessary. • Redistribute road space along R109 and Chapel Hill to provide inbound bus lane only • Widen R835 as required from to Chapel Hill junction to R136 junction to provide bus lanes

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
			between R136 and R835 • Upgrade existing bus stops	possible • Widen off-ramp from N4 Junction 3 (Ballyowen/Lucan) to provide bus lane top stop line. • Redistribute road space on R136 to provide outbound bus lane • Alteration to junction between R136 and R835 • Upgrade existing bus stops	required from to Chapel Hill junction to R136 junction to provide bus lanes and cycle tracks in both directions. • Redistribute road space along R109 and Chapel Hill to provide inbound bus lane • Redistribution of road space on R136 to provide outbound bus lane • Widen off-ramp from N4 Junction 3 (Ballyowen/Lucan) to provide bus lane top stop line. • Alteration to junction between R136 and R835 • Upgrade existing bus stops	and cycle tracks in both directions. • Redistribution of road space on R136 to provide outbound bus lane • Widen off-ramp from N4 Junction 3 (Ballyowen/Lucan) to provide bus lane top stop line. • Alteration to junction between R136 and R835 • Upgrade existing bus stops

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
		Land Acquisition Cost: (€1.2m) • 220 m^2 public land • 790 m^2 public land • 8 private properties affected	***Land Acquisition Cost:*** (€10.8m) • 3150 m^2 public land • 7200 m^2 private land • 19 private properties affected	***Land Acquisition Cost:*** (€9.4m) • 2710 m^2 public land • 6250 m^2 private land • 19 private properties affected	***Land Acquisition Cost:*** (€10.9m) • 1589 m^2 public land • 7300 m^2 private land • 19 private properties affected	***Land Acquisition Cost:*** (€10.1m) • 132 m^2 public land • 6800 m^2 private land • 15 private properties affected
	Rank					
	Transport	Journey time: 8 – 9 minutes	Journey time: 10.5 – 13 minutes	Journey time: 10 – 13 minutes	Journey time: 11.5 – 13 minutes	Journey time: 11.5 – 18 minutes

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
	Reliability and Quality of Service	Length of route: 4.1 km Priority: Full bus priority provided for 95% of inbound route including through junctions. Full bus priority provided for 95% of outbound route including through signalised junctions.	Length of route: 4.4 km Priority: Full bus priority provided for 95% of inbound route including through junctions. Priority not achievable for a 150m stretch on the approach to the R120 junction in Lucan. Full bus priority provided for 90% of outbound route including through signalised junctions. Priority not achievable	Length of route: 4.8 km Priority: Full bus priority provided for 95% of inbound route including through junctions. Priority not achievable for a 150m stretch on the approach to the R120 junction in Lucan. Full bus priority provided for 90% of outbound route including through signalised junctions. Priority not achievable	Length of route: 4.3 km Priority: Full bus priority provided for 95% of inbound route including through junctions. Priority not achievable for a 150m stretch on the approach to the R120 junction in Lucan. Full bus priority provided for 90% of outbound route including through signalised junctions. Priority not achievable	Length of route: 4.4 km Priority: Full bus priority provided for 95% of inbound route including through junctions. Priority not achievable for a 150m stretch on the approach to the R120 junction in Lucan. Full bus priority provided for 75% of outbound route including through signalised junctions. Priority not achievable

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
			for a 150m stretch on the approach to the R120 junction in Lucan.	for a 100m stretch on the R120 after the junction with the R835 in Lucan.	for a 150m stretch on the approach to the R120 junction in Lucan.	outbound through Lucan Village. Priority not achievable for a 150m stretch on the approach to the R120 junction in Lucan.
	Rank					
Integration	Land Use Integration	Route integrates well with land use zoning identified in County Development Plans. Most of area surrounding route is already substantially developed with little opportunity to encourage further. However, a section of	Route integrates well with land use zoning identified in County Development Plans. Area surrounding route is already substantially developed with little opportunity to encourage further.	Route integrates well with land use zoning identified in County Development Plans. Area surrounding route is already substantially developed with little opportunity to encourage further.	Route integrates well with land use zoning identified in County Development Plans. Area surrounding route is already substantially developed with little opportunity to encourage further.	Route integrates well with land use zoning identified in County Development Plans. Area surrounding route is already substantially developed with little opportunity to encourage further.

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
		the route is within 500m of the northern most section of the Adamstown SDZ lands and could feasibly provide public transport linkages to this area.				
	Rank					
	Residential, Employment and Educational Catchments	***Residential Population Catchment*** • 2878 within 5 minute walk of route • 7285 within 10 minute walk of route • 16425 within 15 minute walk of route ***Employment Catchment*** • 347 within 5 minute	***Residential Population Catchment*** • 3410 within 5 minute walk of route • 5965 within 10 minute walk of route • 12507 within 15 minute walk of route ***Employment Catchment*** • 927 within 5 minute	***Residential Population Catchment*** • 3221 within 5 minute walk of route • 4646 within 10 minute walk of route • 12053 within 15 minute walk of route ***Employment Catchment*** • 911 within 5 minute	***Residential Population Catchment*** • 2495 within 5 minute walk of route • 4665 within 10 minute walk of route • 11474 within 15 minute walk of route ***Employment Catchment*** • 797 within 5 minute	***Residential Population Catchment*** • 2780 within 5 minute walk of route • 5968 within 10 minute walk of route • 12494 within 15 minute walk of route ***Employment Catchment*** • 834 within 5 minute

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
		walk of route • 1077 within 10 minute walk of route • 2228 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)*** • 907 within 5 minute walk of route • 1519 within 10 minute walk of route • 3276 within 15 minute walk of route	walk of route • 1091 within 10 minute walk of route • 1471 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)*** • 659 within 5 minute walk of route • 1173 within 10 minute walk of route • 2079 within 15 minute walk of route	walk of route • 981 within 10 minute walk of route • 1369 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)*** • 659 within 5 minute walk of route • 1173 within 10 minute walk of route • 1173 within 15 minute walk of route	walk of route • 1027 within 10 minute walk of route • 1368 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)*** • 624 within 5 minute walk of route • 1173 within 10 minute walk of route • 1173 within 15 minute walk of route	walk of route • 1164 within 10 minute walk of route • 1495 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)*** • 624 within 5 minute walk of route • 1173 within 10 minute walk of route • 1173 within 15 minute walk of route
	Rank					
	Transport Network Integration	This route option follows that of a number of express Dublin Bus services and a considerable	This route option follows the route of the majority of Dublin Bus services through Lucan, although does	This route option follows the route of the majority of Dublin Bus services through Lucan, although does	This route option follows the route of the majority of Dublin Bus services through Lucan, although the	This route option follows the route of the majority of Dublin Bus services through

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
		number of Bus Eireann services. Potential for a number of new stops to be provided along the N4 and at off-ramps of junctions at R136, allowing for possible interchanges with local and orbital bus routes.	not enter the village itself as the current services do.	not enter the village itself as the current services do.	proposed route only enters the village in the inbound direction.	Lucan.
	Rank					
	Cycling Integration	This route is designated as a primary cycle route. There are existing cycle tracks along the N4 throughout this route. Cycle lanes are provided throughout the scheme.	The majority of this route is designated as a secondary cycle route. There are a number of sections along the R835 where there is insufficient width to provide segregated cycle tracks due to the	The majority of this route is designated as a secondary cycle route. There are a number of sections along the R835 and a short section of the R120 where there is insufficient width to	The majority of this route is designated as a secondary cycle route. It is not possible to provide cycle facilities through Lucan Village along with bus priority facilities due to the proximity of building	The majority of this route is designated as a secondary cycle route. It is not possible to provide cycle facilities through Lucan Village along with bus priority facilities due to the proximity of building

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
			proximity of building lines on both sides. In these sections, it would be necessary for the cyclists to use bus lanes, therefore reducing the quality of service below the required level. There is no obvious alternative route for this section of secondary cycle route.	provide segregated cycle tracks due to the proximity of building lines on both sides. In these sections, it would be necessary for the cyclists to use bus lanes, therefore reducing the quality of service below the required level. There is no obvious alternative route for these sections of secondary cycle routes.	lines on both sides along the entire section of this route. There is no obvious alternative route for this secondary cycle route.	lines on both sides along the entire section of this route. There is no obvious alternative route for this secondary cycle route.
	Rank					
Accessibility & Social Inclusion	Key Trip Attractors	***Education*** • St. Thomas's Primary School • Scoil Aine Naofa • Lucan Community College	***Education*** • Scoil Mhuire NS • St. Joseph's Secondary School • St. Mary's Boys NS • Scoil Mhuire Girls	***Education*** • Scoil Mhuire NS • St. Joseph's Secondary School • St. Mary's Boys NS • Scoil Mhuire Girls	***Education*** • Scoil Mhuire NS • St. Joseph's Secondary School • St. Mary's Boys NS • Scoil Mhuire Girls	***Education*** • Scoil Mhuire NS • St. Joseph's Secondary School • St. Mary's Boys NS • Scoil Mhuire Girls

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
		• Gaelscoil Eiscir Riada • Coláiste Cois Life • Esker Educate Together NS • Coláiste Pádraig • Scoil Mhuire NS	NS • St. Andrew's NS • Coláiste Pádraig	NS • Coláiste Pádraig • St. Andrew's NS	NS • Coláiste Pádraig • St. Andrew's NS	NS • Coláiste Pádraig
			Health • St. Edmundsbury Hospital	***Health*** • St. Edmundsbury Hospital	***Health*** • St. Edmundsbury Hospital	***Health*** • St. Edmundsbury Hospital
		Retail/Leisure • Lucan Shopping Centre • Hillcrest Shopping Centre • Lucan Spa Hotel • Lucan Retail Park	***Retail/Leisure*** • Hillcrest Shopping Centre • Lucan Spa Hotel • Lucan Village Centre	***Retail/Leisure*** • Hillcrest Shopping Centre • Lucan Spa Hotel • Lucan Village Centre • Lucan Shopping	***Retail/Leisure*** • Hillcrest Shopping Centre • Lucan Spa Hotel • Lucan Village Centre	***Retail/Leisure*** • Hillcrest Shopping Centre • Lucan Spa Hotel • Lucan Village Centre

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
		• Lucan Village West ***Employment*** • Lucan Village West	• Lucan Retail Park ***Employment*** • Lucan Village Centre	Centre (Outbound only) • Lucan Retail Park ***Employment*** • Lucan Village Centre	• Lucan Retail Park ***Employment*** • Lucan Village Centre	• Lucan Retail Park ***Employment*** • Lucan Village Centre
	Rank					
	Deprived Geographic Areas	Route option does not directly serve any RAPID areas. There are 3 disadvantaged areas, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.	Route option does not directly serve any RAPID areas. There is 1 disadvantaged area, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.	Route option does not directly serve any RAPID areas. There are 2 disadvantaged areas, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.	Route option does not directly serve any RAPID areas. There is 1 disadvantaged area, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.	Route option does not directly serve any RAPID areas. There is 1 disadvantaged area, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.
	Rank					

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
Safety	Road Safety	***No. of junctions:*** 3 signalised 1 roundabout ***Vehicle Accident Data (since 2005)*** 25+ minor	***No. of junctions:*** 3 signalised 1 roundabout 2 priority ***Vehicle Accident Data (since 2005)*** 15+ minor	***No. of junctions:*** 5 signalised 1 roundabout 1 priority ***Vehicle Accident Data (since 2005)*** 25+ minor 1 serious	***No. of junctions:*** 4 signalised 1 roundabout 3 priority ***Vehicle Accident Data (since 2005)*** 25+ minor	***No. of junctions:*** 4 signalised 1 roundabout 3 priority ***Vehicle Accident Data (since 2005)*** 25+ minor
	Rank					
	Pedestrian Safety	Access for pedestrians is limited to existing and proposed bus stops along the N4 for the majority of the route. The N4 is a highly trafficked road with an 80 km/h speed limit. Upgraded accesses	Footpaths are available on both sides for the majority of this route.	Footpaths are available on both sides for the majority of this route.	Footpaths are available on both sides for the majority of this route.	Footpaths are available on both sides for the majority of this route.

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
		are required for new bus stops along the N4 along with a new pedestrian overbridge. Pedestrian crossings/bridges located within 50m of 7 of 13 stops. ***Pedestrian Accident Data (since 2005)*** 3 minor 1 serious 1 fatal	Pedestrian crossings located within 50m of 1 of 21 stops. ***Pedestrian Accident Data (since 2005)*** 4 minor 3 serious	Pedestrian crossings located within 50m of 1 of 20 stops. ***Pedestrian Accident Data (since 2005)*** 4 minor 4 serious	Pedestrian crossings located within 50m of 1 of 21 stops. ***Pedestrian Accident Data (since 2005)*** 6 minor 4 serious 1 fatal	Pedestrian crossings located within 50m of 1 of 22 stops. ***Pedestrian Accident Data (since 2005)*** 6 minor 4 serious 1 fatal

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
	Rank					
Environment	Archaeology, Architectural and Cultural Heritage	There are no recorded monuments/places, protected structures or sites of cultural heritage identified along this route.	There is one recorded monument/place identified along this route. Five protected structures are identified along the route. It is not intended to affect these recorded monument/places or protected structures. However, a section of this route would require a large stone wall along the R835 to be removed to allow for road widening.	There are two recorded monuments/places identified along this route. Five protected structures are identified along the route. It is not intended to affect these recorded monument/places or protected structures. However, a section of this route would require a large stone wall along the R835 to be removed to allow for road widening	There is one recorded monument/place identified along this route. Twenty protected structures are identified along the route. It is not intended to affect these recorded monument/places or protected structures. However, a section of this route would require a large stone wall along the R835 to be removed to allow for road widening	There is one recorded monument/place identified along this route. Twenty protected structures are identified along the route. It is not intended to affect these recorded monument/places or protected structures. However, a section of this route would require a large stone wall along the R835 to be removed to allow for road widening

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
	Rank					
	Flora and Fauna	Land-take may impact on areas of grassed verges along embankments on the N4. It is unlikely that any major effects to local flora or fauna will be caused by removal of these grassed areas.	Land-take may impact grass land in parkland areas along with a large number of trees to be removed. There may be some effects to local flora and fauna due to the removal of parkland and trees.	Land-take may impact grass land in parkland areas along with a large number of trees to be removed. There may be some effects to local flora and fauna due to the removal of parkland and trees.	Land-take may impact grass land in parkland areas along with a large number of trees to be removed. There may be some effects to local flora and fauna due to the removal of parkland and trees. A section of this route is directly adjacent to a proposed Natural Heritage Area. However, it is not intended to directly affect this NHA.	Land-take may impact grass land in parkland areas along with a large number of trees to be removed. There may be some effects to local flora and fauna due to the removal of parkland and trees. A section of this route is directly adjacent to a proposed Natural Heritage Area. However, it is not intended to directly affect this NHA.
	Rank					
	Soils and	In general the route uses the existing	In general the route uses the existing	In general the route uses the existing	In general the route uses the existing	In general the route uses the existing

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
	Geology	carriageway reservation for the majority of its route. In areas where widening is required, there is little risk of affecting the existing geology of the area.	carriageway reservation for the majority of its route. In areas where widening is required, there is little risk of affecting the existing geology of the area.	carriageway reservation for the majority of its route. In areas where widening is required, there is little risk of affecting the existing geology of the area.	carriageway reservation for the majority of its route. In areas where widening is required, there is little risk of affecting the existing geology of the area.	carriageway reservation for the majority of its route. In areas where widening is required, there is little risk of affecting the existing geology of the area.
	Rank					
	Hydrology	This route traverses a number of small streams, which are culverted under the N4. There is minimal risk of flooding along this route.	This route traverses a local stream within Lucan Village. A short section of this route is identified as being at risk of flooding in a 1 in 1000 year event.	This route traverses a local stream within Lucan Village. A short section of this route is identified as being at risk of flooding in a 1 in 1000 year event.	This route traverses a local stream within Lucan Village. A short section of this route is identified as being at risk of flooding in a 1 in 1000 year event.	This route traverses a local stream within Lucan Village. A short section of this route is identified as being at risk of flooding in a 1 in 1000 year event.
	Rank					
	Landscape	This route makes use of the N4 road corridor	This route makes use of existing road	This route makes use of existing road	This route makes use of existing road	This route makes use of existing road

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
	and Visual	for the majority of its length. Some impact on landscape and visual aesthetics in localised areas where widening may require removal of trees and hedgerows.	corridors along its length. Some impact on landscape and visual aesthetics in most locations, including grass parkland and public amenity areas.	corridors along its length. Some impact on landscape and visual aesthetics in most locations, including grass parkland and public amenity areas.	corridors along its length. Some impact on landscape and visual aesthetics in most locations, including grass parkland and public amenity areas. Impact on visual amenity through Lucan Village including possibility of narrower footpaths and loss of urban street trees.	corridors along its length. Some impact on landscape and visual aesthetics in most locations, including grass parkland and public amenity areas. Impact on visual amenity through Lucan Village including possibility of narrower footpaths and loss of urban street trees.
	Rank					
	Air Quality	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in pollutants.	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in pollutants.	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in pollutants.	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in pollutants.	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in pollutants.

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
		In general, some of the widening that is required along this route is located close to residential or commercial premises and may result in a reduction in air quality in these sensitive receptors.	In general, some of the widening that is required along this route is located close to residential or commercial premises and may result in a reduction in air quality in these sensitive receptors.	In general, some of the widening that is required along this route is located close to residential or commercial premises and may result in a reduction in air quality in these sensitive receptors.	In general, some of the widening that is required along this route is located close to residential or commercial premises and may result in a reduction in air quality in these sensitive receptors..	In general, some of the widening that is required along this route is located close to residential or commercial premises and may result in a reduction in air quality in these sensitive receptors..
	Rank					
	Noise & Vibration	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in noise and vibration. There may be some widening required locally in areas close to existing commercial and residential	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in noise and vibration. There may be some widening required locally in areas close to existing commercial and residential	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in noise and vibration. There may be some widening required locally in areas close to existing commercial and residential	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in noise and vibration. There may be some widening required locally in areas close to existing commercial and residential	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in noise and vibration. There may be some widening required locally in areas close to existing commercial and residential

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
		premises which may result in a detectable increase in noise and vibration..	premises which may result in a detectable increase in noise and vibration.	premises which may result in a detectable increase in noise and vibration.	premises which may result in a detectable increase in noise and vibration.	premises which may result in a detectable increase in noise and vibration.
	Rank					
	Land Use Character	Route option has little impact on existing land use as it is contained within the existing N4 road reservation for the majority of its length. Land acquisition is generally along embankments and fill areas, although some areas require land take from residential gardens etc.	Route option has some impact on existing car parking in a number of sections. Land acquisition is generally taken from open green spaces, however, some land would be required from various private land owners, including residential properties and the Italian Ambassador's residence.	Route option has some impact on existing car parking in a number of sections. Land acquisition is generally taken from open green spaces, however, some land would be required from various private land owners, including residential properties and the Italian Ambassador's residence.	Route option has large impact on existing car parking in a number of sections, particularly within Lucan Village. Some of this parking is residential in nature and difficult to relocate. Land acquisition is generally taken from open green spaces, however, some land would be required from various private land owners, including residential properties and the Italian Ambassador's	Route option has large impact on existing car parking in a number of sections, particularly within Lucan Village. Some of this parking is residential in nature and difficult to relocate. Land acquisition is generally taken from open green spaces, however, some land would be required from various private land owners, including residential properties and the Italian Ambassador's

Assessment Criteria	Assessment Sub-Criteria	Route Option LN01	Route Option LN02	Route Option LN03	Route Option LN04	Route Option LN05
					residence.	residence.
	Rank					

Appendix A2 – MCA Section 2: N4 Junction 3 (Ballyowen/Lucan) to Kennelsfort Road Upper

Assessment Criteria	Assessment Sub-Criteria	Route Option PM01	Route Option PM02
Economy	Capital Cost	**Total Indicative Cost:** €5.2m **Indicative Scheme Infrastructure Works Cost:** (€2.4m) • Use existing bus lanes along N4 • Provide new bus and cycle facilities along parallel side road on N4 by widening • Extend existing pedestrian bridge over N4 • Provide new bus lanes through N4/M40 junction by means of road markings • Extend existing bus lane inbound on approach to Kennelsfort Road by remarking. • Upgrade existing bus stops	**Total Indicative Cost:** €5.5m **Indicative Scheme Infrastructure Works Cost:** (€2.7m) • Use existing bus lanes along N4 • Provide new bus and cycle facilities along parallel side road on N4 by widening • Extend existing pedestrian bridge over N4 • Provide new bus lanes through N4/M40 junction by means of road markings • Provide bus lane and cycle track on off-ramp at R113 by redistributing existing road space • Provide bus lane on on-ramp from R113 to N4 by means of road markings. • Extend existing bus lane inbound on approach to Kennelsfort Road by remarking. • Upgrade existing bus stops • Provision of a new bus stop on N4

Assessment Criteria	Assessment Sub-Criteria	Route Option PM01	Route Option PM02
		Land Acquisition Cost: (€2.8) • 0 m^2 public land • 1856 m^2 private land	**Land Acquisition Cost:** (€2.8) • 0 m^2 public land • 1856 m^2 private land
	Rank		
	Transport Reliability and Quality of Service	Journey time: 5 – 6 minutes Length of route: 3.6 km Priority: Full bus priority provided for 95% of inbound route. Bus lanes are shared as merge and diverges at junctions.	Journey time: 5.5 – 6 minutes Length of route: 3.6 km Priority: Full bus priority provided for 95% of inbound route. Bus lanes are shared as merge and diverges at junctions.

Assessment Criteria	Assessment Sub-Criteria	Route Option PM01	Route Option PM02
		Full bus priority provided for 95% of outbound route. Bus lanes are shared as merge and diverges at junctions.	Full bus priority provided for 95% of outbound route. Bus lanes are shared as merge and diverges at junctions.
	Rank		
Integration	Land Use Integration	Route integrates well with land use zoning identified in County Development Plans. Area surrounding route is already substantially developed with little opportunity to encourage further. Large sections to the north of the route are designated as "to protect and enhance the outstanding natural character and amenity of the Liffey Valley".	Route integrates well with land use zoning identified in County Development Plans. Area surrounding route is already substantially developed with little opportunity to encourage further. Large sections to the north of the route are designated as "to protect and enhance the outstanding natural character and amenity of the Liffey Valley".
	Rank		
	Residential, Employment and Educational Catchments	**Residential Population Catchment** • 1875 within 5 minute walk of route • 3270 within 10 minute walk of route • 6113 within 15 minute walk of route	**Residential Population Catchment** • 1875 within 5 minute walk of route • 3270 within 10 minute walk of route • 7116 within 15 minute walk of route

Assessment Criteria	Assessment Sub-Criteria	Route Option PM01	Route Option PM02
		Employment Catchment • 3424 within 5 minute walk of route • 3464 within 10 minute walk of route • 3479 within 15 minute walk of route **Educational Catchment (1st, 2nd and 3rd Levels)** • 588 within 5 minute walk of route • 589 within 10 minute walk of route • 589 within 15 minute walk of route	**Employment Catchment** • 3424 within 5 minute walk of route • 3464 within 10 minute walk of route • 5228 within 15 minute walk of route **Educational Catchment (1st, 2nd and 3rd Levels)** • 588 within 5 minute walk of route • 589 within 10 minute walk of route • 883 within 15 minute walk of route
	Rank		
	Transport Network Integration	This route option follows that of a number of express Dublin Bus services and a considerable number of Bus Eireann services.	This route option follows that of a large number of Dublin Bus services and a considerable number of Bus Eireann services.

Assessment Criteria	Assessment Sub-Criteria	Route Option PM01	Route Option PM02
			Use of the on and off ramps at Junction 2 (Fonthill/Liffey Valley) of the N4 allows the opportunity for further interchanges with possible local and orbital bus services.
	Rank		
	Cycling Integration	This route is designated as a primary cycle route. Cycling facilities are provided throughout the route.	This route is designated as a primary cycle route. Cycling facilities are provided throughout the route.
	Rank		
Accessibility & Social Inclusion	Key Trip Attractors	***Education*** • King's Hospital ***Health*** • St. Loman's Hospital ***Retail/Leisure*** • Liffey Valley Shopping Centre	***Education*** • King's Hospital ***Health*** • St. Loman's Hospital • Hermitage Medical Clinic ***Retail/Leisure*** • Liffey Valley Shopping Centre • Fonthill Retail Park

Assessment Criteria	Assessment Sub-Criteria	Route Option PM01	Route Option PM02
			• Clarion Hotel
		Employment • Liffey Valley Shopping Centre	***Employment*** • Liffey Valley Shopping Centre • Fonthill Retail Park
	Rank		
	Deprived Geographic Areas	Route option does not directly serve any RAPID areas. There are no disadvantaged areas, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.	The South Dublin – Clondalkin RAPID area is within 10 minutes' walk of the route. There is 1 disadvantaged area and 1 very disadvantaged area, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.
	Rank		
Safety	Road Safety	***No. of junctions:*** M50 free-flow junction with N4	***No. of junctions:*** M50 free-flow junction with N4

Assessment Criteria	Assessment Sub-Criteria	Route Option PM01	Route Option PM02
		Conflict with merging and diverging traffic at junctions. ***Vehicle Accident Data (since 2005)*** 30+ minor 2 serious	Conflict with merging and diverging traffic at junctions. 1 roundabout ***Vehicle Accident Data (since 2005)*** 35+ minor 2 serious
	Rank		
	Pedestrian Safety	Access for pedestrians is limited to existing and proposed bus stops along the N4 for the majority of the route. Pedestrian crossings/bridges within 50m of 4 of 6 stops. ***Pedestrian Accident Data (since 2005)*** 3 minor 1 serious 1 fatal	Access for pedestrians is limited to existing and proposed bus stops along the N4 for the majority of the route. Pedestrian crossings/ bridges within 50m of 4 of 6 stops. ***Pedestrian Accident Data (since 2005)*** 3 minor 1 serious 1 fatal
	Rank		

Assessment Criteria	Assessment Sub-Criteria	Route Option PM01	Route Option PM02
Environment	Archaeology, Architectural and Cultural Heritage	There are no recorded monuments/places along the route. There are two protected structures adjacent to the route but it is not intended to affect these.	There are no recorded monuments/places along the route. There are two protected structures adjacent to the route but it is not intended to affect these.
	Rank		
	Flora and Fauna	Land take along the route is generally from road fronting gardens or commercial properties. As a result it is unlikely to have any major effects on the local and flora along the route.	Land take along the route is generally from road fronting gardens or commercial properties. As a result it is unlikely to have any major effects on the local and flora along the route.
	Rank		
	Soils and Geology	Land take along the route is generally from road fronting gardens or commercial properties. As a result it is unlikely to have any major effects on the soils and geology along the route.	Land take along the route is generally from road fronting gardens or commercial properties. As a result it is unlikely to have any major effects on the soils and geology along the route.
	Rank		
	Hydrology	There are no areas along this route identified at being at risk from fluvial flooding. The route does not cross any major watercourses and is	There are no areas along this route identified at being at risk from fluvial flooding. The route does not cross any major watercourses and is

Assessment Criteria	Assessment Sub-Criteria	Route Option PM01	Route Option PM02
		unlikely to affect the local hydrology.	unlikely to affect the local hydrology.
	Rank		
	Landscape and Visual	In general, this route makes use of the N4 and R148 road corridors for the total of its length and there is minimal impact to landscape or visual amenity. Where widening is required along the N4 parallel side road there will be some effects to existing landscaping and boundaries.	In general, this route makes use of the N4 and R148 road corridors for the total of its length and there is minimal impact to landscape or visual amenity. Where widening is required along the N4 parallel side road there will be some effects to existing landscaping and boundaries.
	Rank		
	Air Quality	Where widening is required along the existing road parallel to the N4, some affects to air quality may be observed in adjacent sensitive receptors such as commercial and residential premises.	Where widening is required along the existing road parallel to the N4, some affects to air quality may be observed in adjacent sensitive receptors such as commercial and residential premises.
	Rank		
	Noise & Vibration	Where widening is required along the existing road parallel to the N4, some additional noise and vibration may be observed in adjacent sensitive receptors such as commercial and residential premises.	Where widening is required along the existing road parallel to the N4, some additional noise and vibration may be observed in adjacent sensitive receptors such as commercial and residential premises.
	Rank		
	Land Use	In general, this route makes use of the N4 and R148 road	In general, this route makes use of the N4 and R148 road

Assessment Criteria	Assessment Sub-Criteria	Route Option PM01	Route Option PM02
	Character	corridors for the total of its length and there is minimal impact to landscape or visual amenity. Where widening is required along the N4 parallel side road there will be some effects to the existing land use character including the loss of green space in residential properties, loss of parking spaces at an existing apartment block and reduction in the forecourt size of an existing petrol station.	corridors for the total of its length and there is minimal impact to landscape or visual amenity. Where widening is required along the N4 parallel side road there will be some effects to the existing land use character including the loss of green space in residential properties, loss of parking spaces at an existing apartment block and reduction in the forecourt size of an existing petrol station.
	Rank		

Appendix A3 – MCA Section 3: Kennelsfort Road Upper to Con Colbert Road

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
Economy	Capital Cost	***Total Indicative Cost:*** €23.65m ***Indicative Scheme Infrastructure Works Cost:*** (€18.25m) • Upgrade existing junctions at Kennelsfort Road and The Oval to improve pedestrian safety. • Use existing bus lanes on R148 where possible. • Upgrade existing junction at Kylemore slip onto N4 to provide outbound bus lane. • Widening of existing Lucan Road from u-turn loop on R148 off-ramp to junction with Kylemore Road to provide inbound bus lane and cycle tracks in both directions • Redistribution of existing road space on Kylemore Road to provide	***Total Indicative Cost:*** €6.2m ***Indicative Scheme Infrastructure Works Cost:*** (€6.2m) • Upgrade existing junctions at Kennelsfort Road and The Oval to improve pedestrian safety • Use existing bus lanes on R148. • Upgrade existing junction at Kylemore slip onto N4 to bus lane outbound through merge. • Upgrade existing bus stops. • Provision of pedestrian overbridge over Chapelizod Bypass to service proposed bus stops • Provision of new bus stops on Chapelizod Bypass	***Total Indicative Cost:*** €24.3m ***Indicative Scheme Infrastructure Works Cost:*** (€23.2m) • Upgrade existing junctions at Kennelsfort Road and The Oval to improve pedestrian safety. • Use existing bus lanes on R148 where possible. • Upgrade existing junction at Kylemore slip onto N4 to provide outbound bus lane. • Widen of existing Lucan Road from u-turn loop on R148 off-ramp to junction with Kylemore Road to provide inbound bus lane and cycle tracks in both directions • Redistribution of existing road space on Kylemore Road to provide bus

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
		outbound bus lane and cycle tracks in both directions • Alterations to existing signalised junction between Kylemore Road for buses turning right on to R148 slip lane. • Widening of Lucan Road from junction with Kylemore Road to junction with Chapelizod Road to provide bus lanes and cycle tracks in both directions • Alterations to junction between Lucan Road and Chapelizod Road to provide ITS system to give bus priority inbound to bridge over River Liffey. • Widening of Chapelizod Road to provide bus lanes and cycle tracks in both directions. • Upgrade existing bus stops. ***Land Acquisition Cost:*** (€5.4)		lanes and cycle tracks in both directions • Upgrade existing roundabout junction between R112 and R833 to signalised junction. • Redistribute road space and widen locally where required on R833 to provide bus lanes in both directions from R112 to Con Colbert Road. • Provide cycle tracks in both directions on Kylemore Road and Ballyfermot Road. • Upgrade existing bus stops.

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
		• 3175 m^2 public land • 3600 m^2 private land • 43 private properties affected	***Land Acquisition Cost:*** (€0m) • 1000 m^2 public land	***Land Acquisition Cost:*** (€0.9m) • 1800 m^2 public land • 600 m^2 private land • 19 private properties affected
	Rank			
	Transport Reliability and Quality of Service	Journey time: 11.5 – 13.5 minutes Length of route:	Journey time: 6.5 – 7 minutes Length of route:	Journey time: 14 – 15 minutes Length of route:

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
		4.1 km Priority: Full bus priority provided for 90% of inbound route including through signalised junctions. Bus priority is not feasible at the R148 off-ramp to Chapelizod Road and at Chapelizod Bridge. Full bus priority provided for 95% of outbound route including through signalised junctions. Bus priority is not feasible at Chapelizod Bridge.	3.7 km Priority: Full bus priority provided for 100% of inbound route including through junctions. Full bus priority provided for 100% of outbound route including through junctions.	4.7 km Priority: Full bus priority provided for 95% of inbound route including through signalised junctions. Bus priority is not feasible at the R148 off-ramp to Chapelizod Road. Full bus priority provided for 100% of outbound route including through signalised junctions.
	Rank			

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
Integration	Land Use Integration	Route integrates well with land use zoning identified in County Development Plans. Area surrounding route is already substantially developed with little opportunity to encourage further.	Route integrates well with land use zoning identified in County Development Plans. Area surrounding route is already substantially developed with little opportunity to encourage further.	Route integrates well with land use zoning identified in County Development Plans. Area surrounding route is already substantially developed with little opportunity to encourage further.
	Rank			
	Residential, Employment and Educational Catchments	***Residential Population Catchment*** • 3995 within 5 minute walk of route • 8758 within 10 minute walk of route • 12277 within 15 minute walk of route ***Employment Catchment*** • 773 within 5 minute walk of route • 2191 within 10 minute walk of route • 4877 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)***	***Residential Population Catchment*** • 1235 within 5 minute walk of route • 3726 within 10 minute walk of route • 6436 within 15 minute walk of route ***Employment Catchment*** • 137 within 5 minute walk of route • 1217 within 10 minute walk of route • 1489 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)***	***Residential Population Catchment*** • 7747 within 5 minute walk of route • 15879 within 10 minute walk of route • 22571 within 15 minute walk of route ***Employment Catchment*** • 1285 within 5 minute walk of route • 3209 within 10 minute walk of route • 5621 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)***

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
		• 857 within 5 minute walk of route • 1291 within 10 minute walk of route • 3698 within 15 minute walk of route	• 635 within 5 minute walk of route • 764 within 10 minute walk of route • 764 within 15 minute walk of route	• 2311 within 5 minute walk of route • 3870 within 10 minute walk of route • 4380 within 15 minute walk of route
	Rank			
	Transport Network Integration	This route option follows the route of a number of Dublin Bus services that travel in to the city centre from Lucan and Leixlip.	This route option follows that of a number of express Dublin Bus services and a considerable number of Bus Eireann services, along with a few non express Dublin Bus services. Potential for new bus stops at the point where Chapelizod Hill Road runs underneath Chapelizod Bypass, allowing for possible interaction with the local population catchments.	This route option follows the route of a number of Dublin Bus services that travel in from Lucan and Leixlip before diverting through Ballyfermot where it overlaps with other Dublin Bus services travelling from Liffey Valley and other areas. This route has a large overlap with the Liffey Valley CBC and as such is not as beneficial.
	Rank			
	Cycling Integration	This route is designated as a primary cycle route along its entire length. There are a number of sections along this route, notably at Chapelizod Bridge, where it is not possible to provide segregated cycle and bus	A relatively short section of this route from Kennelsfort Road to the Chapelizod off-ramp is designated as a primary cycle route. Most of this section has already been constructed and does not impact on the provision	The majority of this route is designated as a primary cycle route, with a short section being a secondary route. There are a number of sections along

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
		facilities due to proximity of building lines. There are no obvious alternative routes for this primary cycle route to travel.	of bus lanes.	this route, notably on the R833 on approach to the Landen Road junction, where it is not possible to provide segregated cycle and bus facilities due to the proximity of building lines. However, an alternative route for this primary cycle route could be provided along Kylemore Avenue, Kylemore Road and Landen Road before re-joining the CBC.
	Rank			
Accessibility & Social Inclusion	Key Trip Attractors	***Education*** • St. Lorcan's Boys NS • St. Brigids Girls NS • Stewarts School • St. John's College De Le Salle • Kylemore College • St. Laurence's NS • St. Dominic's Secondary School	***Education*** • St. Lorcan's Boys NS • St. Brigids Girls NS • Stewarts School	***Education*** • St. Lorcan's Boys NS • St. Brigids Girls NS • Stewarts School • St. John's College De Le Salle • Kylemore College • St. Gabriels NS • St. Dominic's Secondary School

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
		• St. Michael's NS • St. Raphael's NS • St. Patrick's NS ***Health*** • Stewart's Hospital • St. Mary's Hospital ***Retail/Leisure*** • Palmerstown Centre Shopping Centre • Palmerston Village • Chapelizod Village • Phoenix Park	***Health*** • Stewart's Hospital ***Retail/Leisure*** • Palmerstown Centre Shopping Centre • Palmerston Village	• St. Michael's NS • St. Raphael's NS • St. Patrick's NS • De Le Salle NS, Ballyfermot ***Health*** • Stewart's Hospital ***Retail/Leisure*** • Palmerstown Centre Shopping Centre • Palmerston Village • Ballyfermot Village
	Rank			
	Deprived	The Dublin – Ballyfermot RAPID area	The Dublin – Ballyfermot RAPID area	The Dublin – Ballyfermot RAPID area

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
	Geographic Areas	is within 10 minutes' walk of this route. There are 7 disadvantaged areas, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.	is within 10 minutes' walk of this route. There are 3 disadvantaged areas, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.	is within 10 minutes' walk of this route. There are 26 disadvantaged areas and 2 very disadvantaged areas shown within 10 minutes' walk of the route. However, many of these are also served by the Liffey Valley CBC.
	Rank			
Safety	Road Safety	***No. of junctions:*** 6 signalised 1 merge 1 diverge ***Vehicle Accident Data (since 2005)*** 20 minor	***No. of junctions:*** 3 signalised ***Vehicle Accident Data (since 2005)*** 10+ minor 1 serious	***No. of junctions:*** 8 signalised 1 merge 1 diverge ***Vehicle Accident Data (since 2005)*** 30+ minor 2 serious
	Rank			
	Pedestrian Safety	There are footpaths along both sides of this route for the majority of the	There are footpaths along both sides of sections of the route around	There are footpaths along both sides of this route for the majority of the route.

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
		route. Pedestrian crossings located within 50m of 7 of 20 stops. ***Pedestrian Accident Data (since 2005)*** 1 minor 3 serious	Palmerston. As the route then uses the R148 Chapelizod Bypass, there are no pedestrian facilities along this section. Pedestrian crossings located within 50m of 3 of 4 stops. ***Pedestrian Accident Data (since 2005)*** 2 serious	Pedestrian crossings located within 50m of 4 of 20 stops. ***Pedestrian Accident Data (since 2005)*** 7 minor 5 serious
	Rank			
Environment	Archaeology, Architectural and Cultural Heritage	There is 1 recorded monument/place, along this route. Ten protected structures are identified along the route.	There is 1 recorded monument/place, along this route. One protected structure is identified along the route.	There are no recorded monuments/places identified along this route. Two protected structures are identified along the route.

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
		It is not intended to affect any of these recorded monument/places or protected structures. Large sections of the route through Chapelizod are identified as being in a conservation area.	It is not intended to affect any of these recorded monument/places or protected structures.	It is not intended to affect any of these recorded monument/places or protected structures.
	Rank			
	Flora and Fauna	Land take may impact on areas of grassland and parkland. Widening of Chapelizod Road may impact sensitive flora and fauna adjacent to the River Liffey.	A small area of land take may impact trees along the R148. However, this land is on an embankment and is generally of low ecological value. As such it is unlikely to affect the local flora and fauna.	Land-take may impact grass land in parkland areas. The extent of land-take in these areas is small and the removal of trees in an urban parkland environment is unlikely to have major effects on the local flora and fauna.
	Rank			
	Soils and Geology	In general the route uses the existing carriageway reservation for the majority of its route.	In general the route uses the existing carriageway reservation for the majority of its route.	In general the route uses the existing carriageway reservation for the majority of its route.

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
		In areas where widening is required, there is little risk of affecting the existing geology of the area	In areas where widening is required, there is little risk of affecting the existing geology of the area	In areas where widening is required, there is little risk of affecting the existing geology of the area
	Rank			
	Hydrology	This route crosses the River Liffey and runs alongside the river for a large section. Short sections of the route are identified as being at risk from flooding in 1 in 100 year event.	Risk of flooding along this route is minimal. Route does not cross any major watercourses.	Risk of flooding along this route is minimal. Route does not cross any major watercourses.
	Rank			
	Landscape and Visual	This route makes use of existing road corridors along its length. Some impact on landscape and visual aesthetics in most locations, including grass parkland and public amenity areas.	This route makes use of the R148 road corridor for the total of its length. Some impact on landscape and visual aesthetics in localised areas where widening may require removal of trees and hedgerows but effects are minimal in comparison to some other options.	This route makes use of existing road corridors along its length. Some impact on landscape and visual aesthetics in localised areas where widening may require removal of trees and hedgerows but effects are minimal in comparison to some other options.

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
	Rank			
	Air Quality	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in pollutants. Some road widening is required along this route in the vicinity of residential areas.	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in pollutants. Road widening required along this route is not located close to sensitive receptors.	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in pollutants. Road widening is generally not required along this route in the vicinity of any sensitive receptors.
	Rank			
	Noise & Vibration	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in noise and vibration. Some road widening is required along this route in the vicinity of residential areas.	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in noise and vibration. Although some road widening is required along this route it is located along the existing Chapelizod Bypass and not in the vicinity of residential areas.	Where road widening is required, traffic may be relocated closer to sensitive areas, possibly resulting in an increase in noise and vibration. Some road widening is required along this route but is located at an urban parkland area and not in the vicinity of a sensitive receptor.

Assessment Criteria	Assessment Sub-Criteria	Route Option CZ01	Route Option CZ02	Route Option CZ03
	Rank			
	Land Use Character	Route option has some impact on existing land use as extensive widening is required. Land acquisition is generally taken from open green spaces, however, considerable amounts of land would also be required from various private land owners and residences.	Route option has little impact on existing land use as it is contained within the existing R148 road reservation for the majority of its length. Land acquisition is generally along embankments and fill areas.	Route option has some impact on existing land use as extensive widening is required. Land acquisition is generally taken from open green spaces, however, some land would also be required from various private land owners and residences although the area would be less than other possible options.
	Rank			

Appendix A4 – MCA Section 4: Con Colbert Road to City Centre

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
Economy	Capital Cost	***Total Indicative Cost:*** €10.2m ***Indicative Scheme Infrastructure Works Cost:*** (€10.2m) • Redistribute road space along R148 from Con Colbert Road junction to junction with South Circular Road to provide bus lanes and cycle tracks in both directions. • Widen R148 to extend existing bus lane outbound through diverge junction at Con Colbert Road junction. • Alter existing junction of R148 and R111 to provide continuous bus lanes and cycle tracks through junction as far as	***Total Indicative Cost:*** €12.9m ***Indicative Scheme Infrastructure Works Cost:*** (€12.9m) • Redistribute road space along R148 from Con Colbert Road junction to junction with South Circular Road to provide bus lanes and cycle tracks in both directions. • Widen R148 to extend existing bus lane outbound through diverge junction at Con Colbert Road junction. • Redistribute road space along R111 from R148 junction to R109 junction to provide bus lanes in both directions where	***Total Indicative Cost:*** €14.4m ***Indicative Scheme Infrastructure Works Cost:*** (€12.2m) • Redistribute road space and widen locally on R109 to junction with R111 to provide bus lanes in both directions. Cycle tracks provided where possible before joining shared lane. • Alterations to junction between R111 and R109 to provide bus priority. • Redistribute existing road space along R109 from junction with R111 to quays to provide bus lanes in both directions a.	***Total Indicative Cost:*** €12.2m ***Indicative Scheme Infrastructure Works Cost:*** (€11m) • Redistribute road space and widen locally on R109 to junction with R111 to provide bus lanes in both directions. Cycle tracks provided where possible before joining shared lane. • Alterations to junction between R111 and R109 to provide bus priority. • Alter existing junction of R148 and R111 to provide continuous bus lanes and cycle tracks through junction as far as

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
		practically possible. • Redistribute road space and widen in localised areas on R148 from junction with R111 to Heuston Station to provide bus lanes and cycle tracks in both directions. • Widen R148 on approach to Frank Sherwin Bridge inbound to provide bus lanes and cycle tracks where possible. • Use existing bus lanes on north and south quays for inbound and outbound operation. • Upgrade existing bus stops. • Provision of new bus stops on adjacent to Royal Hospital Kilmainham	possible. • Alterations to junction between R111 and R109 to provide bus priority. • Redistribute existing road space along R109 from junction with R111 to quays to provide bus lanes in both directions a. • Signalise existing priority junction between R109 and Frank Sherwin Bridge to provide bus priority. • Use existing bus lanes on north and south quays for inbound and outbound operation. • Provision of cycle tracks in both directions along R148 as alternative cycle route. • Upgrade existing bus stops.	• Signalise existing priority junction between R109 and Frank Sherwin Bridge to provide bus priority. • Use existing bus lanes on north and south quays for inbound and outbound operation. • Provision of cycle tracks in both directions along R111 and R148 as alternative cycle • Upgrade existing bus stops.	practically possible. • Redistribute road space and widen in localised areas on R148 from junction with R111 to Heuston Station to provide bus lanes and cycle tracks in both directions. • Widen R148 on approach to Frank Sherwin Bridge inbound to provide bus lanes and cycle tracks where possible. • Use existing bus lanes on north and south quays for inbound and outbound operation. • Upgrade existing bus stops.

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
			Land Acquisition Cost: (€0m) • 320 m^2 public land		***Land Acquisition Cost:*** (€1.2m) • 120 m^2 public land • 800 m^2 private land • 7 private properties affected
		Land Acquisition Cost: (€0) • 450 m^2 public land		***Land Acquisition Cost:*** (€1.2m) • 800 m^2 private land • 7 private properties affected	
	Rank				
	Transport Reliability and Quality of Service	Journey time: 12 – 13 minutes Length of route: 3.3 km Priority: Full bus priority provided for 100% of inbound route	Journey time: 16.5 – 17.5 minutes Length of route: 3.6 km Priority: Full bus priority provided for	Journey time: 13 – 14 minutes Length of route: 2.4 km Priority: Full bus priority provided for 100% of inbound route	Journey time: 15.5 – 16.5 minutes Length of route: 4.7 km Priority: Full bus priority provided for 95% of inbound route

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
		including through signalised junctions. Full bus priority provided for 90% of outbound route. Bus priority is not feasible on the south quays at James Joyce bridge, and through the junction of the south quays and R148.	95% of inbound route. Priority not achievable on slip lane from R148 to R111 and on R111 at bridge over River Liffey. Full bus priority provided for 80% of outbound route. Bus priority is not feasible on the south quays at James Joyce bridge, through the junction of the south quays and R148, on R111 at bridge over River Liffey and through junction of R111 and R148.	including through signalised junctions. Full bus priority provided for 85% of outbound route including through signalised junctions. Bus priority is not feasible on the south quays at James Joyce bridge or through the junction of the south quays and R148. This route only links to routes in previous sections that travel through Chapelizod Village.	including through signalised junctions. Priority not achievable on R111 at bridge over River Liffey and through junction from R111 to R148. Full bus priority provided for 75% of outbound route including through signalised junctions. Bus priority is not feasible on the south quays at James Joyce bridge, through the junction of the south quays and R148, through the junction of R148 and R111 and at bridge over River Liffey on R111. This route only links to routes in previous sections that travel through Chapelizod Village.
	Rank				

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
Integration	Land Use Integration	This route integrates well with the land use and objectives identified in the DCC City Development Plan. Area surrounding route is already substantially developed with little opportunity to encourage further.	This route integrates well with the land use and objectives identified in the DCC City Development Plan. Area surrounding route is already substantially developed with little opportunity to encourage further.	This route integrates well with the land use and objectives identified in the DCC City Development Plan. Area surrounding route is already substantially developed with little opportunity to encourage further.	This route integrates well with the land use and objectives identified in the DCC City Development Plan. Area surrounding route is already substantially developed with little opportunity to encourage further.
	Rank				
		Residential Population Catchment • 13574 within 5 minute walk of route • 35968 within 10 minute walk of route • 60483 within 15 minute walk of route	***Residential Population Catchment*** • 13120 within 5 minute walk of route • 35924 within 10 minute walk of route • 60838 within 15 minute walk of route	***Residential Population Catchment*** • 11876 within 5 minute walk of route • 30262 within 10 minute walk of route • 52110 within 15 minute walk of route	***Residential Population Catchment*** • 13874 within 5 minute walk of route • 33688 within 10 minute walk of route • 55448 within 15 minute walk of route

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
	Residential, Employment and Educational Catchments	***Employment Catchment*** • 13203 within 5 minute walk of route • 29446 within 10 minute walk of route • 53490 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)*** • 1405 within 5 minute walk of route • 4037 within 10 minute walk of route • 16728 within 15 minute walk of route	***Employment Catchment*** • 11400 within 5 minute walk of route • 24309 within 10 minute walk of route • 53438 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)*** • 1407 within 5 minute walk of route • 3995 within 10 minute walk of route • 16730 within 15 minute walk of route	***Employment Catchment*** • 10681 within 5 minute walk of route • 22236 within 10 minute walk of route • 51947 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)*** • 1148 within 5 minute walk of route • 2988 within 10 minute walk of route • 15391 within 15 minute walk of route	***Employment Catchment*** • 13169 within 5 minute walk of route • 29083 within 10 minute walk of route • 52487 within 15 minute walk of route ***Educational Catchment (1st, 2nd and 3rd Levels)*** • 1147 within 5 minute walk of route • 3864 within 10 minute walk of route • 15965 within 15 minute walk of route
	Rank				
	Transport Network Integration	This route option follows the route of a number of Dublin Bus services, express	This route option follows that of a large number of Dublin Bus services and some Bus	This route option follows that of a large number of Dublin Bus services and some Bus	This route option follows the route of a number of Dublin Bus services, express

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
		services and Bus Eireann services. The route provides direct linkage with Heuston station. The route also provides a direct interchange with the Red Line Luas at Heuston. Proposed bus stops adjacent to Royal Hospital Kilmainham will allow for possible interchanges with the local population catchments.	Eireann services. The route provides linkage with Heuston station by a short walk. The route also provides interchanges with the Red Line Luas at Heuston and Museum by means of a short walk.	Eireann services. The route provides linkage with Heuston station by a short walk. The route also provides interchanges with the Red Line Luas at Heuston and Museum by means of a short walk.	services and Bus Eireann services. The route provides direct linkage with Heuston station. The route also provides a direct interchange with the Red Line Luas at Heuston.
	Rank				
	Cycling Integration	This route is designated as a secondary cycle route for most of its length before becoming a primary cycle route along the north quays. It is feasible to provide	The majority of this route is designated as a primary cycle route. It is not feasible to provide cycle tracks along with bus lanes along a number of	This route is designated as a primary cycle route. It is not feasible to provide cycle tracks along with bus lanes along a number of sections of the R109 due to	The majority of this route is designated as a primary cycle route with a section along the R148 being designated as a secondary route.

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
		segregated cycle facilities along the majority of this route from Con Colbert Road to the quays. The overall plan for Dublin City along the quays area is currently in flux and the cycle route in this area may be relocated.	sections of the R109 due to the proximity of building lines. An alternative for this primary cycle route can be provided on the R148 before re-joining at the north and south quays. It is not possible to provide cycle lanes along with bus lanes on the R111 from the R148 junction to the R109 junction due to proximity of building lines. This is currently designated as a primary cycle route and no alternative exists. The overall plan for Dublin City along the quays area is currently in flux and the cycle route in this area may be relocated.	the proximity of building lines. An alternative for this primary cycle route can be provided on the R111 and R148 before re-joining at the north and south quays. However, there is a 400m section of the R109 on approach to the junction with the R111 where no alternatives can be provided.	It is not feasible to provide cycle tracks along with bus lanes along a section of the R109 due to the proximity of building lines. It is not possible to provide cycle lanes along with bus lanes on the R111 from the R148 junction to the R109 junction due to proximity of building lines. These sections are both currently designated as primary cycle routes and no alternative exists. The overall plan for Dublin City along the quays area is currently in flux and the cycle route in this area may be relocated.

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
	Rank				
Accessibility & Social Inclusion	Key Trip Attractors	***Education*** • Inchicore NS • Inchicore College of Further Education • St. John of God School ***Health*** • St. James' Hospital • St. Patrick's University Hospital ***Retail/Leisure*** • Irish Museum of Modern Art • Kilmainham Gaol • National Museum of Ireland • Guinness Storehouse	***Education*** • Inchicore NS • Inchicore College of Further Education • St. John of God School ***Health*** • St. Patrick's University Hospital ***Retail/Leisure*** • Irish Museum of Modern Art • Kilmainham Gaol • National Museum of Ireland • Guinness Storehouse	***Education*** • St. John of God School ***Health*** • St. Patrick's University Hospital ***Retail/Leisure*** • Irish Museum of Modern Art • National Museum of Ireland • Guinness Storehouse • Christchurch Cathedral	***Education*** • St. John of God School ***Health*** • St. James' Hospital • St. Patrick's University Hospital ***Retail/Leisure*** • Irish Museum of Modern Art • Kilmainham Gaol • National Museum of Ireland • Guinness Storehouse

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
		• Christchurch Cathedral • Smithfield ***Employment*** • Heuston South Quarter • Dublin City Centre West • Saint James's Gate Brewery • Inchicore Village ***Other*** • Criminal Courts of Justice • Four Courts	• Christchurch Cathedral • Phoenix Park • Smithfield ***Employment*** • Heuston South Quarter • Dublin City Centre West • Saint James's Gate Brewery • Inchicore Village ***Other*** • Criminal Courts of Justice • Four Courts	• Phoenix Park • Smithfield ***Employment*** • Heuston South Quarter • Dublin City Centre West • Saint James's Gate Brewery ***Other*** • Criminal Courts of Justice • Four Courts	• Christchurch Cathedral • Smithfield ***Employment*** • Heuston South Quarter • Dublin City Centre West • Saint James's Gate Brewery ***Other*** • Criminal Courts of Justice • Four Courts
	Rank				
	Deprived	The Dublin – South West	The Dublin – South West	The Dublin – South Inner	The Dublin – South West

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
	Geographic Areas	Inner City, Dublin – South Inner City and Dublin – North West Inner City RAPID area are within 10 minutes' walk of this route. There are 14 disadvantaged areas and 10 very disadvantaged areas, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.	Inner City, Dublin – South Inner City and Dublin – North West Inner City RAPID area are within 10 minutes' walk of this route. There are 15 disadvantaged areas and 11 very disadvantaged areas, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.	City and Dublin – North West Inner City RAPID area are within 10 minutes' walk of this route. There are 14 disadvantaged areas and 10 very disadvantaged areas, as shown on the Pobal deprivation maps, within 10 minutes' walk of the route.	Inner City, Dublin – South Inner City and Dublin – North West Inner City RAPID area are within 10 minutes' walk of this route. There are 15 disadvantaged areas and 10 very disadvantaged areas, as shown on the Pobal deprivation maps, within 10 minutes walk of the route.
	Rank				
Safety	Road Safety	***No. of junctions:*** 14 signalised 1 priority ***Vehicle Accident Data (since 2005)*** 65+ minor	***No. of junctions:*** 15 signalised 1 priority ***Vehicle Accident Data (since 2005)*** 60+ minor	***No. of junctions:*** 13 signalised 1 priority ***Vehicle Accident Data (since 2005)*** 60+ minor	***No. of junctions:*** 14 signalised 1 priority ***Vehicle Accident Data (since 2005)*** 65+ minor

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
		4 serious 1 fatal	2 serious 2 fatal	2 serious 2 fatal	4 serious 1 fatal
	Rank				
	Pedestrian Safety	There are footpaths along both sides of this route for its entirety. Pedestrian crossings located within 50m of 4 of 13 stops. ***Pedestrian Accident Data (since 2005)*** 16 minor 3 serious 1 fatal	There are footpaths along both sides of this route for its entirety. Pedestrian crossings located within 50m of 5 of 20 stops. ***Pedestrian Accident Data (since 2005)*** 22 minor 2 serious 1 fatal	There are footpaths along both sides of this route for its entirety. Pedestrian crossings located within 50m of 3 of 18 stops. ***Pedestrian Accident Data (since 2005)*** 20 minor 2 serious 1 fatal	There are footpaths along both sides of this route for its entirety. Pedestrian crossings located within 50m of 6 of 15 stops. ***Pedestrian Accident Data (since 2005)*** 16 minor 3 serious 1 fatal
	Rank				
Environment	Archaeology, Architectural and Cultural	There are 12 recorded monuments/places, along this route, 11 of which are	There are 14 recorded monuments/places, along this route, 11 of which are	There are 12 recorded monuments/places, along this route, 11 of which are	There are 12 recorded monuments/places, along this route, 11 of which are

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
	Heritage	along the quays. 45 protected structures are identified along the route, 42 of which are listed buildings along the quays. It is not intended to affect these recorded monuments/places or protected structures. The route passes adjacent to the conservation areas at the IMMA, Heuston Station and through the conservation area along the quays but does not impact on these areas.	along the quays. 65 protected structures are identified along the route, 42 of which are listed buildings along the quays. It is not intended to affect these recorded monuments/places or protected structures. The route passes through the conservation area along the River Liffey and Phoenix Park and would affect these areas. It also passes through the conservation area along the quays but does not impact on these areas.	along the quays. 45 protected structures are identified along the route, 42 of which are listed buildings along the quays. It is not intended to affect these recorded monuments/places or protected structures. The route passes through the conservation area along the River Liffey and Phoenix Park and would affect these areas. It also passes through the conservation area along the quays but does not impact on these areas.	along the quays. 45 protected structures are identified along the route, 42 of which are listed buildings along the quays. It is not intended to affect these recorded monuments/places or protected structures. The route passes through the conservation area along the River Liffey and Phoenix Park and would affect these areas. The route also passes adjacent to the conservation areas at the IMMA, Heuston Station and through the conservation area along the quays but does not impact on these areas.

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
	Rank				
	Flora and Fauna	There is minimal land take required along the route. The small amount required is generally grass verge or embankment of low ecological value and would have little effect on flora and fauna.	There is minimal land take required along the route. The small amount required is generally grass verge or embankment of low ecological value and would have little effect on flora and fauna.	There is minimal land take required along the route. However, some land take may be required adjacent to the River Liffey, which could possibly have an effect on the local flora and fauna.	There is minimal land take required along the route. However, some land take may be required adjacent to the River Liffey, which could possibly have an effect on the local flora and fauna.
	Rank				
	Soils and Geology	Given the very small area of land-take required and its location within the existing carriageway reservation it is unlikely that this route would have any appreciable effects on soils and geology in the area.	Given the very small area of land-take required and its location within the existing carriageway reservation it is unlikely that this route would have any appreciable effects on soils and geology in the area.	Given the very small area of land-take required it is unlikely that this route would have any appreciable effects on soils and geology in the area.	Given the very small area of land-take required it is unlikely that this route would have any appreciable effects on soils and geology in the area.
	Rank				
	Hydrology	This route crosses the River	This route crosses the River	This route crosses the River	This route crosses the River

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
		Liffey at Frank Sherwin Bridge and travels along both the north and south quays. Areas along both north and south quays are identified as being at risk from flooding in the 1 in 10 year event.	Liffey at Frank Sherwin Bridge and at Islandbridge and travels along both the north and south quays. Areas along both north and south quays are identified as being at risk from flooding in the 1 in 10 year event. Additionally, a short section of the route at the Islandbridge bridge is identified as being at risk from flooding in a 1 in 1000 year event.	Liffey at Frank Sherwin Bridge and at and travels along both the north and south quays. A section of the route runs parallel to the river adjacent to the Phoenix Park. Areas along both north and south quays are identified as being at risk from flooding in the 1 in 10 year event. Additionally, a short section of the route adjacent to the Phoenix Park is identified as being at risk from flooding in a 1 in 100 year event.	Liffey at Frank Sherwin Bridge and Islandbridge and travels along both the north and south quays. A section of the route runs parallel to the river adjacent to the Phoenix Park. Areas along both north and south quays are identified as being at risk from flooding in the 1 in 10 year event. Additionally, a short section of the route adjacent to the Phoenix Park is identified as being at risk from flooding in a 1 in 100 year event.
	Rank				
	Landscape and Visual	This route makes use of existing road corridors along its length. There is little impact to the landscape or visual amenity.	This route makes use of existing road corridors along its length. There is little impact to the landscape or visual amenity.	This route makes use of existing road corridors along its length. There is little impact to the landscape or visual amenity.	This route makes use of existing road corridors along its length. There is little impact to the landscape or visual amenity.

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
				Where road widening is required adjacent to the River Liffey, there would be some detrimental effects to the visual amenity of the route.	Where road widening is required adjacent to the River Liffey, there would be some detrimental effects to the visual amenity of the route.
	Rank				
	Air Quality	The route generally uses existing road reservations along its length. A very small area of widening is required but given its location along at the Ballyfermot exit on the Chapelizod Bypass it is unlikely to have any appreciable effect on air quality in sensitive receptors.	The route generally uses existing road reservations along its length. A very small area of widening is required but given its location along at the Ballyfermot exit on the Chapelizod Bypass it is unlikely to have any appreciable effect on air quality in sensitive receptors.	The route generally uses existing road reservations along its length. Some road widening is required but is generally located adjacent to the River Liffey and is unlikely to have an appreciable effect on air quality in sensitive receptors.	The route generally uses existing road reservations along its length. Some road widening is required but is generally located adjacent to the River Liffey and is unlikely to have an appreciable effect on air quality in sensitive receptors.
	Rank				
	Noise & Vibration	The route generally uses existing road reservations along its length. A very small	The route generally uses existing road reservations along its length. A very small	The route generally uses existing road reservations along its length. Some road	The route generally uses existing road reservations along its length. Some road

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
		area of widening is required but given its location along at the Ballyfermot exit on the Chapelizod Bypass it is unlikely to have any appreciable effect on noise and vibration in sensitive receptors.	area of widening is required but given its location along at the Ballyfermot exit on the Chapelizod Bypass it is unlikely to have any appreciable effect on noise and vibration in sensitive receptors.	widening is required but is generally located adjacent to the River Liffey and is unlikely to have an appreciable effect on noise and vibration in sensitive receptors.	widening is required but is generally located adjacent to the River Liffey and is unlikely to have an appreciable effect on noise and vibration in sensitive receptors.
	Rank				
	Land Use Character	Route option has little impact on existing land use as it is generally contained within the existing road reservation. Some existing car pay and display parking spaces may be lost along the R148 in the vicinity of Heuston Station in order to provide bus priority. However, this parking is not considered critical and can be relocated.	Route option has little impact on existing land use as it is generally contained within the existing road reservation. Some existing car parking spaces may be lost along the R109 in order to provide bus priority. However, this parking is not considered critical and can be relocated.	Route option has some impact on existing land use where widening is required adjacent to the River Liffey. The majority of the route is, however, contained within the existing road reservation. Some existing car parking spaces may be lost along the R109 in order to provide bus priority. However, this parking is not considered critical and can be relocated.	Route option has little impact on existing land use as it is generally contained within the existing road reservation. Some existing car parking spaces may be lost along the R148 in the vicinity of Heuston Station in order to provide bus priority. However, this parking is not considered critical and can be relocated.

Assessment Criteria	Assessment Sub-Criteria	Route Option CT01	Route Option CT02	Route Option CT03	Route Option CT04
	Rank				

Appendix B – Emerging Preferred Route Concept Schemes Drawings

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