CORK NORTHERN DISTRIBUTOR MULTI-MODAL ROUTE

OPTION SELECTION REPORT

MCT0825
S4.P01
22 November 2024

Tionscadal Éireann
Project Ireland
2040

An Roinn Iompair
Department of Transport

NTA
Údarás Náisiúnta Iompair
National Transport Authority

Comhairle Cathrach Chorcaí
Cork City Council

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Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
S4.P01	Issue for Approval	MF/AG/AR	MC/MF/UOS	MC	22/11/2024

Approval for issue

MC	22 November 2024

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EXECUTIVE SUMMARY

RPS have been commissioned by Cork City Council (CCC) to provide the engineering and consultancy services required to deliver the Cork Northern Distributor Multi-Modal Route (CNDMR) through Phases 1 and 2 of the National Transport Authority's (NTA's) Project Approval Guidelines (PAG). The scheme is a Band 3 Project in accordance with the NTA's Project Approval Guidelines (>€20m) and likely to be a Major Project (>€200m) in accordance with the Infrastructure Guidelines.

Following submission of the Strategic Assessment Report (SAR), the project received gateway approval in December 2023 to progress to Phase 2 Options Selection Stage.

Project Need

The CNDMR is critical to the sustainable development of Cork City, and is a 'critical enabler' for the wider Cork Metropolitan Area Transport Strategy (CMATS) strategy, for the following reasons –

- The CNDMR is a sustainable transport corridor with multi-modal provision, including bus lanes, cycle lanes and generous pedestrian space, offering real alternatives to car travel and thus encouraging significant modal shift. The CNDMR provides direct access to zoned lands and will facilitate the expansion of the city in a compact manner and support the overall goals of the National Planning Framework in terms of projected population growth.

- The CNDMR will provide for orbital movements north of the city thereby reducing traffic flows on radial routes through Cork City Centre. This allows for wider benefits such as facilitating the delivery of bus priority measures identified through the BusConnects programme, facilitating environmental improvements in the city centre and supporting a more vibrant city centre.

- The CNDMR will facilitate high-quality public realm zones, creating safe and attractive spaces for community interaction and congregation. The CNDMR is identified as a short-term objective of the CMATS. One of the key findings from the CMATS assessment work was the requirement for additional transport infrastructure on the northern side of Cork City to access zoned development lands by all modes with a focus on active and sustainable transport models.

Scheme Objectives

The CNDMR specific Project Objectives are outlined below and are aligned with the Transport Appraisal Framework (TAF) criteria headings, to enable measurement of Key Performance Indicators (KPIs). The objectives are summarised as follows:

Criteria	Project Objectives
Transport User Impacts and other Economic Impacts:	To deliver a scheme that provides value for money for the state
	To provide a sustainable transport route with journey time reliability from the eastern to western side of Cork City serving existing and planned communities within the northern side of the city and beyond
	To improve the attractiveness of the northern side of Cork City for investment in employment and residential developments
Accessibility:	To improve accessibility to jobs and services by all modes and reduce dependency on the private car
	To create high quality, safe and convenient dedicated active travel infrastructure serving adjoining communities
	To form part of a series of integrated transport provisions for Cork City as part of CMATS
	To facilitate the rollout of sustainable transport measures and promotion of non-car travel patterns
	To link communities and workplaces by sustainable and active travel modes
Land Use:	To provide a sustainable transport route centred on non-car based transport modes to unlock the significant development potential along the northern side of Cork City
Safety:	To achieve a reduction in road traffic accidents within the Cork Metropolitan Area
	To provide a safer environment for cyclists
	To provide a safer environment for pedestrians and other vulnerable road users
Climate Change:	To support the achievement of carbon emissions targets for the transport sector under the Climate Action Plan, by reducing operational carbon emissions from vehicles within Cork
	To facilitate and promote active travel and sustainable public transport thereby reducing emissions in support of the Climate Action Plan and a healthier living environment
	To facilitate increased physical activity through improving the attractiveness of cycling journeys within Cork

Criteria	Project Objectives
	To facilitate increased physical activity through improving the attractiveness of pedestrian journeys within Cork
Local Environment:	To minimise impact on the natural environment within the study area by a process of avoiding sensitive receptors where possible, choosing options that minimise impact, and mitigating remaining impact
	To reduce the negative impact of transport generated air and noise emissions
	To protect existing communities and promote new communities through sensitive design and place making
	To protect, and minimise the impact on, the built environment

Strategic Policy Alignment

The policy alignment for the CNDMR scheme, at a National, Regional and Local level is summarised below.

- The scheme is fully compliant with the policies of the National Planning Framework and the National Strategic Outcomes (NSOs).
- The scheme aligns with the strategic investment priorities and sustainable mobility objectives of the National Development Plan (NDP 2021-2030).
- The scheme aligns with the framework for investment as set out by the National Investment Framework for Transport in Ireland (NIFTI), following the modal hierarchy as it provides sustainable access to; key development lands, provides public transport infrastructure to existing and future communities, provides real alternatives to vehicular travel by encouraging active travel, and facilitates the creation and enhancement of public spaces within communities.
- The CNDMR supports the framework of the Climate Action Plan 2024 (CAP 2024) – Avoid, Shift, Improve. The CNDMR provides sustainable transport infrastructure, supports compact urban growth and facilitates / enables other sustainable transport initiatives such as Cork BusConnects and environmental improvement measures in Cork City Centre.
- The CNDMR aligns with the Regional Policy Objectives (RPOs) of the Southern Regional Spatial and Economic Strategy (RSES). The RSES notes the priorities for the enhancement of the road network within Cork City, including the implementation of the CNDMR scheme.

The CNDMR scheme is a clear objective of CMATS and the Cork City Development Plan (CDP 2022-2028).

In conclusion therefore, National, Regional & Local policies identify the need for a multi-modal transport corridor for the northern side of Cork City, which can act as a key enabler for compact and sustainable growth in the area and support a shift to sustainable transport modes. This is explicitly prioritised at all policy levels.

Study Area & Constraints

A comprehensive Constraints Study was carried out at Phase 1 and was compiled with reference to all relevant planning guidelines and references Article 3 of the EIA Directive (2014/52/EU) in terms of scope of topics considered at feasibility stage. The key environmental issues considered in the constraints report are:

- Population and Human Health;
- Biodiversity;
- Land, Soils Geology & Hydrogeology;
- Water
- Air, Climate, Noise and Vibration
- Material Assets.
- Archaeology, Architecture and Cultural Heritage;
- Landscape & Visual;

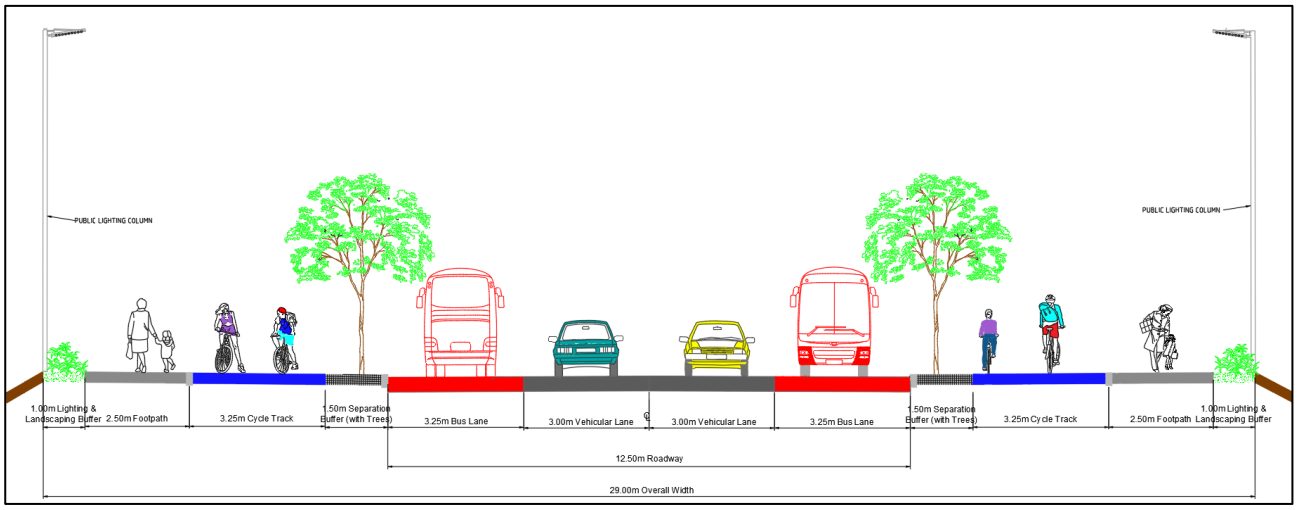
Longlist of Options & Alternatives

The SAR process concluded that a road-based multi-modal route be taken forward as the Investment (Do Something) Alternative within which a range of feasible options have been developed and appraised. The recommended road-based alternative will need to serve the various employment and residential developments both existing and proposed on the northern side of Cork City through the facilitation and encouragement of sustainable transport modes - public transport, cycling and walking. The proposed scheme will also contribute to a reduction of vehicular based traffic on the existing road network in Cork City

thereby facilitating the provision of public transport measures on the wider network as well as environmental improvements in the City Centre.

The proposed cross-section for the CNDMR includes dedicated infrastructure for active and sustainable transport modes as well as landscape verges.

An optimal corridor width of 29 m has been used for this assessment and is illustrated below.

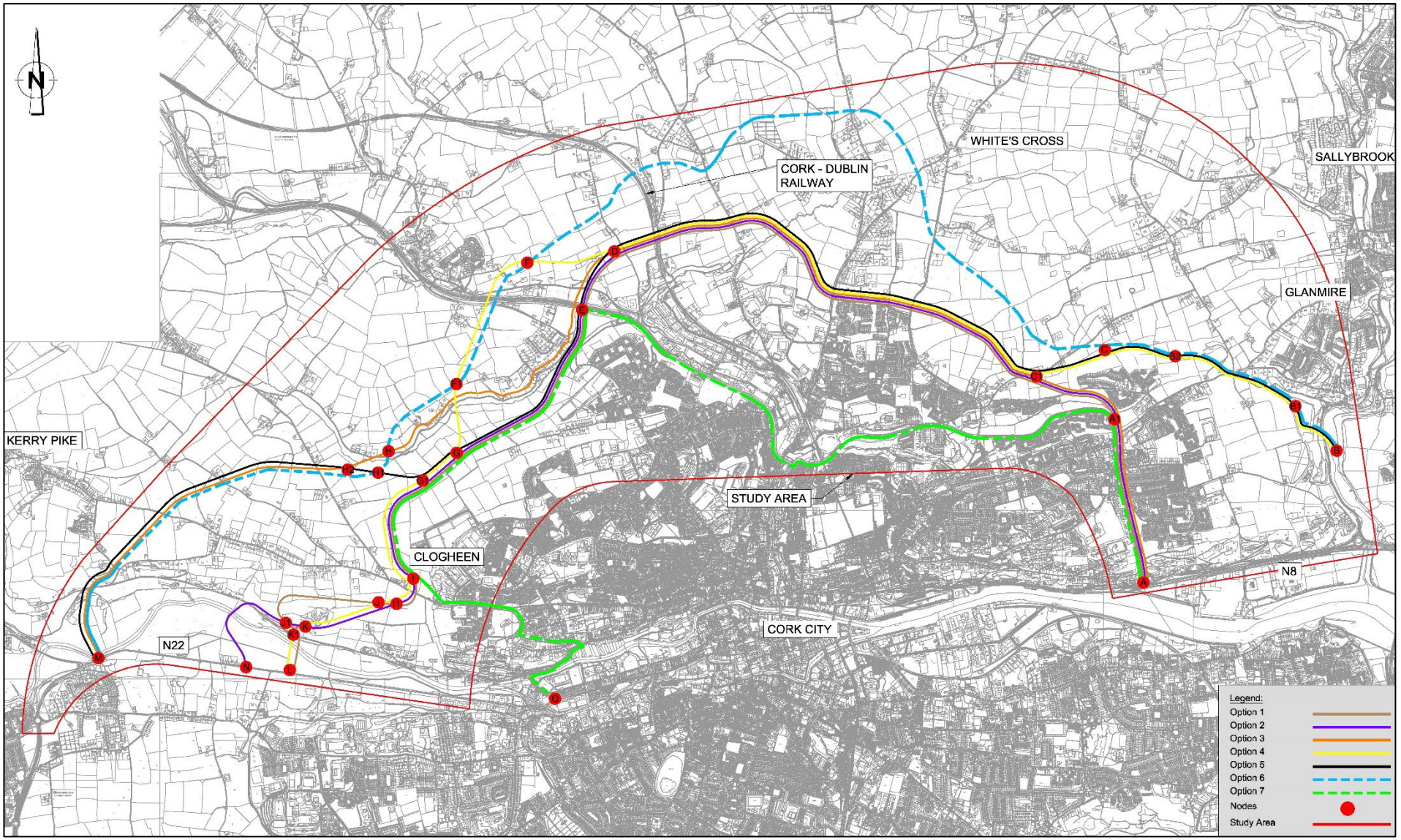


A total of seven long-list do-something options were developed for the CNDMR. Each option was developed based on providing the best possible access to zoned lands as defined in the CDP whilst also avoiding, where possible, natural and built environment constraints. Key travel needs and desire lines were also considered, taking account of zoned lands, and then reviewed against the key travel needs to neighbouring urban centres/ employment centres. These seven options are shown in the figure overleaf.

Of the seven options developed, five of these options (Options 1 to 5) were deemed to meet the project objectives. These five options were further appraised using a Multi-Criteria Analysis (MCA) which assessed the potential impacts of each option and its relative success in achieving the project objectives in accordance with TAF.

To measure the success of the options relative to the project objectives, a set of KPIs were developed for each project objective. The purpose of this preliminary appraisal was to then shortlist options that best met the project objectives, and to take them forward to the next stage of the appraisal process which requires a Transport and Accessibility Appraisal (TAA).

Initial Longlist Options



The five feasible options that met the project objectives and were subject to preliminary appraisal are shown overleaf. The summary of the longlist appraisal scoring for these five options is shown below.

Objective:	KPI	Option 1	Option 2	Option 3	Option 4	Option 5
T2 To provide a sustainable transport route with journey time reliability from the eastern to western side of Cork City serving existing and planned communities within the northern side of the city and beyond	Sum of junction delays for straight-on movements at scheme junctions in peak hours	5.6	5.5	5.4	5.8	5.4
T3 To improve the attractiveness of the northern side of Cork City for investment in employment and residential developments	All-mode accessibility to development sites	5.5	5.7	5.6	5.7	5.1
A1 To improve accessibility to jobs and services by all modes and reduce car dependency	All-mode accessibility for all zones	5.2	5.6	5.5	5.6	5.4
A4 To facilitate the rollout of sustainable transport measures and promotion of non-car travel patterns	Percentage reduction in flow on radial routes identified for sustainable transport measures	5.3	5.6	5.4	5.6	5.6
A5 To link communities and workplaces by sustainable and active travel modes	Non-car accessibility for all zones	5.8	5.7	5.4	5.6	5.1
L1 To provide a sustainable transport route centred on non car-based transport modes to unlock development potential	Non-car accessibility to development sites	5.5	5.5	5.5	5.9	5.1
C1 To support the achievement of carbon emissions targets by reducing operational carbon emissions from vehicles	Network-wide % change from DM, CO2 emissions	4.0	5.7	4.6	6.9	6.3
C3 To increase physical activity through improving the attractiveness of cycling	KPI based on provision of new facilities against existing scenario	7.0	7.0	7.0	7.0	7.0
E1 To minimise impact on the natural environment and biodiversity	GIS-based calculation of length of route through various land designations or buffers thereof	2.0	1.6	1.8	1.4	1.2
E2 To reduce the negative impact of transport generated air & noise emissions within the city	Network-wide % change from DM, averaged over local air pollutants (CO, NOX, HC, PM10)	5.1	5.4	5.1	6.1	6.0
E4 To protect, and minimise the impact on, the built environment	GIS calculation of numbers of buildings within the 200m corridor	2.0	2.0	2.0	3.0	2.5
	TOTAL SCORE	**53.0**	**55.3**	**53.3**	**58.6**	**54.7**
	AVERAGE	**4.8**	**5.0**	**4.8**	**5.3**	**5.0**
	Overall Impact	**Neutral**	**Low Positive**	**Neutral**	**Low Positive**	**Low Positive**

Based on the appraisal of the Longlist of Options in accordance with the TAF guidance, the appraisal of all objectives with a measurable KPI resulted in the following Options being the three best performing Options (in no particular order).

1. Option 2
2. Option 4
3. Option 5

These three options were shortlisted for the detailed appraisal as they were deemed to best align with the Project Objectives. From these Options an emerging preferred route option was chosen.

Detailed Appraisal

The detailed appraisal involved a detailed Transport and Accessibility Appraisal (TAA) of the shortlisted options using the six TAF criteria. Under each criterion, a number of sub-criteria were defined to allow for a more detailed assessment of the Route Options to be undertaken.
The criteria examined were:

- Accessibility Impact
- Social Impact
- Land Use Impact
- Safety Impacts
- Climate Change Impact
- Local Environment Impact

The results of the TAA are demonstrated in the following table.

Route Option	Accessibility	Social	Land Use	Safety	Climate Change	Local Environment
Option 2	Positive	Positive	Positive	Positive	Neutral	Negative
Option 4	Positive	Positive	Positive	Positive	Slight Positive	Slight Negative
Option 5	Positive	Slight Positive	Positive	Positive	Neutral	Negative

Cost Benefit Analysis and Financial Appraisal

A cost-benefit analysis (CBA) was carried out for the three options identified for detailed appraisal (Option 2, Option 4 and Option 5). The CBA gave the following results for the three options.

Item	Option 2	Option 4	Option 5
Present Value of Benefits (PVB)	548,382	636,555	596,956
Present Value Costs (PVC)	143,864	166,384	166,976
Net Present Value (NPV = PVB – PVC)	**404,518**	**470,171**	**429,980**
Benefit to Cost Ratio (BCR = PVB / PVC)	**3.81**	**3.83**	**3.58**

Option 4 provides the greatest Net Present Value and the higher Benefit to Cost Ratio. Option 4 is therefore the best performing option in terms of CBA, although it is noted that in terms of Benefit to Cost Ratio, Option 2 is only marginally lower, with Option 5 being the lowest.

The Financial Appraisal of the shortlisted options focuses on the financial impact of the CNDMR scheme.

The following table summarises the exchequer cash flow results for the shortlisted options (in €M)

DCF summary table (€M)	VAT (from Capital cost and operating cost)	Capital Cost (Target Cost)	Operation Cost (Maintenance Cost)	Total Financial Net Present Value (FNPV)	Total Financial Net Present Value (FNPV) NO VAT
Option 2	34.651	249.226	45.015	-241.634	**-212.327**
Option 4	35.958	290.987	45.434	-278.990	**-245.069**
Option 5	35.924	290.770	48.889	-280.247	**-246.184**

It was concluded that all three shortlist options appraised offer value for money to the exchequer, with Option 2 having a marginally lower Capital Cost of all three options. However, on the basis of the outcomes of the CBA, Option 4 is the best performing option from a financial appraisal perspective as it offers the best overall value for money to the exchequer in terms of return on benefits.

Appraisal of the Emerging Preferred Option

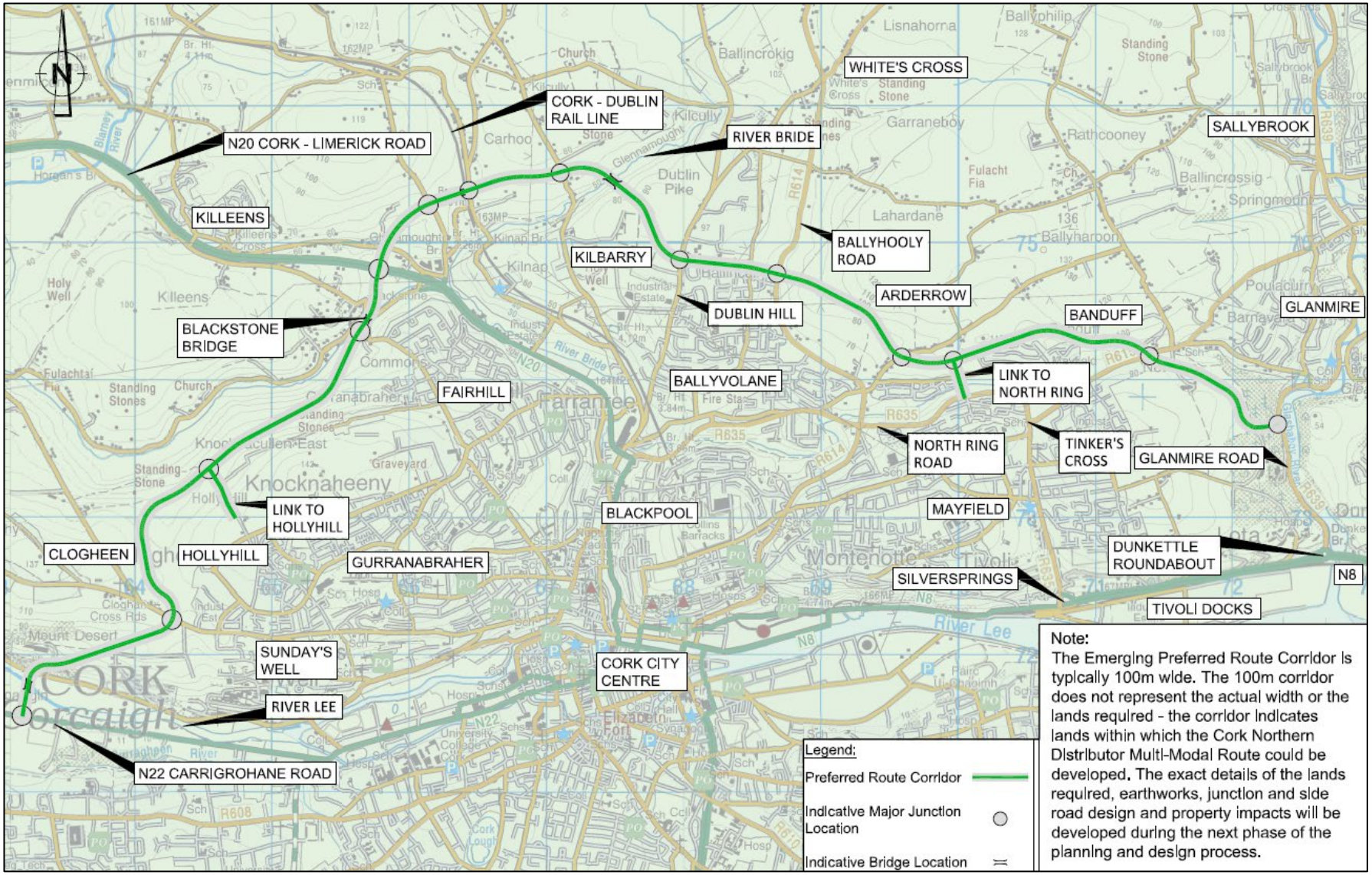
When assessing route options along varying and overlapping corridors, it is important to consider if combinations of different option arrangements would lead to a different choice in terms of a preferred option, due to benefits that may otherwise be unclear or minimised in the assessment process. This is a particularly critical exercise as it tests the robustness of the assessment process and evaluates each of the options, node by node.

The TAA process noted that Option 4 is the preferred option when assessed under the range of criteria, however the impact scores indicate that Option 2 also performs well. The Cost Benefit Analysis also noted little difference between Option 4 and Option 2. The Financial Appraisal noted that Option 2 offers greater value for money than Option 4 as it has a lower capital cost.

Therefore, to ensure the optimum route is brought forward, the areas of difference between Option 2 and Option 4 needed to be more closely examined. The best approach was therefore to examine the differences between the two options and carry out a Comparative Assessment using the TAA criteria, on the discreet sections of both Option 2 and Option 4 that differ along the route corridors.

The Emerging Preferred Route

This assessment identified that a combination of Option 2 and Option 4 is the best performing solution and is therefore brought forward as the Emerging Preferred Route and is presented below.



Public Consultation

Public consultation will be an important part of the process and will inform the final route within the proposed corridor.

A robust public consultation process clearly explaining the scheme and the statutory process will be progressed.

Consultation has already taken place for the wider CMATS in which the CNDMR scheme has been presented, and therefore it is considered that the initial project specific consultation will be on the Emerging Preferred Option identified for the CNDMR scheme.

Any amendments resulting from this initial scheme consultation will be addressed in order to finalise the Preferred Option for the CNDMR and in advance of commencement of Phase 3 Design & Environmental Evaluation.

Recommendation

The Emerging Preferred Route achieves high value for money with a BCR >3.8, with a Total Scheme Budget of approximately €300m at present prices.

For future funding reasons a cost range within which the scheme is likely to fit, has been established with a Lower and Upper bound limit of €210m to €520m (incl. VAT). This is based on benchmarking of per km rates across recent major schemes in this jurisdiction. This range will likely shorten as more detailed costings are carried out at later scheme phases, and uncertainty around scheme risks reduce.

It is recommended that the Emerging Preferred Route be brought forward for public consultation.

1 INTRODUCTION

1.1 General

RPS have been commissioned by Cork City Council (CCC) to provide the engineering and consultancy services required to deliver the Cork Northern Distributor Multi-Modal Route (CNDMR) through Phases 1 and 2 of the National Transport Authority's (NTA) Project Approval Guidelines.

The scheme will be developed in accordance with the NTA's Project Approval Guidelines (Infrastructure Projects and Programmes) - March 2024, the Transport Appraisal Framework – June 2023 (TAF), the Infrastructure Guidelines - December 2023, and with reference to TII's Project Appraisal Guidelines.

The scheme is a Band 3 Project in accordance with the NTA's Project Approval Guidelines (>€20m) and likely to be a Major Project (>€200m) in accordance with the Infrastructure Guidelines.

This Option Selection Report (OSR) summarises the option assessment process, which culminates in the identification of a Preferred Option for the CNDMR scheme. This OSR is deemed to meet the requirement of the Longlist Assessment Report (LAR) as required under TAF.

1.2 Previous Studies and Deliverables

The CNDMR project reached the equivalent of Gate 0 approval (now replaced under TAF) at the end of Phase 1 Strategic Assessment on the 22nd December 2023 following the conclusion of the Strategic Assessment Report (SAR). Phase 1 deliverables were completed in accordance with the NTA Project Approval Guidelines (PAG) December 2020. This project is now in Phase 2 and is a Band 3 Project as its costs are estimated to be in excess of €30 million (likely >€200m). This Phase is being carried out in accordance with the NTA's Project Approval Guidelines (Infrastructure Projects and Programmes) March 2024 which require the following deliverables:

- Project Execution Plan
- Feasibility Report
- Option Selection Report

The previously agreed SAR sets out the feasibility information which would otherwise be provided in the current PAG's Feasibility Report. **Table 1-1** demonstrates the requirements for the Feasibility Report under the current PAG's, and how the approved SAR has covered the individual requirements.

Table 1-1: Feasibility Report and SAR Deliverables Alignment

Feasibility Report Requirement under current PAG's	Section of approved SAR which Satisfies Feasibility Report Requirement	Comment
Definition of the problem to be addressed.	Section 2 and specifically Section 2.3 - Future Issues.	Section 2 of the SAR sets out the investment rationale and outlines the issues which this project aims to address, particularly the constraint to the future of sustainable development of Cork City due to a lack of transport alternatives. This section of the SAR covers, the Background, the Existing Situation, The Study Area, Existing Development, Travel Patterns, Existing Movement Context, and Future Issues.
Policy Background.	Section 4 Strategic Alignment & Policy Context.	This section outlines the specific strategic alignment and policies with which the CNDMR is aligned. This has also been updated and included in Section 3 of this Option Selection Report.
Outline of Solution types Proposed. Confirmation of Technical Feasibility	Section 6 – Consideration of Alternatives and Options.	Section 6 details, do-nothing, do-minimum and do-something alternatives and options across a range of different transport

Feasibility Report Requirement under current PAG's	Section of approved SAR which Satisfies Feasibility Report Requirement	Comment
Outline of likely Benefits.		modes and finds that a multimodal road-based solution is most favourable.
Order of magnitude of costs on a range basis.	Section 8 – Assessment of Affordability.	Section 8 gives a cost estimate of the scheme including maintenance costs.
Outline of challenges/risks.	Section 9 - Identification of Risks.	Section 9 outlines known risks at this stage of the project.

The SAR has been included in **Appendix A** of this report for reference purposes. Based on the demonstrated alignment of deliverables with the Feasibility Report and SAR, a separate resubmission of information in the form of a new Feasibility Report is believed to be unwarranted. The agreed SAR will instead be referenced where required.

1.3 Purpose of the Option Selection Report

The Option Selection Report (OSR) presents the alternative routes considered, the project constraints and the assessments that were undertaken in order to identify the Preferred Route Option for the project.

This OSR, will address the following requirements in accordance with the NTA's Project Approval Guidelines (Infrastructure Projects and Programmes), March 2024

- Project need and objectives;
- List of Alternatives and Options;
- Assessment of Available (Feasible) Options;
- Identification of a Preferred Option;
- Feasibility Working Cost Estimate and;
- Indicative planning and procurement approach.

Information is presented in this report to provide clarity on the decision-making process which has resulted in the recommendation of a Preferred Option for the Scheme.

The TAF sets out the implementation of a three-stage option assessment process leading to the selection of the Preferred Option. A summary of these stages is presented below.

- Establish the longlist of options in line with TAF and the Infrastructure Guidelines.
- Conduct a Multi-Criteria Analysis (MCA) centred on scheme objectives to shortlist options.
- Conduct a Transport and Accessibility Appraisal (TAA) and Cost Benefit Analysis on shortlisted options to identify a Preferred Option for the Scheme.

2 PROJECT NEED AND OBJECTIVES

2.1 Overview

This section sets out the project needs that the CNDMR scheme will serve and the objectives it will deliver. The CNDMR scheme objectives are consistent with those set out for the Cork Metropolitan Area Transport Strategy (CMATS) 2040. These have been grouped into the seven criteria included in the TAF.

The CMATS aims to set a framework for the delivery "of an accessible, integrated transport network that enables the sustainable growth of the Cork Metropolitan Area as a dynamic, connected and internationally competitive European City region". The strategy was prepared by the National Transport Authority (NTA), Transport infrastructure Ireland (TII), Cork City Council and Cork County Council and it fully aligns with the aims of the CNDMR.

2.2 Project Need

2.2.1 National Context

The National Planning Framework (NPF) 2040 envisages that Cork will become the fastest growing city region in Ireland with a projected 50% to 60% increase in its population in the period up to 2040. This projected growth in population, and associated economic growth, will result in a significant increase in the demand for travel in the Cork Metropolitan Area (CMA). In order to safeguard and enhance Cork's attractiveness as a place to live, work, visit and invest, growth will need to be managed and located in proximity to the existing urban form of the city, and served by sustainable transport infrastructure.

There is limited capacity within the existing transport network to cater for the anticipated population growth referenced in the NPF 2040. Land use and transport planning will need to be closely aligned to deliver sustainable communities with a sustainable integrated transport system in line with national, regional and local transport and land-use policy.

2.2.2 Regional Context

The CNDMR is identified as a short-term objective of the Cork Metropolitan Area Transport Strategy (CMATS). One of the key findings from the CMATS was the requirement for additional transport infrastructure on the northern side of Cork City to cater for access to centres of employment, development lands, walking and cycling links, access to (and enhancement of) public transport service, strategic orbital public transport provision and strategic orbital displacement associated with changes brought about by BusConnects and changes to travel patterns in the City Centre. Refer also to Section 3 of this report.

In the wider context of the CMA, CMATS identified a range of transport infrastructure scheme proposals including:

- Cork Northern Distributor Multi-Modal Route - CNDMR (previously Cork Northern Distributor Road) is a strategic multi-modal route serving existing and future communities in the northern half of Cork City. It will provide dedicated bus infrastructure, cycle infrastructure, pedestrian infrastructure and one traffic lane in each direction;
- BusConnects Network - The National Transport Authority (NTA) launched its revised layout for the Cork Metropolitan Bus Network in June 2022. The new network, part of BusConnects Cork, is intended to transform the public transport network across the Cork Metropolitan Area. The new network will involve the creation of new bus routes and improved bus frequencies to help transform the public transport offering to meet anticipated growth and future demand in the region.
- Bus Connects Sustainable Transport Corridors (STCs) which aim to have continuous bus priority along specific routes aimed at creating greater certainty and dependability of the public transport services.
- Cork Docklands and Tivoli Docks Infrastructure – major bridge and route access improvements, to enable future development of these strategic sites;
- Dunkettle Interchange – full grade separation of the strategic interchange at the junction of the M8, N8, N40 and N25.

- M28 Cork to Ringaskiddy – upgrading of the route to motorway standard to improve access to the Port of Cork at Ringaskiddy;
- City Centre Traffic Management – comprehensive measures to improve facilities for public transport, walking and cycling within the City Centre to create a more attractive and vibrant environment.
- Cycling – The vision for the Cork Metropolitan Area Cycle Network Plan is set out in Cycle Connects. It aims to provide a coherent, safe and attractive cycle network that will support a shift from the private car to cycling.

CMATS identifies existing challenges to the sustainable movement of people within the city. Some of the key challenges identified are as follows:

Land Use and Physical Constraints

- *"Cork is projected to be the fastest growing Metropolitan Area in the State. The substantial increase in population, employment and educational will lead to a subsequent increase in travel demand;*
- *A legacy of dispersed patterns of residential, employment and retail development, particularly outside of the central city area;*
- *A unique and challenging geography characterised by steep topography and waterways;*
- *The general unsuitability of the road network - particularly within the medieval city core and arterial routes - to accommodate relatively high volumes of peak time vehicular traffic;*
- *Cork City's pivotal role as the major regional centre for employment, education, retail and leisure for a large geographical area leading to a significant number of long-distance trips made primarily by car;*
- *Many competing demands for scarce road and kerbside space for different road users;*
- *Some high capacity roads within Cork City such as the N22, N27 and N40, that cause community severance and hinder pedestrian and cyclist movement; "*

Travel Behaviour

CMATS confirms that the existing road network has many issues which do not support sustainable transport in its current form. Some of the key issues identified are as follows:

- Some high-capacity roads within Cork City such as the N22, N27 and N40 that cause community severance, hinder pedestrian and cyclist movement.
- A lack of a strategic orbital corridor to the north of the city resulting in strategic traffic and HGV movement routing through the city centre adding to congestion, noise, and pollution.
- Many competing demands for scarce road and kerbside space for different road users.
- Traffic congestion and resultant delays to public transport and other traffic at key locations on the Cities road network during peak periods

The CNDMR is critical to the sustainable development of Cork City, and is seen as a 'critical enabler' for the wider CMATS strategy, for the following reasons -

- The CNDMR will provide for orbital movements north of the city thereby reducing reliance on radial routes through Cork City Centre, with wider benefits such as facilitation of BusConnects proposals, facilitator of environmental improvements in the city centre, displacement of through traffic etc.
- It is a sustainable transport route with multi-modal provision, including bus lanes, cycle lanes and generous pedestrian space, offering real alternatives to car travel and thus encouraging significant modal shift.
- In overall terms, investment in sustainable transport for the north of Cork City is key to the future of the city. This can only be achieved by investing in good public transport and walking/cycling networks within the CMA. This must be done in conjunction with the development of sustainable communities and residential developments within the north of Cork City, which cannot be realised without the CNDMR integrated multi-modal transport corridor.

- It is a development enabling corridor that will provide strategic sustainable access to zoned residential land banks within Cork City.
- The CNDMR will facilitate high-quality public realm zones, creating safe and attractive spaces for community interaction and congregation.
- It will serve both existing communities and proposed new communities as well as employment centres by improving access to public transport and sustainable transport facilities.

2.3 Scheme Objectives

2.3.1 Role of Scheme Objectives

Good appraisal practice involves setting scheme objectives to guide the development of the project through the different stages of the project appraisal process, including option identification, selection of a preferred option, and scheme design. They are a statement of what the project is intended to achieve.

2.3.2 Transport Appraisal Framework Criteria

The framing of scheme objectives has been undertaken during the strategic assessment of the project and have been approved as part of the Strategic Assessment Report. The purpose of the TAF is to develop a common framework for appraising transport investments in accordance with the Infrastructure Guidelines.

2.3.3 Option Sifting

The TAF recommends that scheme objectives are used to appraise a developed longlist of options with the aim of sifting options to create a short list of options which will then undergo further detailed appraisal. A set of measurable Key Performance Indicators (KPI's) are developed for each of the project objectives as a means of comparing each options performance against the scheme objectives. A scoring scale is applied in accordance with TAF Appraisal Guidelines for Capital Investment in Transport, Module 7 – Detailed Guidance on Appraisal Techniques, as follows;

- 7 – Highly Positive Impact. The option is likely to significantly improve conditions in the relevant criteria.
- 6 – Positive Impact. The option is likely to improve conditions in the relevant criteria.
- 5 – Low Positive Impact. The option is likely to somewhat improve conditions in the relevant criteria.
- 4 – Neutral Impact. The option will result in no changes to conditions in the relevant criteria.
- 3 – Low Negative Impact. The option is likely to somewhat worsen conditions in the relevant criteria.
- 2 – Negative Impact. The option is likely to worsen conditions in the relevant criteria.
- 1 – Highly Negative Impact. The option is likely to significantly worsen conditions in the relevant criteria.

2.3.4 CMATS Objectives

CMATS identified the need for transport network improvements on the northern side of Cork City to cater for access to employment centres, local communities, planned development lands, provide walking and cycling linkages, provide access to radial public transport routes, orbital public transport provision, strategic orbital displacement etc.

CMATS concluded that the CNDMR scheme will provide for these local transport multi-modal needs, while also facilitating growth in both the existing and new residential and employment centres on the northern side of Cork City.

The following key objectives were identified in CMATS:

- Ensuring that the transport network can support the population, employment and educational growth as envisaged by the NPF 2040;
- Supporting the vibrancy, accessibility and liveability of Cork City Centre and Metropolitan centres;

- Ensuring that future development is located and designed in a fashion that prioritises walking, cycling and public transport and reduces the need to travel by car;
- Improving the public transport offering through higher frequency services operating with greater speed, directness and journey time reliability;
- Balancing the needs of different transport modes to better support the movement of people through the transport network, particularly within the confines of the limited space available in parts of the city;
- Accommodating a greater number of trips more efficiently by maximising connectivity by walking, cycling and public transport to major employment and education centres;
- Supplementing the public transport network with complementary facilities such as Park and Ride for the benefit of people accessing the city from the surrounding rural areas;
- Maintaining an effective strategic road network in the CMA that is integrated with the wider national road network to cater for strategic through trips and the movement of goods especially serving the expanding Port of Cork facilities at Ringaskiddy;
- Maximising existing transport infrastructure including the InterCity and Commuter rail network and Cork Airport;
- Overcoming physical constraints for transport presented by the challenging topography and physical features in Cork;
- Improving transport infrastructure in a cost-efficient manner that will support the case for funding and investment;
- Achieving efficiency and resilience within Cork City Metropolitan Area's transport network;
- Improving the safety of road users in Cork through the reduction in traffic collisions and incidents;
- Prioritising active modes (walking and cycling) to improve health benefits; and
- Reducing the impact of transport on the environment through targeted measures to limit the negative impact of air and noise emissions.

2.3.5 CNDMR Specific Objectives

The CNDMR is a key element of delivering CMATS and consequently the scheme objectives are aligned.

The CNDMR will:

- provide much needed active and sustainable transport infrastructure across the northern side of Cork City and provide a real alternative to private car-based transport.
- facilitate the sustainable compact development of zoned residential and employment lands in close proximity to Cork City Centre.
- facilitate the delivery of other sustainable transport initiatives on radial routes into the City Centre as well as initiatives within the City Centre.

The CNDMR specific Project Objectives are outlined in **Table 2-1**.

Table 2-1: CNDMR Full List of Project Objectives Strategic Alignment & Policy Context

Criteria	Project Objectives	
Transport User Impacts and other Economic Impacts:	**T1**	To deliver a scheme that provides value for money for the state.
	T2	To provide a sustainable transport route with journey time reliability from the eastern to western side of Cork City serving existing and planned communities within the northern side of the city and beyond.
	T3	To improve the attractiveness of the northern side of Cork City for investment in employment and residential developments.
Accessibility:	**A1**	To improve accessibility to jobs and services by all modes and reduce dependency on the private car.
	A2	To create high quality, safe and convenient dedicated active travel infrastructure serving adjoining communities.
	A3	To form part of a series of integrated transport provisions for Cork City as part of CMATS.
	A4	To facilitate the rollout of sustainable transport measures and promotion of non-car travel patterns.
	A5	To link communities and workplaces by sustainable and active travel modes.
Land Use:	**L1**	To provide a sustainable transport route centred on non-car based transport modes to unlock the significant development potential along the northern side of Cork City.
Safety:	**S1**	To achieve a reduction in road traffic accidents within the Cork Metropolitan Area.
	S2	To provide a safer environment for cyclists.
	S3	To provide a safer environment for pedestrians and other vulnerable road users.
Climate Change:	**C1**	To support the achievement of carbon emissions targets for the transport sector under the Climate Action Plan, by reducing operational carbon emissions from vehicles within Cork.
	C2	To facilitate and promote active travel and sustainable public transport thereby reducing emissions in support of the Climate Action Plan and a healthier living environment.
	C3	To facilitate increased physical activity through improving the attractiveness of cycling journeys within Cork.
	C4	To facilitate increased physical activity through improving the attractiveness of pedestrian journeys within Cork.
Local Environment:	**E1**	To minimise impact on the natural environment within the study area by a process of avoiding sensitive receptors where possible, choosing options that minimise impact, and mitigating remaining impact.
	E2	To reduce the negative impact of transport generated air and noise emissions.
	E3	To protect existing communities and promote new communities through sensitive design and place making.
	E4	To protect, and minimise the impact on, the built environment.

3 STRATEGIC ALIGNMENT & POLICY CONTEXT

3.1 Strategic Policy Alignment

3.1.1 Project Ireland 2040 - National Planning Framework (NPF)

The National Planning Framework (NPF) constitutes the primary national-level planning framework and sets out a vision and strategy for development throughout the country. It includes 10 National Strategic Outcomes (NSOs) which set out the higher-level goals for the country, a number of National Policy Objectives which consider more specific goals and examines the development of major city settlements throughout the country.

NSO 1 Compact Growth; sets out the need for compact growth throughout the country. It states; *"Carefully managing the sustainable growth of compact cities, towns and villages will add value and create more attractive places in which people can live and work. All our urban settlements contain many potential development areas, centrally located and frequently publicly owned, that are suitable and capable of re-use to provide housing, jobs, amenities and services, but which need a streamlined and co-ordinated approach to their development, with investment in enabling infrastructure and supporting amenities, to realise their potential. Activating these strategic areas and achieving effective density and consolidation, rather than more sprawl of urban development, is a top priority".*

NSO 4 Sustainable Mobility; outlines the need for sustainable mobility to be implemented across the country. As part of this, attractive public transport alternatives to the car need to be expanded to reduce congestion and emissions. It states, *"In line with Ireland's Climate Change mitigation plan, we need to progressively electrify our mobility systems moving away from polluting and carbon intensive propulsion systems to new technologies such as electric vehicles and introduction of electric and hybrid traction systems for public transport fleets, such that by 2040 our cities and towns will enjoy a cleaner, quieter environment free of combustion engine driven transport systems."*

NSO 5 A Strong Economy, supported by Enterprise, Innovation and Skills; addresses the need to support employment and growth in the economy. It states *"This will depend on creating places that can foster enterprise and innovation and attract investment and talent. It can be achieved by building regional economic drivers and by supporting opportunities to diversify and strengthen the rural economy, to leverage the potential of places. Delivering this outcome will require the coordination of growth and place making with investment in world class infrastructure, including digital connectivity, and in skills and talent to support economic competitiveness and enterprise growth."*

NSO 7 Enhanced Amenities and Heritage; examines the need for enhanced amenities and heritage, acknowledging the need for planning and transport strategies for the five cities. These strategies should include a focus on improving walking and cycling routes, with targeted measures to enhance permeability connectivity. It state's "*This will ensure that our cities, towns and villages are attractive and can offer a good quality of life. It will require investment in well-designed public realm, which includes public spaces, parks and streets, as well as recreational infrastructure. It also includes amenities in rural areas, such as national and forest parks, activity-based tourism and trails such as greenways, blueways and peatways. This is linked to and must integrate with our built, cultural and natural heritage, which has intrinsic value in defining the character of urban and rural areas and adding to their attractiveness and sense of place."*

NSO 8 Transition to Low Carbon climate Resilient Society; outlines the ambition to develop a climate-resilient and environmentally sustainable economy. It state's *"The National Climate Policy Position establishes the national objective of achieving transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. This objective will shape investment choices over the coming decades in line with the National Mitigation Plan and the National Adaptation Framework. New energy systems and transmission grids will be necessary for a more distributed, renewables-focused energy generation system, harnessing both the considerable on-shore and off-shore potential from energy sources such as wind, wave and solar and connecting the richest sources of that energy to the major sources of demand."*

The NPF also sets out key future growth enablers for Cork. These include;

- *Progressing the sustainable development of new greenfield areas for housing, especially on public transport corridors,*
- *The development of a much-enhanced Citywide public transport; and*
- *Improved traffic flow around the City.*

National Policy Objective 64 sets out the need for improved air quality, with the integration of land use and spatial planning that supports public transport, walking and cycling as alternatives to the private car as part of this.

National Policy Objective 73c considers the need to provide suitable enabling infrastructure, including transport infrastructure, in order to deliver planned growth and development.

3.1.2 National Development Plan (NDP) 2021 to 2030

The National Development Plan (NDP) 2021 to 2030 is the mechanism by which the objectives and strategic outcomes of the National Planning Framework are implemented on a national and regional level. The NDP is a key document which supports transport strategies including CMATS, in addition to regional and local plans including County and City Development Plans.

The NDP reaffirms commitment to delivery of the various sustainable transport mobility initiatives identified in CMATS, and actively encourages compact development and sustainable transport in Cork City. Within the NDP there is a Strategic Investment Priorities list which has Active Travel and BusConnects listed as priorities. The CNDMR will provide approximately 15km of two-way active travel infrastructure and bus lanes with associated infrastructure that will aide BusConnects.

Specifically listed under Strategic Investment Priorities relating to transport, the NDP lists the following;

- *"An additional 500,000 sustainable mobility journeys per day by 2030;*
- *Comprehensive integrate public transport network for Ireland's cities connecting more people to more places (see NSO4).*

The CNDMR aligns with the NDP strategic investment priorities and sustainable mobility objectives.

3.1.3 National Investment Framework for Transport in Ireland (NIFTI) 2021

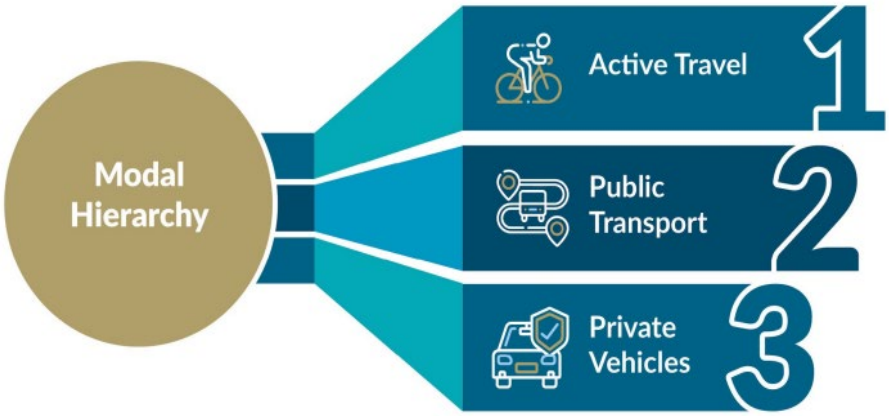
The National Investment Framework for Transport in Ireland (NIFTI) 2021 is the Department of Transport's high-level strategic framework for future investment in the land transport network.

Future transport investment projects and programmes as identified in investment strategies will have to demonstrate their fit with NIFTI and by extension, with the National Strategic Outcomes (NSOs) that underpin the National Planning Framework.

NIFTI sets out a hierarchy of travel modes to be accommodated and encouraged when investments and other interventions are made. Sustainable modes, starting with active travel and then public transport, will be encouraged over less sustainable modes such as the private car. It is acknowledged that some modes will not be appropriate to address some challenges - walking and cycling are not feasible modes of longer distance, interurban travel, and rural areas do not have the population density to make large-scale public transport an effective solution.

The options developed for the CNDMR include approximately 15km of two-way active travel infrastructure and bus lane infrastructure in accordance with the modal hierarchy as set out in NIFTI as shown in **Figure 3.1.**

Figure 3-1: NIFTI Modal Hierarchy



The CNDMR scheme is a clear fit with the framework for investment as set out by NIFTI as it provides sustainable access to key development lands, provides public transport infrastructure to existing and future communities, provides real alternatives to vehicular travel by encouraging active travel, and facilitates the creation and enhancement of public spaces within communities.

3.1.4 Climate Action Plan 2024

The Climate Action Plan (CAP) 2024 is the third annual update to Ireland's Climate Action Plan 2019. This plan is the first to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021, and following the introduction, in 2022, of economy-wide carbon budgets and sectoral emissions ceilings. It builds on the introduction of carbon budgets and sectoral emissions ceilings in Climate Action Plan 2023 and sets a course for Ireland's targets to halve emissions by 2030 and reach net-zero no later than 2050. These national targets align with Ireland's obligations under EU and international treaties, most notably the Paris Agreement (2015) and the European Green Deal (2020).

In this document there is a framework that directly relates to transport. This is the Avoid-Shift-Improve Framework which is described in the Climate Action Plan 2023 as follows;

*"**Avoid** measures aim to reduce or avoid the need for travel through enhanced spatial planning. Integrated transport and spatial planning are critical for reducing our greenhouse gas (GHG) emissions and will bring significant co-benefits – promoting safer, low-carbon, and more people focused transport, and ensuring long-term transport sustainability.*

***Shift** measures encourage modal shift to more sustainable modes of transport. These measures can also include those which reduce the private car 'competitive advantage' by installing bus-gates, and the reclamation of road-space currently.*

***Improve** measures typically refer to technology-based measures that improve the GHG efficiency of residual vehicle-based transport or the efficiency of the network itself. While less directly transformative than avoid and shift measures in terms of behaviour, fleet electrification and biofuels will continue to play a pivotal role in decarbonising transport, particularly for populations living in more isolated areas."*

The CAP 2024 states that this Avoid-Shift-Improve hierarchy is to be retained in the CAP 2024.

The following extracts from the CAP 2024 align with the CNDMR;

15.2.2 Avoid

Strategic Transport Planning

As set out in CAP23, integrated land-use planning and transport planning in our cities is also led through the Metropolitan Area Transport Strategies (MATS), which set out programmes and vision for sustainable transport investment and service enhancements across active travel, bus, light rail and heavy rail for each city over a 20-year period, and which are renewed as part of a regular 6-year cycle of review.

Relevance to CNDMR; The CNDMR is described in the Cork Metropolitan Area Transport Strategy (CMATS) as a 'critical enabler' to CMATS as it provides sustainable transport infrastructure, supports compact urban growth and enables other sustainable transport initiatives such as Cork BusConnects and environmental improvement measures in Cork City Centre.

15.2.4 Shift

Active Travel Infrastructure Programme

*"The provision of safe and accessible walking and cycling infrastructure is key to encouraging modal shift away from private car use and towards walking and cycling. The role of local authorities in the development of active travel infrastructure cannot be overstated, and the increase in the capacity of active travel teams has already helped to deliver hundreds of kilometres of new and improved cycling and walking infrastructure around the country. "*Relevance to CNDMR; The CNDMR will include 14 to 15km of active travel infrastructure along its length and also interconnect and link with existing and planned active travel routes in the area thereby enhancing the overall active travel network.

Major Public Transport Infrastructure Programme

"Significant investment in new public transport infrastructure is required to deliver on our carbon emissions reduction targets, and to provide people with the sustainable alternatives to private car usage. Major public transport projects and programmes that are being progressed under the National Development Plan include MetroLink, DART+, BusConnects programmes in all five cities and commuter rail programmes in Cork and Limerick"….. "With respect to BusConnects Dublin, the programme as well as the procurement strategy for Next Generation Ticketing has significantly advanced, with five phases of the network redesign now live, with significant uplift in passenger numbers observed on these routes. Twelve planning applications have been lodged with An Bord Pleanála since April 2022 in respect of the Core Bus Corridor infrastructure to be delivered in the course of subsequent phases. In Cork, following an extensive public consultation process, the final network redesign was published by the National Transport Authority in June 2022 and will provide an increase in bus services of over 50%. Planning for the new network has commenced and it is expected to be fully operational by the end of 2024. With respect to the Sustainable Transport Corridors infrastructure, two rounds of public consultation have taken place in late 2022 and early 2023."

Relevance to CNDMR: The CNDMR will make provision for the construction of a dedicated bus lane in each direction with associated shelters and other infrastructure. The CNDMR is referred to in CMATS as facilitating, *"the rollout of sustainable transport measures including public transport services for the North Cork Metropolitan City area;"* and in relation to BusConnects routes in the north of Cork City "*This route will utilise the proposed Cork Northern Distributor Road (NDR) which is required to be multi-modal to cater for bus movements as well as* **Public Transport Services Investment Programme**

"Meeting the levels of behavioural change and modal shift from private car usage required to meet our climate targets (cf. Table 15.5) will require large-scale expansion of our public transport services. ….. The programme's proposed implementation timeline spans five phases across 2022-2026. Public transport services continue to see an increase in patronage, up 112% at the end of 2022 compared to the beginning of 2019. Where Connecting Ireland services have been implemented, patronage has increased 128% from the beginning of 2022 to year-end. This was reflected in the 85% patronage growth on the enhanced services."

The CNDMR supports and facilitates BusConnects through the provision of a dedicated route for future services. It also enables displacement from existing BusConnects Routes allowing such measures as bus gates etc. on Radial Routes to function as well as City Centre displacement. The CNDMR will make provision for the construction of approximately 15km of dedicated bus lanes in each direction when fully complete. This bus corridor will make bus journey times more reliable, quick and therefore attractive to commuters.

The CAP 2024 sets out a list of Key Actions to deliver abatement in transport for the period of 2024-2025. The Key Actions relevant to this project are described as described in **Table 3-1**.

Table 3-1: CAP 2024 Alignment with CNDMR

Measure	2024-2025 Actions Relevant to CNDMR	CNDMR Alignment with CAP 2024
Strategic Transport Planning	• Metropolitan Area Transport Strategies – programme of review, update, appraisal and planning of services.	• CNDMR is listed in the Cork Metropolitan Area Transport Strategy (CMATS) as a 'critical enabler' of CMATS.
Active Travel Infrastructure Programme	• Advance roll-out of walking/ cycling infrastructure in line with National Cycle Network and CycleConnects plans.	• The CNDMR will include segregated walking and cycling routes along its full length of approximately 15km. It will connect with other cycling infrastructure and help integrate the cycle network.
Major Public Transport Infrastructure Programme	• Advance BusConnects programme	• The CNDMR will make provision for the delivery of dedicated bus lanes in each direction. The CNDMR is referred to in CMATS as facilitating, *"the rollout of sustainable transport measures including public transport services for the North Cork Metropolitan City area;"* and in relation to BusConnects routes in the north of Cork City "*This route will utilise the proposed Cork Northern Distributor Road (NDR) which is required to be multi-modal to cater for bus movements as well as segregated cycle and pedestrian infrastructure"*

3.2 Regional and Local Policy Context

3.2.1 Southern Regional Spatial and Economic Strategy (RSES)

The Southern Regional Spatial and Economic Strategy (RSES) serves as a regional level document which provides more specific goals and objectives in line with those set out in the NPF. These goals and objectives are primarily set out in Regional Policy Objectives (RPO's). These RPO's set out Objectives for the region covering a wide range of areas such as; settlement planning, population growth, housing, metropolitan enhancement, development of infrastructure, sustainability, economic and employment development, all of which the CNDMR aims to aide through its development.

In considering Transport Priorities for the Cork Metropolitan Area, Sections 6.3.5 to 6.3.6 of the RSES provides details for a metropolitan area-wide public transport system, including orbital public transport services to connect the city hinterlands strategic employment locations. Along with this, the RSES notes the priorities for the enhancement of the road network within the city, including the implementation of the CNDMR (described in RSES as Cork Northern Distributor Road) scheme.

Volume 2 of the RSES sets out Metropolitan Area Plans for a number of cities including Cork. This Plan includes a number of considerations and objectives which seek to provide improved connectivity and public transport services within the city. The Plan acknowledges the need for greater investment to provide the appropriate infrastructure necessary in order to make Cork a more attractive place to live and work in sustainable settlement patterns, which prioritises compact urban growth supported by sustainable transport.

3.2.2 Cork Metropolitan Area Transport Strategy 2040

'The Cork Metropolitan Area Transport Strategy (CMATS) will deliver an accessible, integrated transport network that enables the sustainable growth of the Cork Metropolitan Area as a dynamic, connected, and internationally competitive European city region as envisaged by the National Planning Framework 2040.'

As part of this Strategy, the CNDMR scheme is specifically included to cater for access to planned development lands, provide walking and cycling linkages, access to radial public transport routes, orbital public transport provision, and the removal of some strategic traffic from Cork City Centre.

The Strategy categorises the CNDMR as a short-term 'critical enabler' as it:

- *Creates opportunities for sustainable development of existing land banks in the Northern Cork Metropolitan area..;*
- *Facilitates the rollout of sustainable transport measures including public transport services..;*
- *Facilitates the introduction of a HGV ban within the City Centre;*
- *Serves the requirements of local traffic demand in the northern CMA (Cork Metropolitan Area)*

3.2.3 Cork City Development Plan 2022-2028

The Cork City Development Plan 2022-2028 (The Plan) sets out local planning policies for the city.

The Core Strategy of The Plan sets out nine Core Strategy Objectives which serve as the foundation for the more detailed policies and objective. The most relevant of these to the CNDMR are as follows;

- Objective 3: seeks to 'support the implementation of the Cork Metropolitan Area Transport Strategy (CMATS).'
- Objective 10:12 of The Plan sets out the need to provide behavioural change measures to promote walking and cycling. These measures are noted as being particularly important in areas where upgraded infrastructure is being provided.
- Objective 4.1: outlines the support from the council in the improvement of the bus network servicing the city via the implementation of BusConnects under the CMATS programme. The CNDMR is considered a critical future part of that network.

The CNDMR scheme is clearly identified within The Plan as critical infrastructure.

The Plan includes the following specific transport and mobility objectives that are directly relevant to the CNDMR:

- "Objective 4.1 – CMATS: Cork City Council will work in cooperation with the NTA, TII and Cork County Council to fully implement the Cork Metropolitan Area Transport Strategy subject to detailed engineering design and environmental considerations, including the projects and programmes in relation to walking, cycling, public transport, BusConnects, suburban rail, light rail, park and rides and roads infrastructure."
- "Objective 4.2 – Cork City Movement Strategy: Cork City Council will work in cooperation with the NTA to complete the rollout of the City Centre Movement Strategy."
- "Objective 4.3 – Strategic Location of New Development: To ensure that all new residential, employment and commercial development are focused in areas with good access to the planned high frequency public transport network.
- "Objective 4.4 – Active Travel: To actively promote walking and cycling as efficient, healthy, and environmentally friendly modes of transport by securing the development of a network of direct, comfortable, convenient, and safe cycle routes and footpaths across the city."
    - To support the expansion of the Cork Bikes scheme.
    - To accommodate other innovations such as electronic bikes, public car hire, and other solutions that will encourage active travel.
    - To support the rollout of the NTA 5 Year Cycle Plan.
    - To support and engage with the Safe Routes to School programme."

The land use zoning strategy is based on the principles of compact growth, sustainable communities and neighbourhoods, placemaking and climate resilience, and the Strategic Vision for Cork City, all of which align with the CNDMR.

3.3 Policy Conclusion

In conclusion therefore, National, Regional & Local policy identify the need for a multi-modal transport corridor for the northern side of Cork City, which can act as a key enabler for compact and sustainable growth in the area and support a shift to sustainable transport modes and is explicitly prioritised at all policy levels.

4 CONSTRAINTS STUDY

4.1 Overview

This section describes the Constraints Study Report (July 2021) undertaken for the CNDMR, which involved the identification of existing known constraints within the Study Area. This information is used to inform the identification of feasible route options.

The Constraints Study Report was compiled with reference to all relevant planning guidelines and references Article 3 of the EIA Directive (2014/52/EU) in terms of scope of topics considered at feasibility stage. More detailed constraints investigations will follow as the scheme is progressed. The key environmental issues considered in the constraints report are:

- Population and Human Health;
- Biodiversity;
- Land, Soils Geology & Hydrogeology;
- Water Resources;
- Air, Climate, Noise and Vibration;
- Material Assets;
- Archaeology, Architecture and Cultural Heritage;
- Landscape & Visual.

The Constraints Study Report for the CNDMR scheme is included as **Appendix B** to this Report**.**

4.2 Study Area

A Study Area aims to ensure that an appropriate geographic catchment is established and that all feasible route options and constraints within this area are identified. A Study Area was identified during Phase 1 in consultation with Cork City Council for the purpose of carrying out the Constraints Study. The defined Study Area extending from the N22 on the western side of Cork City and running along the northern side of Cork City and connecting to the N8 on the eastern side of the city within which possible route options could be considered and appraised.

4.3 Constraints

Constraints are identified to ensure that all factors are considered when appraising each of the feasible route options within the Study Area. These constraints are thereby integrating into the selection and development of potential route options. The environmental desktop assessment of the study area includes the following:

- A scope of the environmental disciplines to be assessed.
- A description of the receiving environment; and
- Identification of the constraints within the study area.
- A constraints analysis for each of the environmental disciplines addressed is presented in the Constraints Study Report in Volume B.

4.4 Constraints Study Methodology

The initial step in the constraints study process is to identify the nature and extent of significant constraints within the defined Study Area. These constraints are documented and mapped. Environmental constraints are divided into two principal categories:

- Natural Constraints (naturally occurring landscapes and features); and
- Artificial Constraints (forming part of the built environment)

The Constraints Study Report is a desktop study which includes a review of publicly available data, information and mapping. The available mapping for this scheme consisted of 1:50,000 Ordnance Survey of Ireland (OSi), Discovery Series, and aerial photography which provides information on the existing physical features of the study area. Geographic Information Systems (GIS) has been used to present the available data relating to each of the identified constraints within the study area. In addition, several datasets from the National Parks and Wildlife Service (NPWS) ecological database, the Geological Survey Ireland (GSI) database and the Water Framework Directive (WFD) surface and groundwater characteristics have been utilised.

The desktop study was informed by a literature review of relevant published information on both ecological aspects of the scheme area and relevant ecological studies. A review of orthophotography resources of the scheme area was also carried out.

The Constraints Study findings were incorporated into the proposed route options development and selection.

4.5 Constraints Study Summary

The Constraints Study Report focuses on all significant known constraints but in particular those constraints which might impact on the buildability or cost of the CNDMR and its integration into the natural and built environment. Other factors which may lead to a conflict with Planning Policy are also considered.

4.5.1 Population and Human Health

In terms of Population and Human Health, properties represent a constraint which should, where practicable, be avoided during the development of options. Residential houses generally represent a considerable constraint and avoidance of residential properties, where possible, is generally considered best practice. Commercial properties also represent a considerable constraint and in most cases are best avoided. However, properties may be able to absorb a degree of land acquisition and ultimately benefit from improved multi-modal infrastructure. The extent of residential and commercial properties is indicated on **Figure 4-2**.

4.5.2 Biodiversity

In terms of ecology, the majority of the land cover within the Study Area is made up of improved grassland and built urban land, which have a low ecological value. However, the hedgerows and tree lines along rivers within the study area have ecological potential both from a flora and fauna perspective. The most significant ecological constraint is the presence of the European Site - Cork Harbour SPA adjacent to the Study Area along the Glashaboy River estuary. Refer to **Figure 4-2** for designated sites. There is potential for a range of Annex I habitats and Annex II species (EU Habitats Directive), Annex I bird species (Birds Directive), species protected under the Wildlife Acts and Flora Protection Order and other rare species to occur across the study area which all need to be protected throughout the route selection stage. The presence of invasive alien plant species is also likely. Non-native invasive species listed on the Third Schedule to the EC Birds and Natural Habitats Regulations 2011, as amended are recorded within the study area.

4.5.3 Land, Soils, Geology & Hydrogeology

There are areas of heavily sloped land with rock close to the surface in the vicinity of the Shournagh, Glashaboy and Bride River valleys. These areas have varying degrees of susceptibility to landslide from ‘moderately low’ to ‘moderately high’. The pure unbedded limestones south of Blarney and at the southern margin of the study area are susceptible to karstification. Soil type in the study area is dominated by Till and Alluvium. The study area is within drinking water (groundwater) area Ballinhassig East (IE_SW_G_004) and Lee Valley Gravels (IE_SW_G_094). Measures will need to be taken to ensure that construction work does not impact the integrity of these groundwater sources.

4.5.4 Water Resources

A number of rivers (including Rivers Lee, Bride, Glashaboy) and streams are located within the Study Area. Given the Moderate Ecological Status of a number of the watercourses any future development in the area must ensure no further deterioration in the status of these rivers & streams. As such the waterbodies are considered to be “At Risk”. These watercourses are also connected to Great Island Channel SAC and nationally designated sites proposed National Heritage Areas (pNHAs).

4.5.5 Material Assets Utilities and Infrastructure

There are a number of utilities and services (water, electricity, gas) within the scheme area which need to be considered including existing transport infrastructure and any proposed infrastructure such as the N/M20.

4.5.6 Archaeology, Architecture and Cultural Heritage

The Study Area is host to a variety of archaeological and architectural heritage assets and there is also potential for the presence of unrecorded archaeological and architectural sites within the study area.

4.5.7 Landscape and Visual

In terms of landscape character, parts of the route options under consideration pass through *1 City and Estuary* and *6a Broad Fertile Lowland Valleys* Landscape Character Type which are classified as Very High and High Value and Sensitivity, respectively. Designated Landscape Preservation Zones (LPZ), the objective of which is to preserve and enhance the landscape character and assets of these sites, are present throughout the study area including along the Glashaboy River valley, the Lower Killeen's Road, the Bride River Valley and along the New Commons Road. Areas of High Landscape Value (AHLV) are also present in the study area including the Tivoli Ridge, Shanakiel Ridge, Blackpool Valley, River Lee. The effects on these shall be considered alongside effects on Prominent and Strategic Metropolitan Greenbelt Areas and other landscape zonings.

4.5.8 Other Known Constraints

Other constraints include the requirement to handle, store, remove and dispose of waste material in accordance with the relevant waste management legislation. Waste material will be generated from two main sources: wastes resulting from general construction on-site. i.e. waste fuels, oils from machinery, cement and concrete from required masonry works and wastewater from sanitary facilities, and excess excavated materials generated from general site clearance and earthwork excavations, including bridge abutments, as well as construction and demolition waste and other construction activities.

4.6 Refined Study Area and Updated Baseline Information

Following the completion of the Constraints Study Report, the study area was refined during the SAR Stage of Phase 1 in consultation with CCC. The current study area, as defined in the SAR, has been established in terms of where potential routes for the CNDMR may be located, and the extent of physical impacts due to the scheme. **Figure 4-1** illustrates the current study area. The study area may be subject to further refinement during the progression of scheme design process.

An overview of the environmental features and constraints within the current study area is provided in **Figure 4.2** and **Appendix B** of this Report.

In addition, at route options selection stage, the most recent available data was used to assess the corridor options against the project objectives and key performance indicators. This data includes 2024 GeoDirectory and zonings and policies from the most recent Cork City County Development Plan 2022-2028.

Figure 4-1: Proposed Study Area for the CNDMR Route

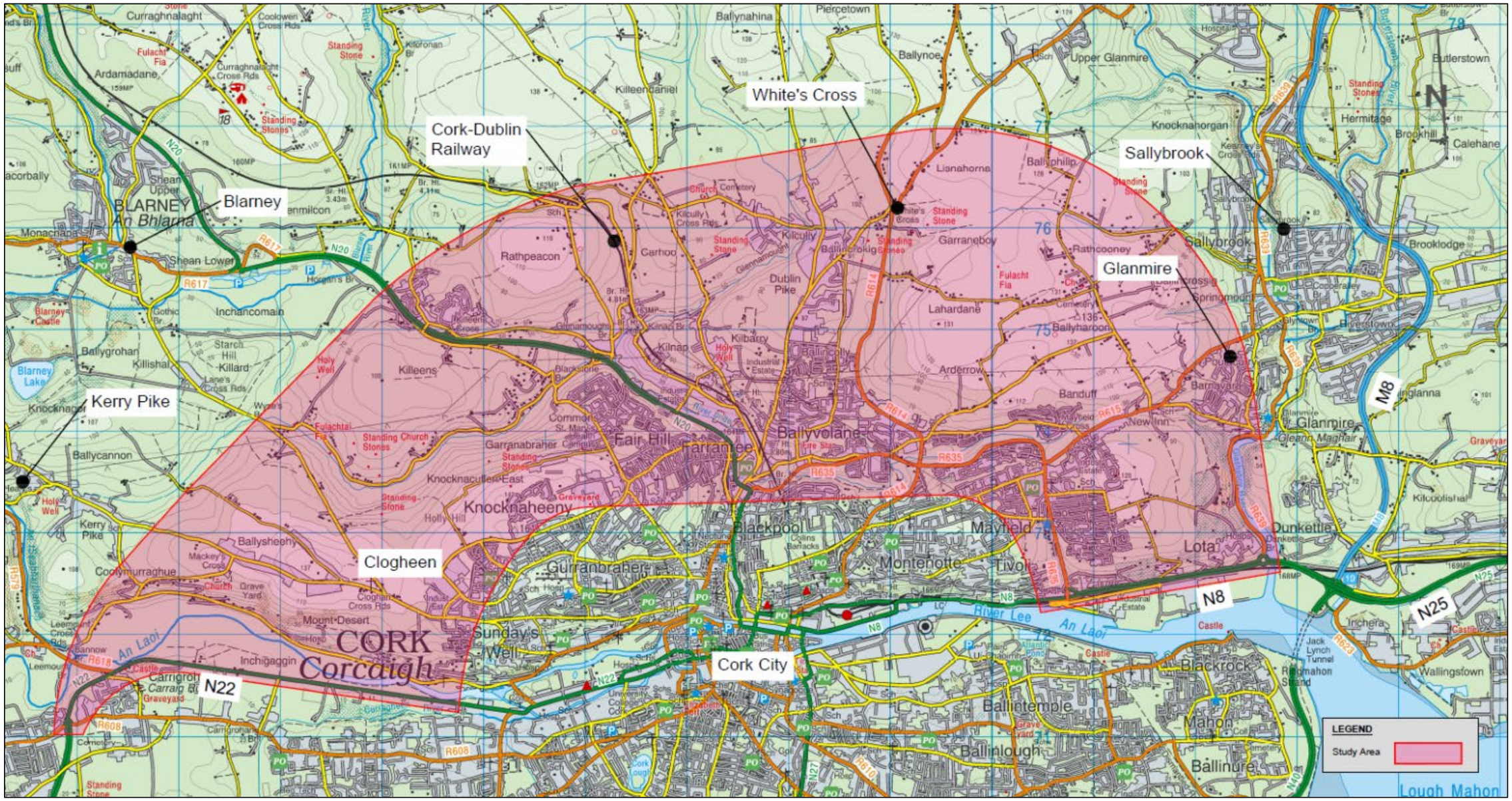
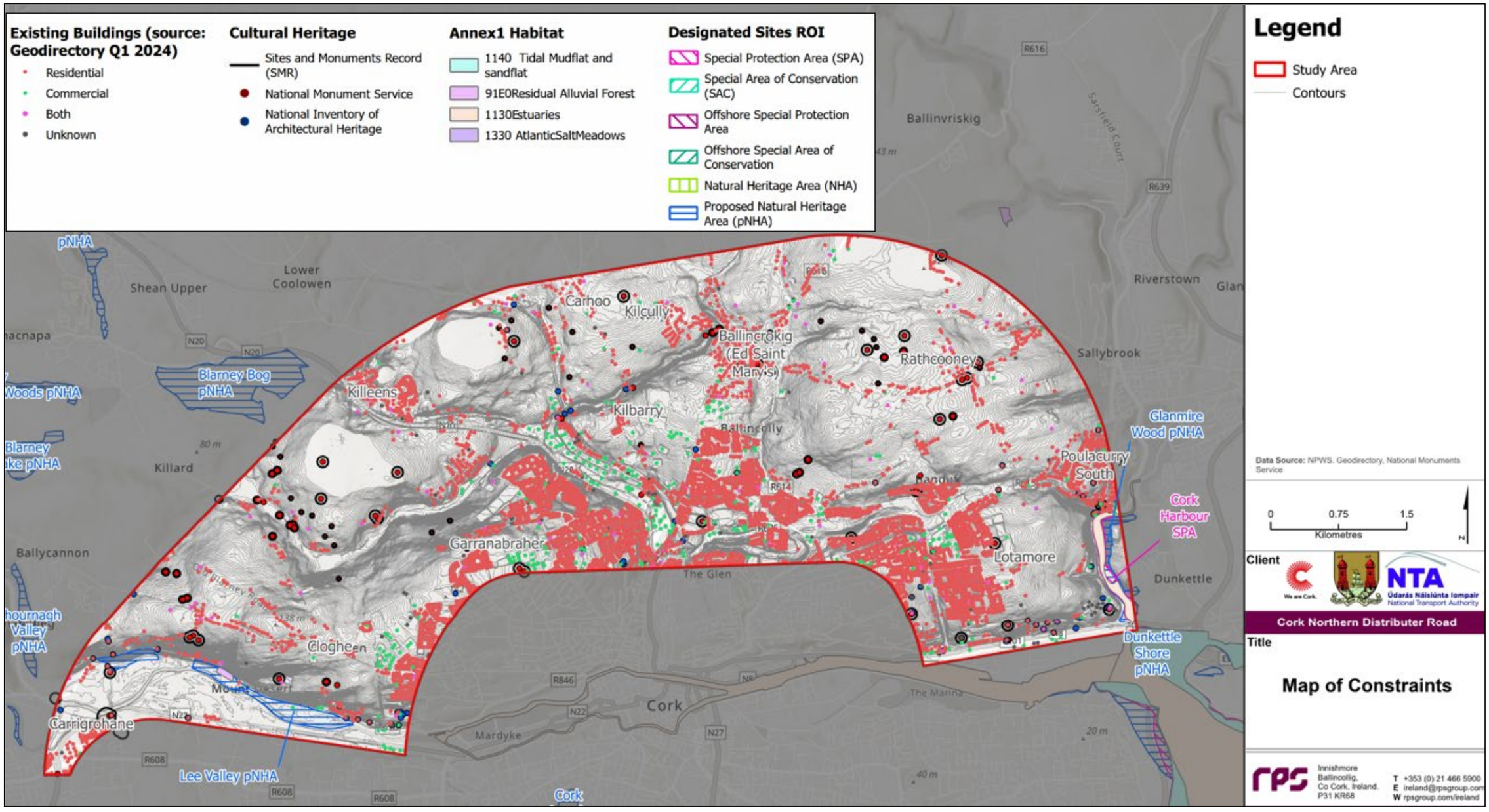


Figure 4-2: Map of Constraints



5 LONGLIST OF OPTIONS

5.1 Consideration of Alternatives

The identification of potential alternatives was considered in the Strategic Assessment Report (SAR, – Section 6). The SAR identified a wide range of alternative proposals:

- Do-Nothing – no improvements to the current transport provision;
- Do-Minimum – implementation of those measures that are committed ;
- Management – lower cost measures targeted at specific issues that would comprise a near-term package of improvements to the existing transport network;
- Demand Management – measures (fiscal or physical) that seek to curtail traffic growth and potentially reduce traffic volumes ;
- Investment (Do-Something) Alternatives – developed for individual (and combined) modes:
  - Walking
  - Cycling
  - Heavy Rail
  - Light Rail
  - Bus
  - Park and Ride
  - Road Based

The SAR was developed following the guidance set out in the Common Appraisal Framework (CAF) and Public Spending Code (PSC).

Each alternative was assessed with regards to their feasibility and likelihood to achieve the project objectives (as per Section 2.3.5).

The SAR process concluded that a road-based solution be taken forward as the Investment (Do-Something) Alternative, within which a range of feasible options can be developed and appraised (with reference to Section 6.6.8 of the SAR). The road-based solution is likely to address all of the identified scheme objectives. The final recommended route must serve the various employment and residential developments, both existing and proposed, within the urban area through the facilitation and encouragement of sustainable transport modes - public transport, cycling and walking. The proposed scheme will also contribute to a reduction of vehicular based traffic on the existing road network in Cork City, thereby facilitating the provision of public transport measures on the wider network as well as environmental improvements in the City Centre.

As summarised in Section 6 of the SAR, a Do-Something Alternative, rather than a Do-Nothing, Do-Minimum or Management Alternative, is considered to best meet the objectives of the scheme and the wider CMATS. A road-based Do-Something Alternative has been assessed as best achieving this –

- by enabling a shift to road-based public transport and other sustainable transport modes,
- by unlocking access to critical development lands, and,
- by facilitating the sustainable growth of the northern side of Cork City.

Therefore, a feasible list of road-based alternatives is to be prepared for the scheme, to be referred to as Route Options.

An initial set of feasible road-based alternatives were developed as part of the SAR (refer to Figure 6-9 of that report). These are further developed in this report into Route Options to be assessed under Phase 2 Option Selection.

5.1.1 Selection of Corridor Type

As a road-based Do-Something alternative has been assessed as best meeting the objectives of the scheme, this section considers what an optimal corridor type would include, in terms of catering for all users and modes. It is considered that the optimal cross-section for the CNDMR scheme should comprise the following elements -

- 2no. 1.0m landscaped boundaries,
- 2no. 2.5m footpaths,
- 2no. 3.25m 2-way segregated cycle tracks,
- 2no. 1.5m separation buffers/verges,
- 2no. 3.25m bus lanes,
- 2no. 3.0m vehicular lanes.

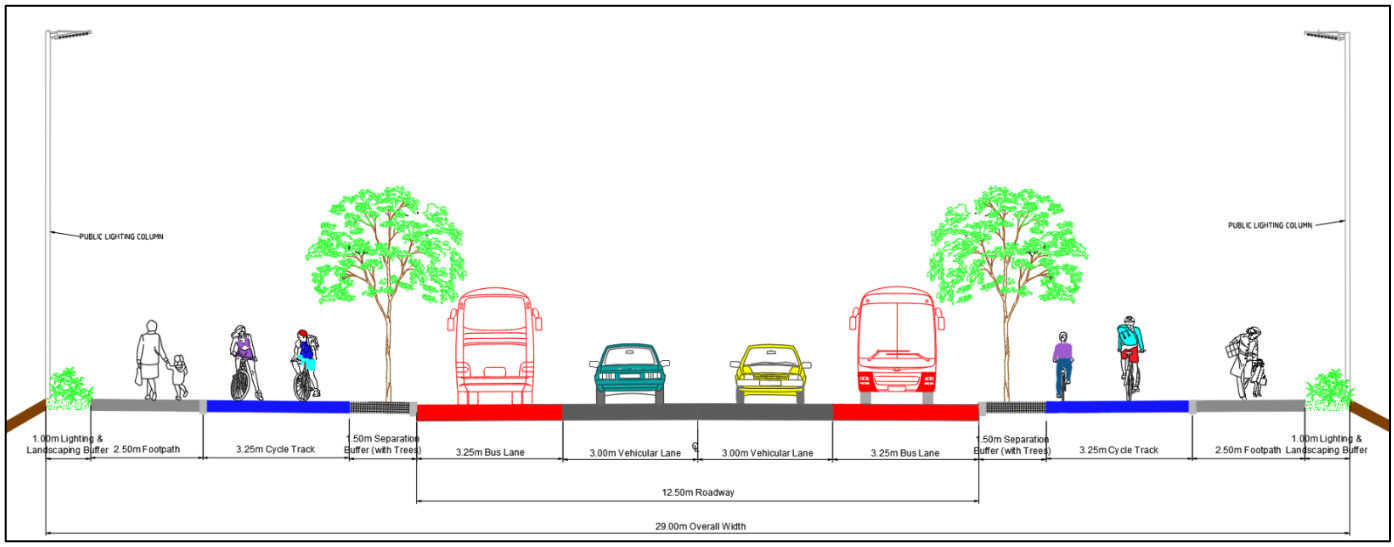
This results in an optimal corridor width of 29m (excluding space for land forming, drainage, etc).

The Cycle Design Manual (CDM) and the Design Manual for Urban Roads and Streets (DMURS) have been used in assessing the cross-section needs, with reference to further published guidance for the BusConnects programme. Further design work to establish the necessary footprint of the project will be carried out in Phase 3.

The provisions of bus lanes and segregated cycle and pedestrian facilities means that the proposed scheme will provide a sustainable transport corridor, similar to those proposed as part of the BusConnects project. This will facilitate expansion of bus routes and services across the northern side of Cork City, providing improved and sustainable access to a variety of communities and facilities.

The optimal corridor of the proposed CNDMR scheme is illustrated in **Figure 5-1** below. It is noted that this may not apply across the scheme in its entirety, but it will be used to consistently assess all longlist options in the assessment process.

Figure 5-1: Proposed CNDMR Typical Corridor



5.2 Longlist Option Development Rationale

5.2.1 Longlist Appraisal Approach

As referenced in **Section 2.3.1**, TAF requires a longlist of options to be developed and appraised against the project objectives. This 'sifting' process results in a reduced number of options to be taken forward to the next stage of the appraisal process which requires a Transport and Accessibility Appraisal (TAA), and following that, a Cost-Benefit Analysis (CBA) is carried out. Considering that the SAR has ruled out alternatives other than road-based options and noting that Do-Nothing/Do-Minimum options do not meet the Project Objectives, only road-based options have been considered.

The following sections provides a summary of the development of the Longlist Route Options and outlines the appraisal of these in accordance with TAF.

5.2.2 Key Travel Needs & Desire Lines

In developing route options, the scheme objectives defined in Section 2 and the scheme specific need as described in Section 3 were forefront considerations.

The CMATS definition of the CNDMR as being critical to the sustainable development of Cork City, and a 'critical enabler' for the wider CMATS strategy, for the reasons set out below was also considered; -

- *"It is a development enabling corridor that will provide strategic access to zoned residential land banks along the northern periphery of the city.*
- *It will serve both existing communities and proposed new communities and employment centres, improving access to public and sustainable transport facilities.*
- *It is a sustainable transport route with multi-modal provision, including bus lanes, cycle lanes and pedestrian networks, offering real alternatives to car travel and thus encouraging significant modal shift.*
- *The CNDMR will facilitate high-quality public realm zones, creating safe and attractive spaces for community interaction with particular benefits for pedestrians, cyclists, and public transport users.*
- *The CNDMR will provide for orbital movements north of the city thereby reducing reliance on radial routes through Cork City Centre."*

With the above taken into account in determining the need for a road-based alternative, the next step in developing the Route Options was to assess the land zonings as defined in the Cork City Development Plan 2022-2028 (CDP) for the northern side of the city and then review the key travel needs between these and the City Centre to ascertain the desired transport routes. The key travel needs have been defined as:

- To/from residential areas to employment areas.
- To/from residential areas to educational areas.
- To/from residential areas to recreational areas.

Residential areas are defined as lands zoned in the CDP as:

- ZO01 Sustainable Residential Neighbourhoods.
- ZO02 New Residential Neighbourhoods.
- ZO03 Long term Strategic Regeneration.

Employment areas are defined as land use type:

- ZO10 Light Industry and Related Use.
- ZO11 Business and Tech.
- ZO07 District Centres.

Educational areas are defined as land use type:

- ZO13 Education.

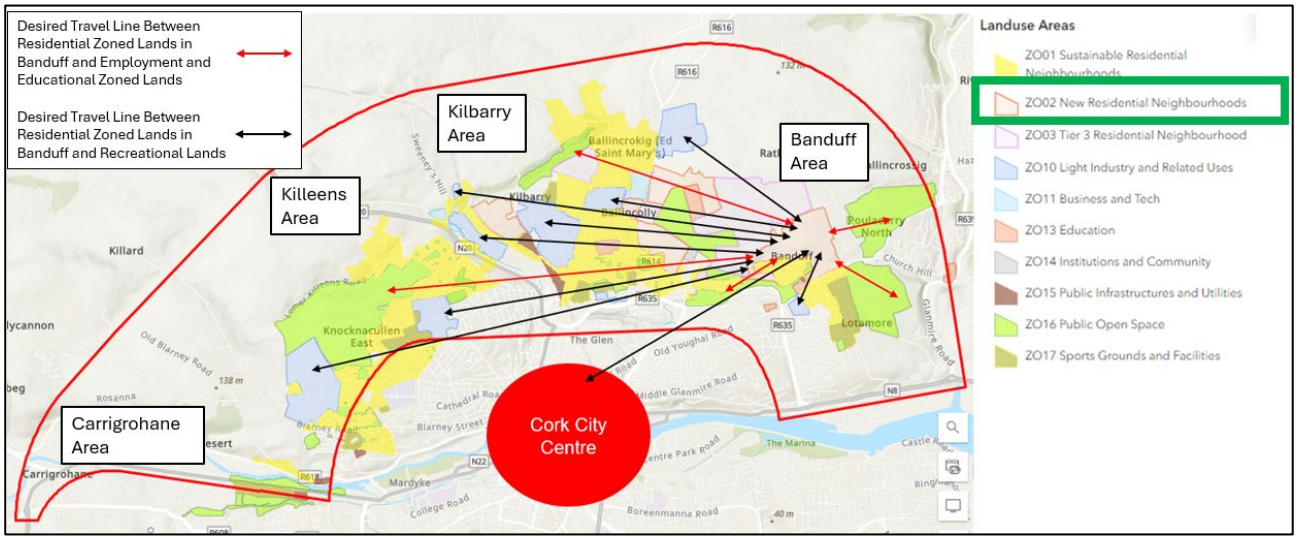
Recreational areas are defined as land use type:

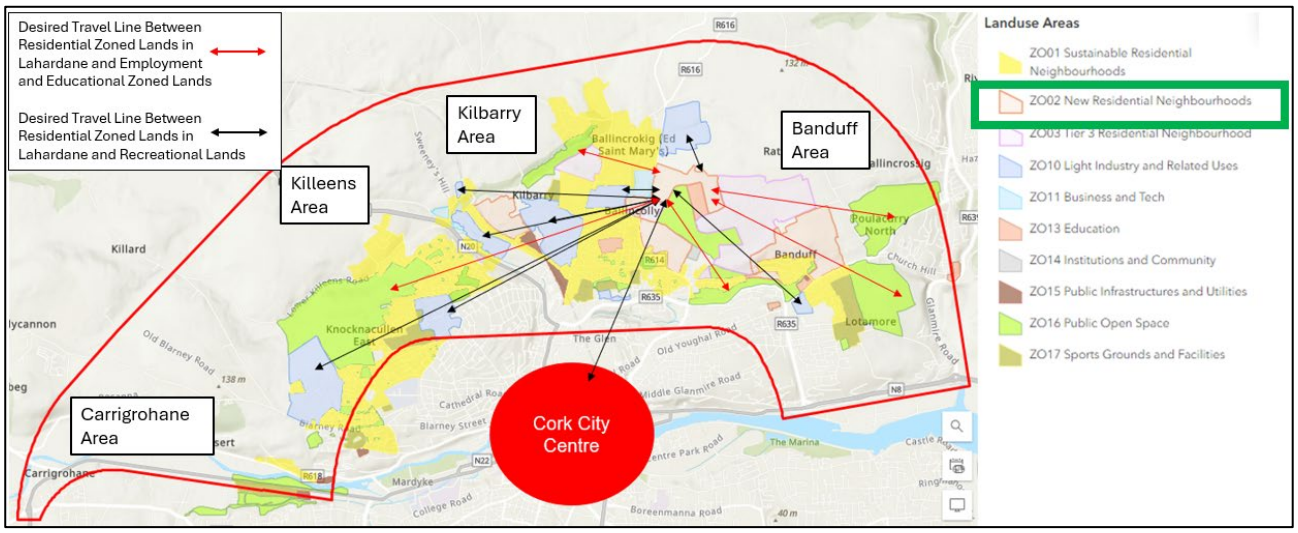
- ZO16 Public Option space.

Note: sports grounds and facilities were considered as recreational areas for this assessment as participation in use of these areas will be dependent on personal choice, ability or age.

Figure 5-2 illustrates the first step in the option development which looked at the potential transport desire lines between lands zoned for New Residential Neighbourhoods and lands zoned for new Employment, Educational and Recreational lands.

Figure 5-2: Desire Lines between New Residential Neighbourhoods and Employment / Recreational Lands





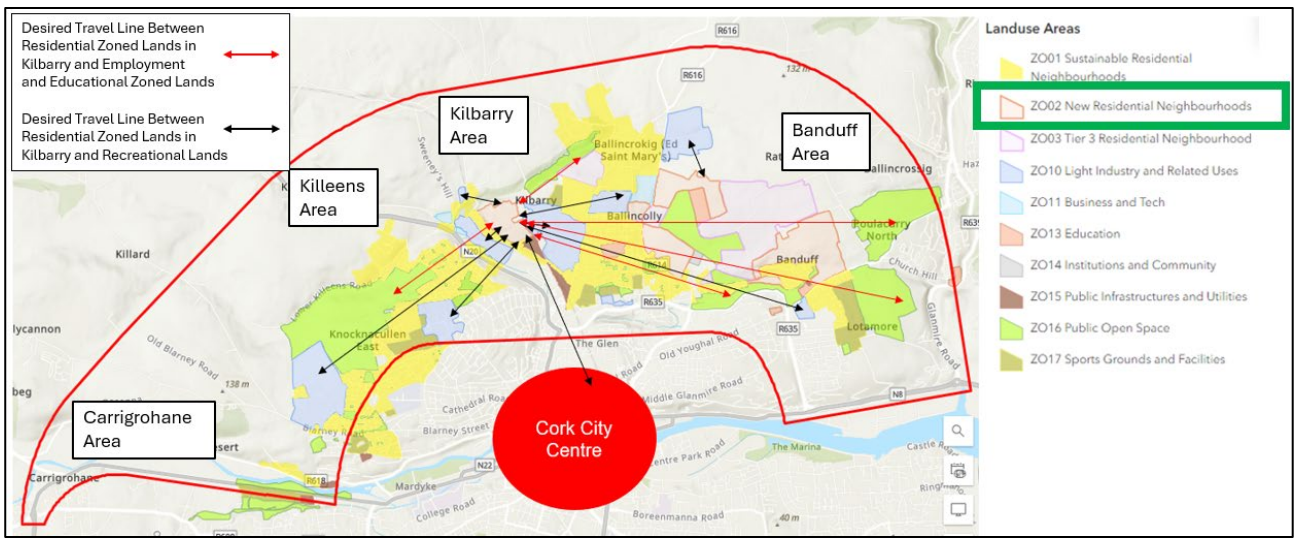


Figure 5-3 illustrates the potential transport desire lines between lands zoned for the creation of Tier 3 Residential Neighbourhoods and lands zoned for new Employment, Educational and Recreational areas.

Figure 5-3: Desire Lines between Tier 3 Residential Neighbourhoods and Employment / Recreational Lands

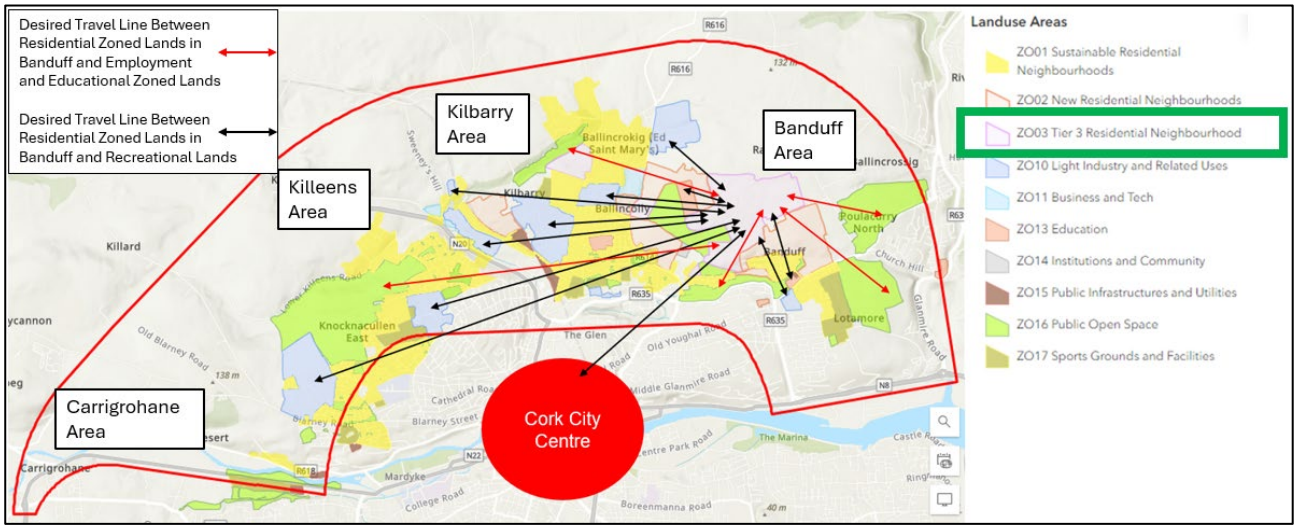
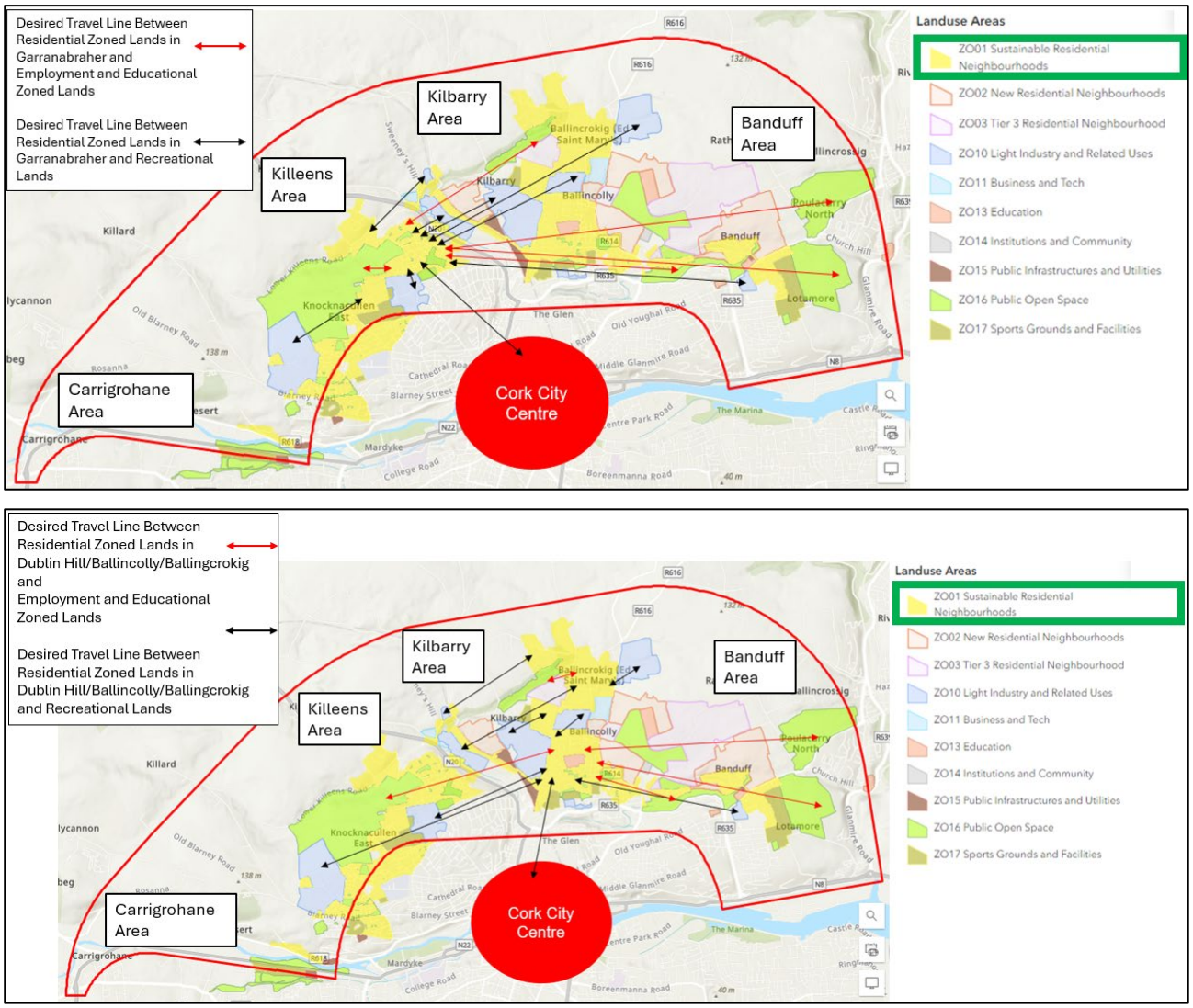


Figure 5-4 illustrates the potential transport desire lines between lands zoned for the creation of Sustainable Residential Neighbourhoods and lands zoned for new Employment, Educational and Recreational areas.

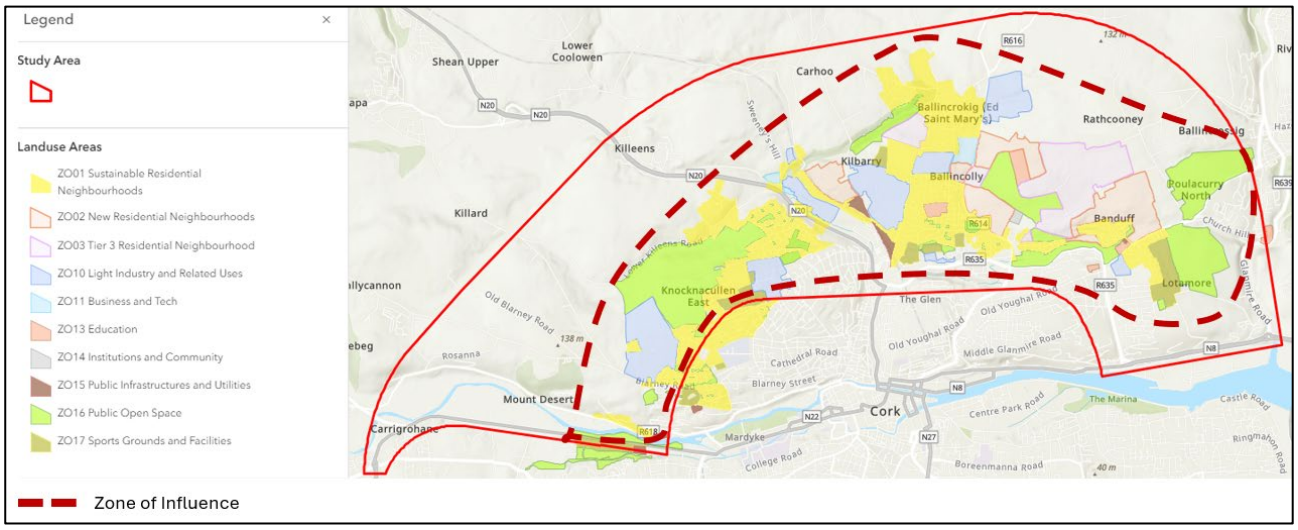
Figure 5-4: Desire Lines between Sustainable Residential Neighbourhoods and Employment /Recreational Lands



The examination of the desired travel lines between lands zoned for residential, employment and educational purposes shows that there is an existing and future travel need across the east-west / west-east axis for the northern part of Cork City. Providing a sustainable transport corridor that considers these desired travel lines is key to the development of route options.

This desired travel pattern allows for the creation of a zone of influence within the study area within which the development of reasonable options is focused. Within the zone of influence, shorter route options and those with less steep gradients will be more attractive for active travel modes and more likely to encourage modal shift. This Zone of Influence is shown in **Figure 5-5**.

Figure 5-5: Zone of Influence for Development of reasonable options



The scheme objectives listed below relating to active travel measures support this methodology:

- **T2**: To provide a sustainable transport route with journey time reliability from the eastern to western side of Cork City serving existing and planned communities within the northern side of the city and beyond.
- **L1**: To provide a sustainable transport route centred on non car-based transport modes to unlock the significant development potential along the northern side of Cork City and thereby encourage compact and sustainable growth.
- **A4**: To facilitate the rollout of sustainable transport measures and promotion of non-car travel patterns.
- **A5**: To link communities and workplaces by sustainable and active travel modes.
- **A1**: To improve accessibility to jobs and services by all modes and reduce dependency on private car.
- **A2**: To create high quality, safe and convenient dedicated active travel infrastructure serving adjoining communities.
- **C3**: To facilitate increased physical activity through improving the attractiveness of cycling journeys within Cork.
- **C4**: To facilitate increased physical activity through improving the attractiveness of pedestrian journeys within Cork.

Considering these Objectives, along with the assessment of the transport desire lines, options for route corridors outside of this Zone of Influence within the Study Area have been discounted.

5.2.3 NIFTI Compliance

A key objective of option selection is to identify a route option which would avoid, where possible, negative impacts on the environment at early stages of project planning and design. This is achieved in the first instance through the avoidance of the major constraints identified during the Constraints Study. Where avoidance is not possible, every effort is made to ensure that any interaction is minimised.

The development of the routes took cognisance of the NIFTI Intervention Hierarchy as per **Figure 5-6**.

Figure 5-6: NIFTI Intervention Hierarchy

The SAR concluded that a multi-modal road-based alternative is the most favourable intervention to achieve the Project Objectives. As there is no existing multimodal corridor within the Study Area, NIFTI intervention measures 1 - Maintain and 2- Optimise cannot be used. The development of options for the CNDMR has therefore aimed at using NIFTI measures 3 - Improve existing infrastructure where possible before providing NIFTI measure 4- New infrastructure. Further assessments in relation to NIFTI will be carried out at as part of the Preliminary Business Case in accordance with TAF Module 4 guidance.

5.2.4 Overview of Longlist Options

Seven long-list Do-Something options were developed for the CNDMR. Each option was developed based on providing the best possible access to land zonings defined in the CDP, whilst also avoiding, where possible natural and built environment constraints. Key travel needs and desire lines were also considered, taking account of the land zonings as defined in the CDP for the northern part of the city, and then reviewed against the key travel needs between these and the City Centre to ascertain the desired transport routes. These seven options are shown in **Figure 5-7**.

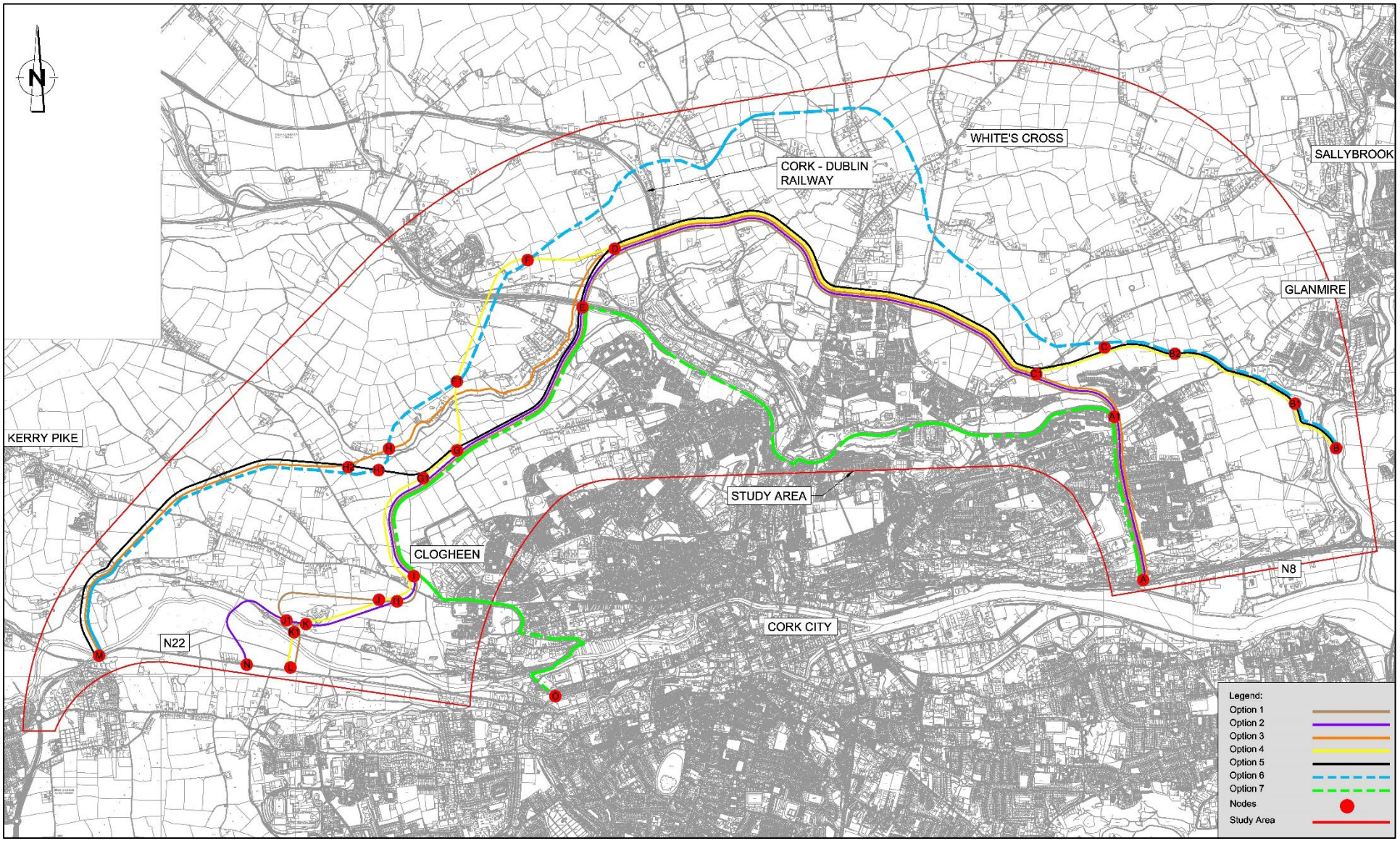
Desirable minimum geometric parameters were implemented, including an assumed design speed of 60km/h based on DMURS and guidance developed for BusConnects.

Some key notes regarding the development of these route options are:

- The route options developed have aimed to incorporate as much of the zoned lands as possible to give the greatest opportunity for sustainable development.
- Each route option has aimed to avoid existing buildings to reduce impacts on the built environment where possible.
- Each route option has aimed to avoid significant topographical constraints to minimise earthworks, and the environmental/construction costs impacts of these. This has resulted in most route options converging into singular locations in order to traverse the east to west/west to east route. This is particularly noticeable at the northern part of the Study Area where significant topographical constraints exist alongside the development areas which have key travel needs.
- The list of constraints which were mapped when producing the route corridors are as follows:
    - Contours (Topography)
    - Designated Sites
    - Buildings
    - Annex 1 Habitats
    - Cultural Heritage Areas
    - Existing road infrastructure

These constraints are shown on the Map of Constraints - Drawing no. MCT0825-RPS-00-DR-G-AP0009 located in **Appendix C.**

Figure 5-7: Initial Longlist Options



5.3 Route Option Descriptions

All Route Options described in the following section are firstly outlined at a full route level, and then described in detail at a section level. These are split into Western, Northern and Eastern sections for the purposes of description.

5.3.1 Route Option 1

Route Option 1 is shown on the Route Option 1 with Constraints Mapped – Drawing no. MCT0825-RPS-00-XX-DR-G-AP0003 in **Appendix C** and in **Figure 5-8**.

Route Option 1 is 12.6km in length. It commences at the western end with a junction at Carrigrohane Road (east of Inchigaggin Lane), heading north across the Lee Fields, crossing the River Lee and Lee Road, before turning east to intersect with the Blarney Road at Clogheen. From here the route heads north and then east around Hollyhill and Apple, following the southern banks of the Glenamought Valley, parallel with Nash's Boreen. The route then heads northeast crossing over Blackstone Bridge and Lower Killeens Road, then crossing the N20 (planned junction) and Sunset Place. It turns east crossing Sweeney's Hill, Old Mallow Road and then Old Whitechurch Road before turning southeast at Kilbarry and crossing the River Bride. The route then turns east crossing Upper Dublin Hill and follows Lower Dublin Hill until Ballyhooly Road. The route then heads southwest eventually crossing Rathcooney Road and then Banduff Road, before crossing the Glen River and joining with the North Ring Road just north of Tinker's Cross. The route then follows the North Ring Road south until it terminates at Silversprings Junction.

Figure 5-8: Route Option 1

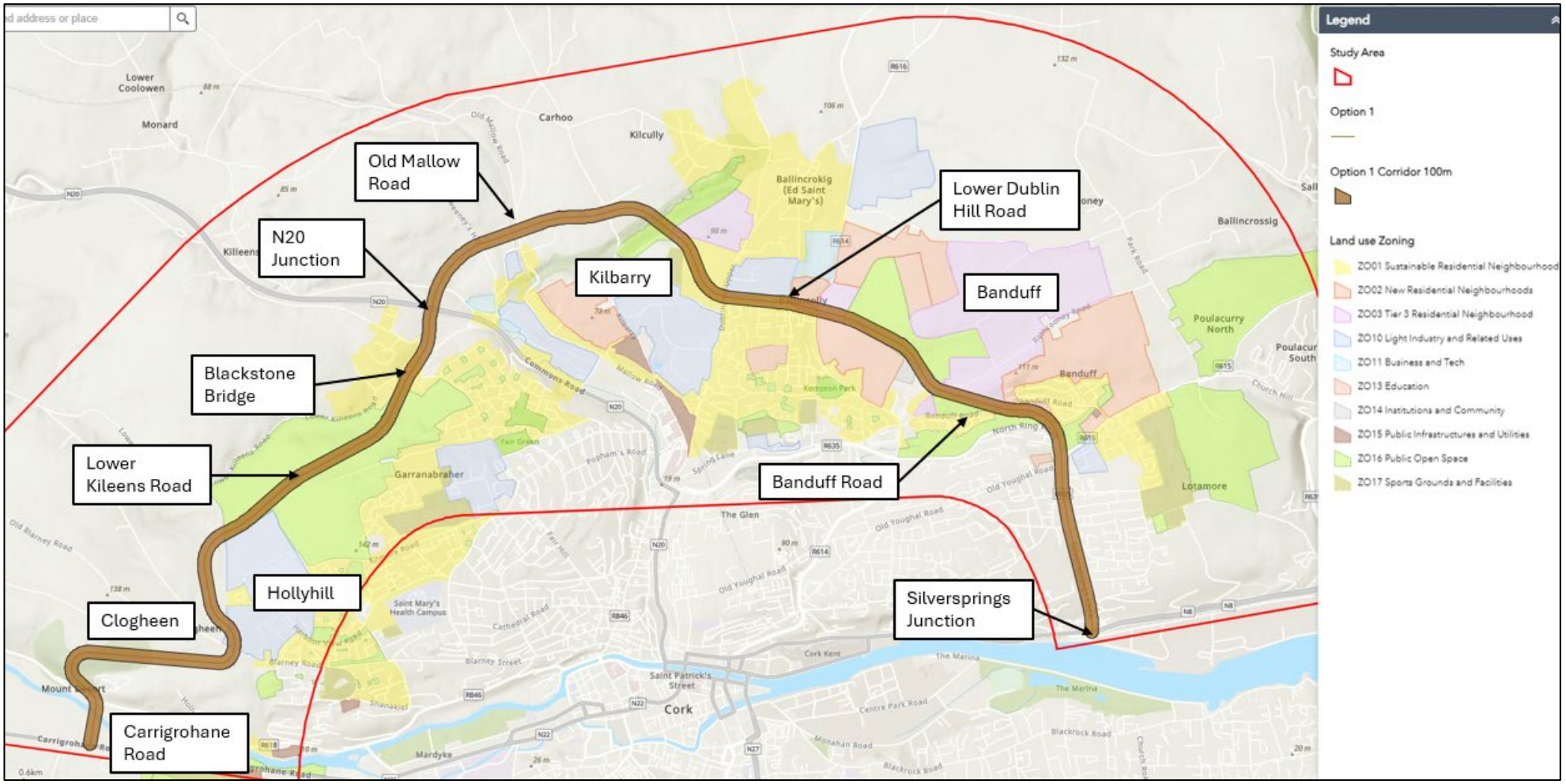
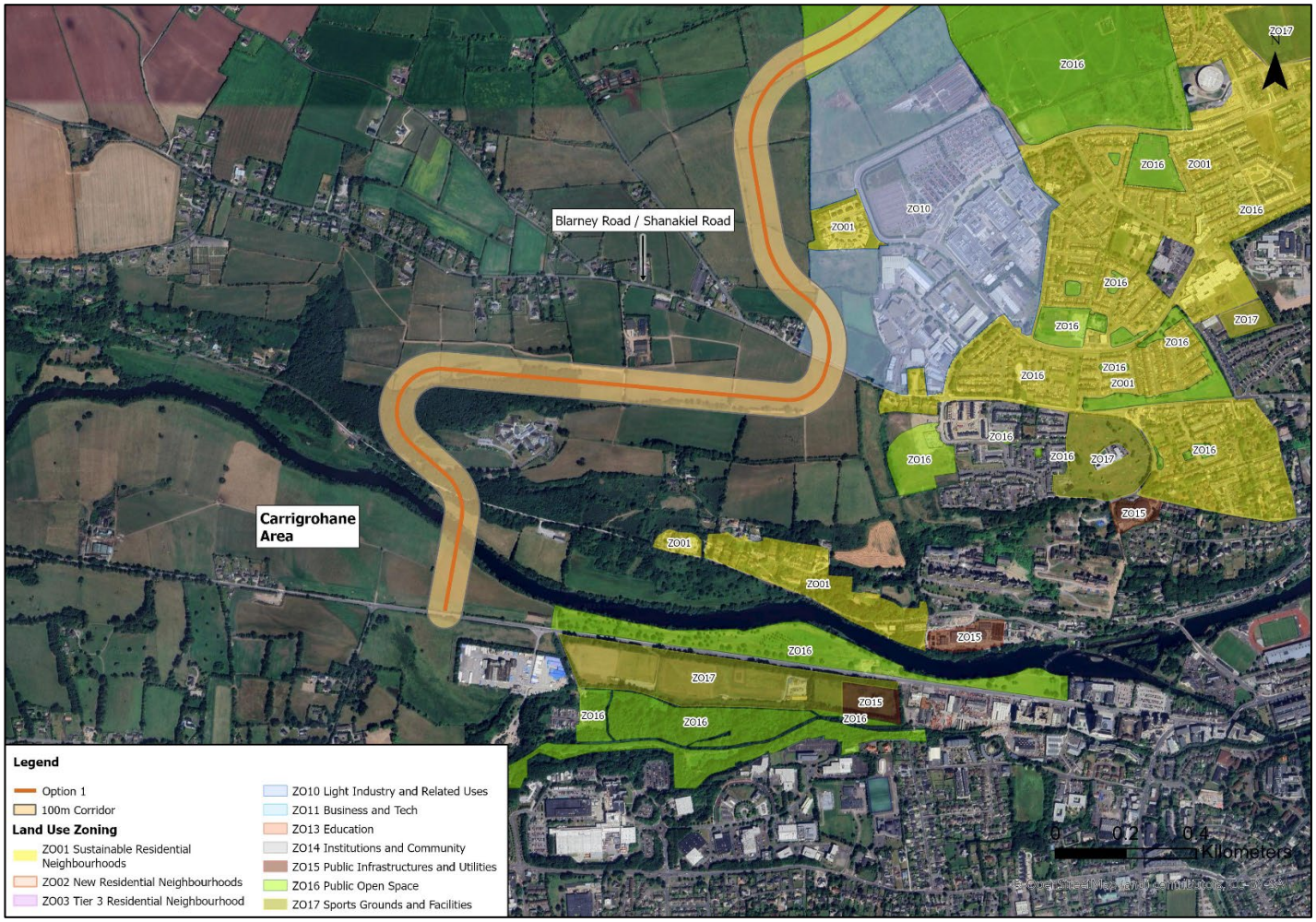


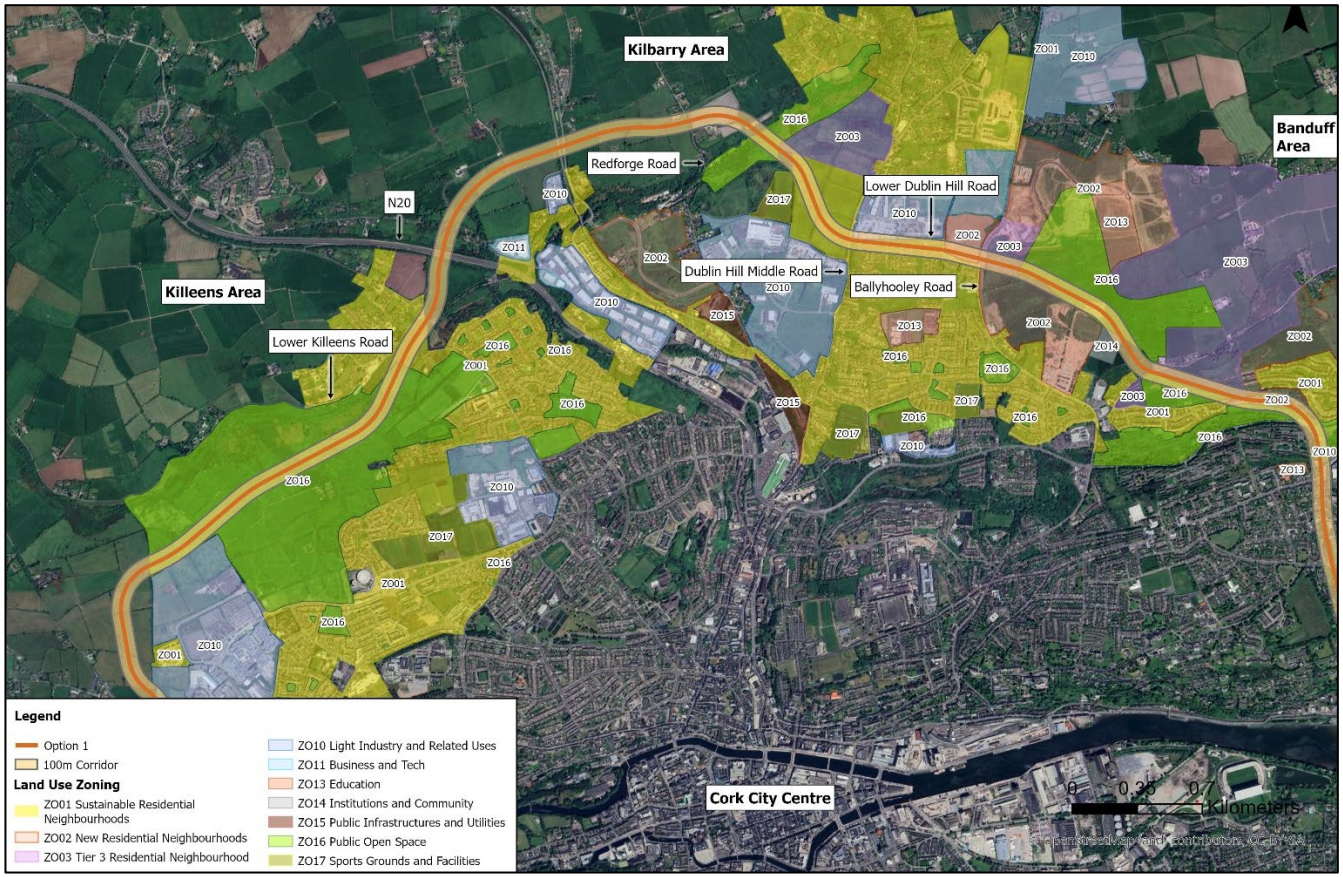
Figure 5-9: Route Option 1 – Western Section



At the western extents of the Study Area there are significant topographical constraints. These constraints require the route to follow the higher ground in this location to provide suitable gradients for active travel. Hence the route has a meandering effect as it navigates the terrain from the River Lee to north of Blarney Road.

There is a large area of land zoned for Business and Technology at Hollyhill. There is a significant large-scale business and technology centre with large employment numbers working in this area (> c.5,000 workers). Linking this area with the CNDMR and to other zoned lands is considered to align well with the Project Objectives.

Figure 5-10: Route Option 1 – Northern Section



The development of Route Option 1 at the northern part of the Study Area considered the land use zoning and the established desire lines. An east to west link was established through the land use zonings.

There is an existing constraint in the form of Blackstone Bridge along this section of the route, however there are engineering solutions to this constraint, such as an overbridge.

Crossing the N20 will likely require the CNDMR to traverse under the dual carriageway due to the topography in this location. While junction strategy is developed at Phase 3, it is considered at this stage that a fully grade-separated junction with the N20 is essential for optimum connectivity with the wider transport network. This is also likely to require upgrades to adjacent roads, with a likely re-configuration or amalgamation with the grade-separated junction at Northpoint due to proximity.

The crossing of the River Bride will require careful consideration and a bridge design that is sympathetic to the surrounding environment.

Lower Dublin Hill was determined as having sufficient width between existing buildings to accommodate the CNDMR corridor width. Lower Dublin Hill is also ideally located through the centre of zoned lands in the northern part of the Study Area and existing residential and business communities that will all benefit from the CNDMR. Utilising Lower Dublin Hill is in line with the NIFTI Intervention Hierarchy 3 – Improve.

Figure 5-11: Route Option 1 – Eastern Section

At the eastern section of Option 1, the NIFTI Intervention Hierarchy was key to the development of the route in this part of the Study Area. Route Option 1 aims to utilise the existing road infrastructure along the R635 North Ring Road before tying into the existing Silversprings Junction to the south. This route targets the land zonings to the northeast of the Study Area but does not traverse directly through the areas zoned for new developments.

There are spatial constraints along the North Ring Road that will prevent the provision of the full width of the CNDMR corridor along the entirety of this route. There is sufficient width at junctions that could be utilised for bus gates, with sections between junctions having sufficient width to accommodate improved active travel infrastructure along this route.

There is an existing traffic congestion issue at the Silversprings Junction, which is a consideration in the success or otherwise of this option.

5.3.2 Route Option 2

Route Option 2 is shown on the Route Option 2 with Constraints Mapped – Drawing no. MCT0825-RPS-00-XX-DR-G-AP0004 in **Appendix C** and in **Figure 5-12**.

Route Option 2 is 12.9km in length. It is a variation of Route Option 1 and explores deviations from Route Option 1 at the southwestern part of the Study Area. As with Route Option 1, Route Option 2 focuses on providing a route that connected the existing and new business and residential communities whilst avoiding significant constraints listed in **Section 5.2.4**. It commences at the western end with a junction at Carrigrohane Road (west of Inchigaggin Lane), heading northwest across the Lee Fields, before turning to cross the River Lee perpendicular, then turning east to follow Lee Road, before turning northeast to follow the same path as Route Option 1 before intersecting with the Blarney Road at Clogheen. From then on it follows the same path as Route Option 1 in its entirety.

Figure 5-12: Route Option 2

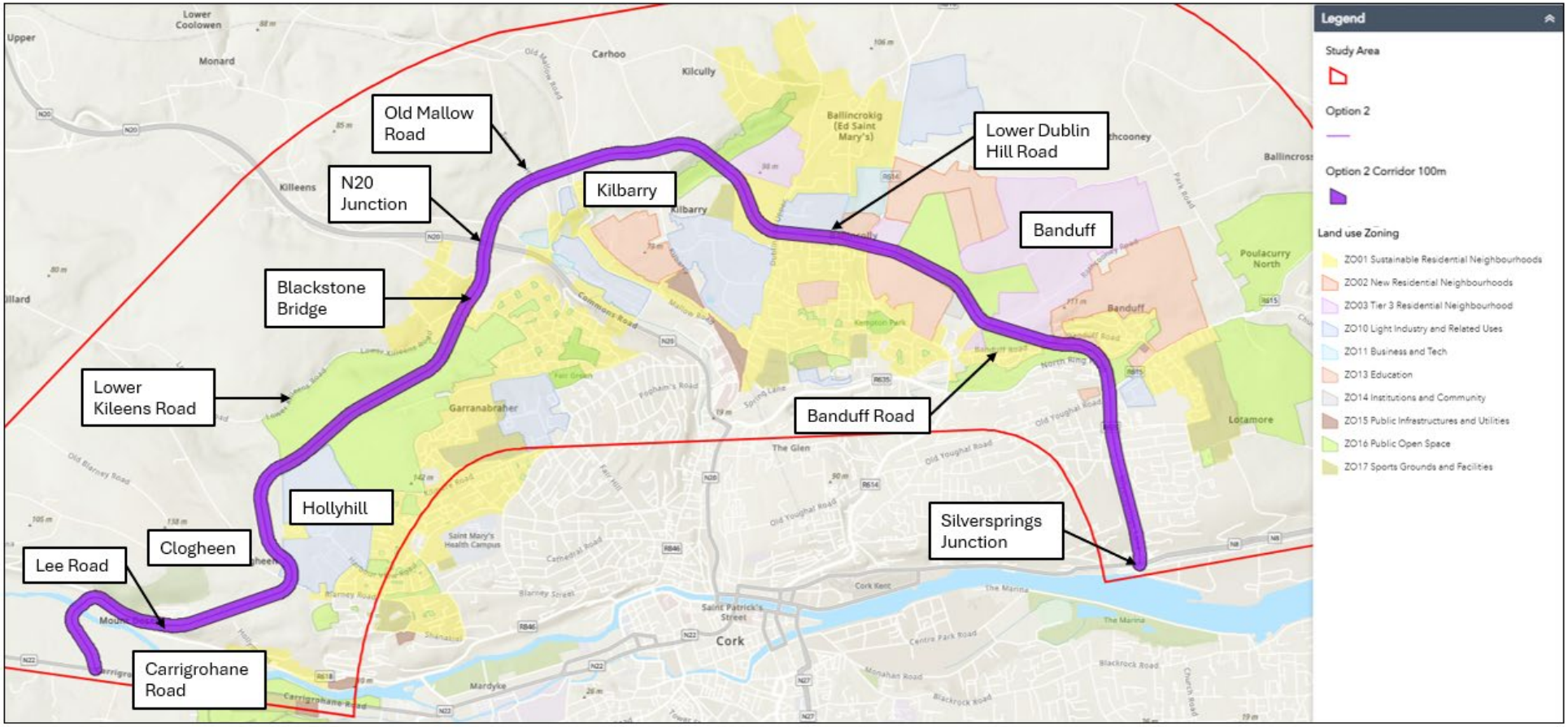
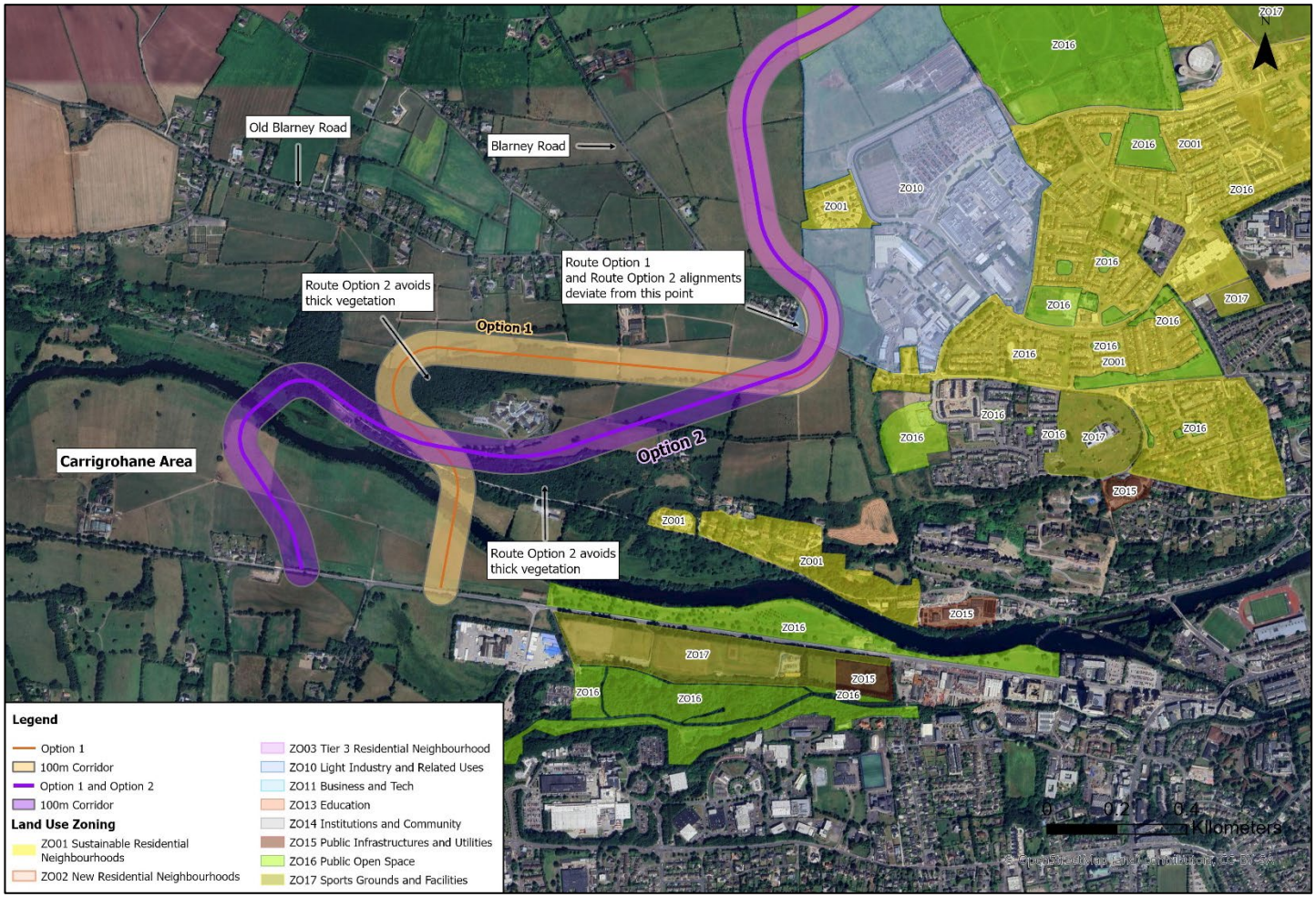


Figure 5-13: Route Option 2- Western Section



Route Option 2 utilises the same logic path as Route Option 1 with regards to connecting existing and new business and residential communities through the targeting of zoned lands. Route Option 2 at the southwestern part of the Study Area uses an alternative route to tie in with the Carrigrohane Road. It takes a different path though the same difficult topography at this location and attempts to minimise impact on an area of woodland that is impacted in Route Option 1. It also has a different crossing point over the River Lee and connection to the Carrigrohane Road, east of Inchigaggin Lane. This was done to explore the different potential environmental impacts between the two Route Options.

5.3.3 Route Option 3

Route Option 3 is shown on the Route Option 3 with constraints Mapped – Drawing no. MCT0825-RPS-00-XX-DR-G-AP0005 in **Appendix C** and in **Figure 5-14**.

Route Option 3 is 13.7km in length. Route Option 3 is a variation of Route Option 1. Route Option 3 explores deviations from Route Option 1 at two locations, the northwestern part of the Study Area and the southwestern part of the Study Area. As with Route Option 1, Route Option 3 focuses on providing a route that connects the existing and new business and residential communities whilst avoiding significant constraints listed in **Section 5.4.3**. Route Option 3 also aims to expand on the NIFTI Intervention Hierarchy 3 – Improve by taking a route along the existing Lower Killeens Road.

Route Option 3 commences in the west at Carrigrohane Road just east of the junction with the R579 Kanturk Road. It crosses the River Lee and turns north towards Upper Leemount, then northwest crossing Lee Road and Tower Road. The route turns east as it crosses Old Blarney Road and Blarney Road. The route then connects with Lower Killeens Road and follows this road until Blackstone Bridge, whereupon it follows Route Option 1 again for the remainder.

Figure 5-14: Route Option 3

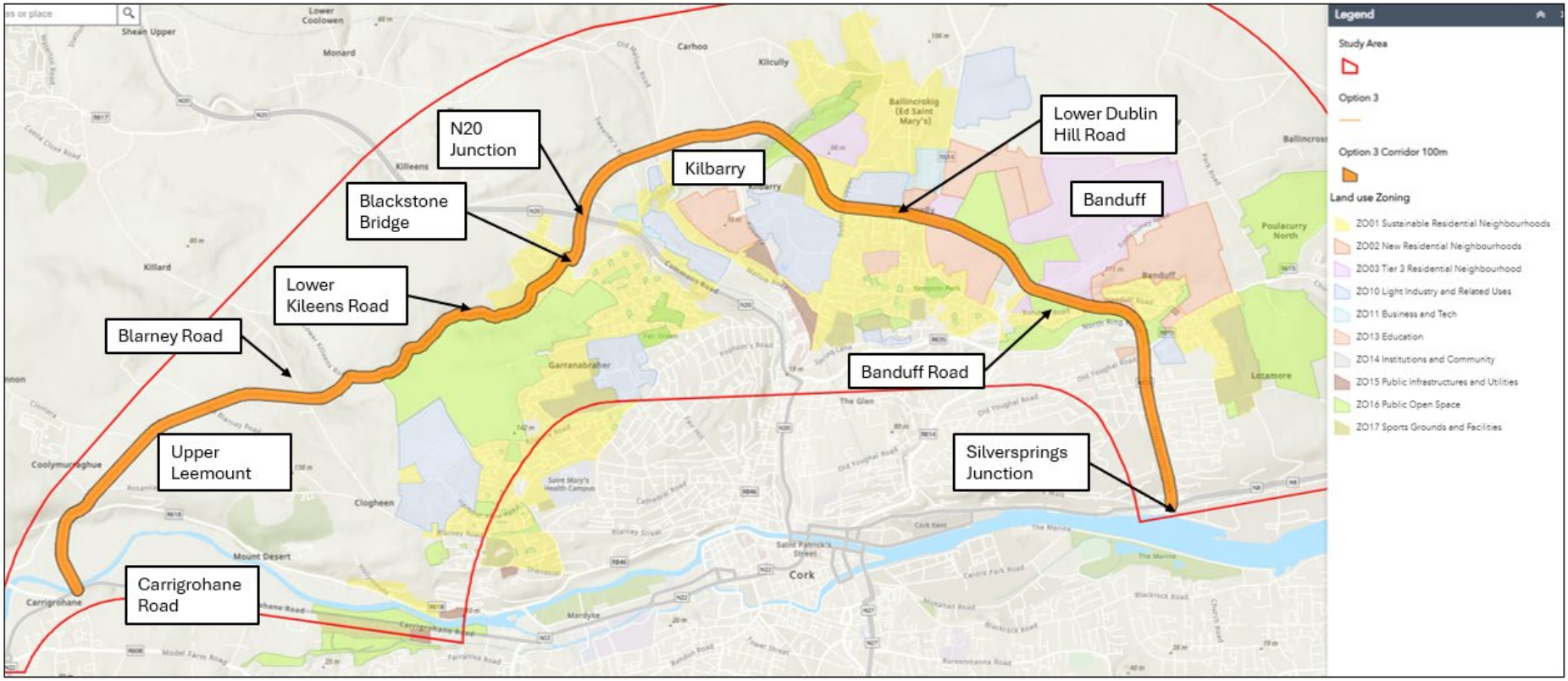
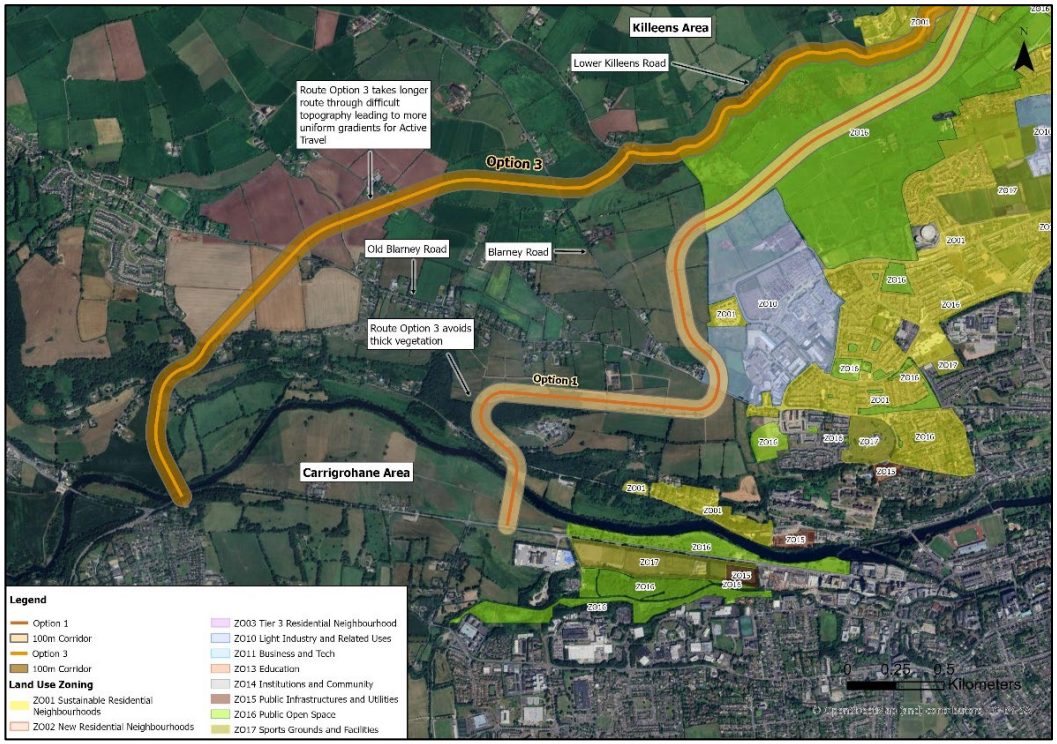


Figure 5-15: Route Option 3 – Western Section



The western section of Route Option 3 aims to explore the potential impacts, both positive and negative of providing a route to the outer extents of the Study area. It also has a different crossing point over the River Lee and connection to the N22 Carrigrohane Road. This route was introduced in order to explore the different potential environmental impacts between the Route Options.

Route Option 3 aims to further utilise NIFTI Intervention Hierarchy 3 – Improve by taking a route along the existing Lower Killeens Road using existing road infrastructure. Route Option 3 takes a route that is impacted less by the topography in this area than in Route Option 1. The route travels along the Lower Killeens Road and intersects with Blackstone Bridge which will require upgrades. This route along the Lower Killeens Road is recognised as having an increased impact on existing buildings. In order to utilise the existing road infrastructure, there are commercial buildings that would be necessary to be acquired. In developing this route, this demolition was considered necessary as the topography and the adjacent residential properties would affect their ability to junction the CNDMR safely as dwell areas at accesses would be difficult to achieve. Consideration was also given to localised narrowing of the CNDMR corridor, however the proximity of these buildings to the existing road edge resulted in this offering little benefit.

There is a further environmental impact by utilising the existing Lower Killeens Road. In order to widen this route to provide the CNDMR corridor, the adjacent watercourse would be impacted. To provide the full CNDMR corridor, there are engineering solutions to this constraint such as a culvert structure over this watercourse or diversion of the watercourse. This constraint is not considered detrimental to the Route Option but will likely have cost and environmental implication due to constructability issues and its location within a floodplain.

5.3.4 Route Option 4

Route Option 4 is shown on the 'Route Option 4 with Constraints Mapped – Drawing no. MCT0825-RPS-00-XX-DR-G-AP0006' in **Appendix C** and in **Figure 5-16**.

Route Option 4 is 13.0 km in length. It is a variation of Route Options 1, 2 and 3. Route Option 4 explores combinations of these routes whilst aiming to provide a route that links the zoned lands with existing communities. As with all other routes, Route Option 4 focuses on providing a route that connects the existing and new business and residential communities whilst avoiding significant constraints listed in **Section 5.4.3**. Route Option 4 follows an alternative route on its eastern end, aimed at providing increased access to zoned lands and avoiding existing constraints along the North Ring Road and Silversprings.

Figure 5-16: Route Option 4

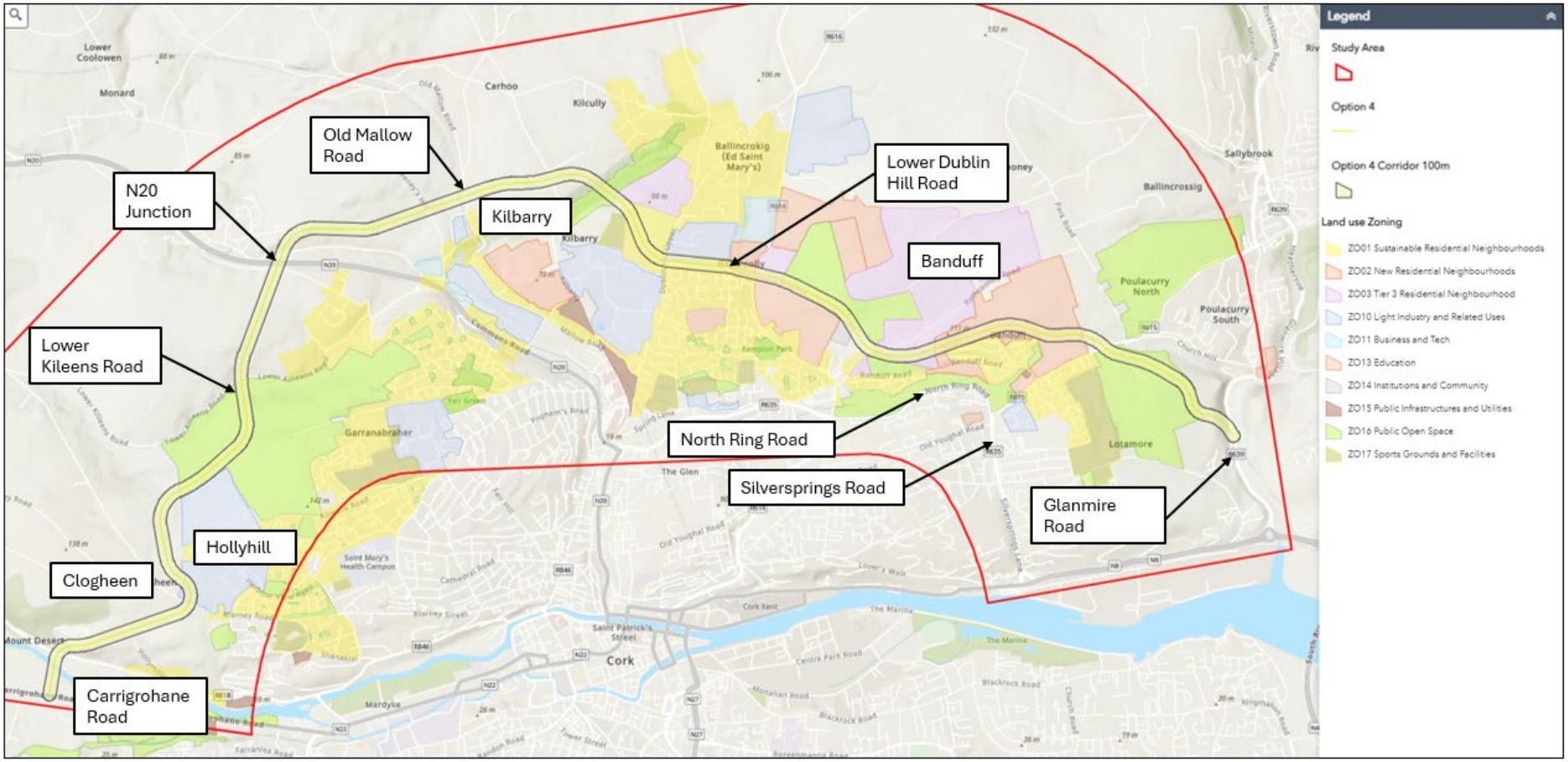
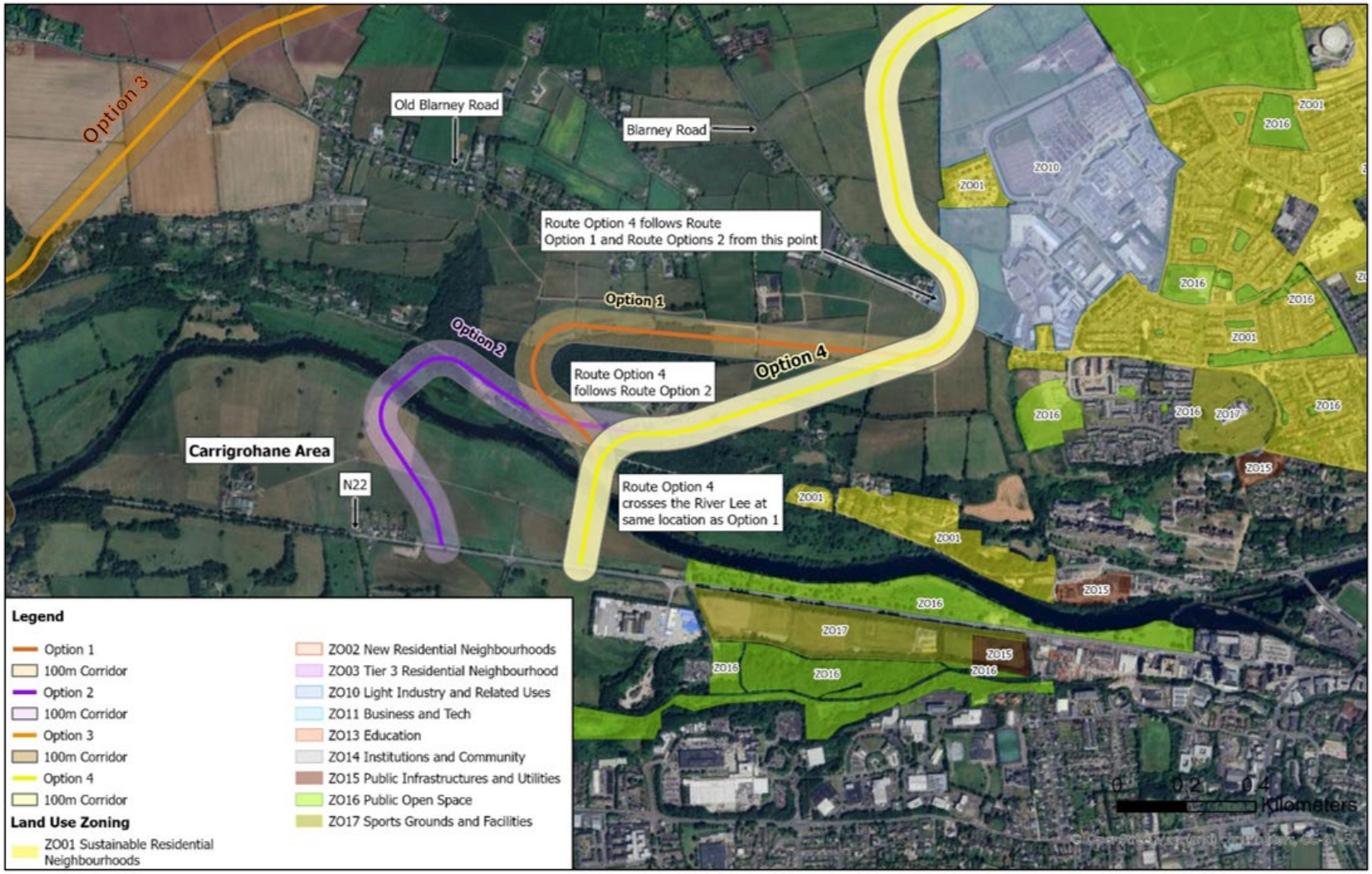
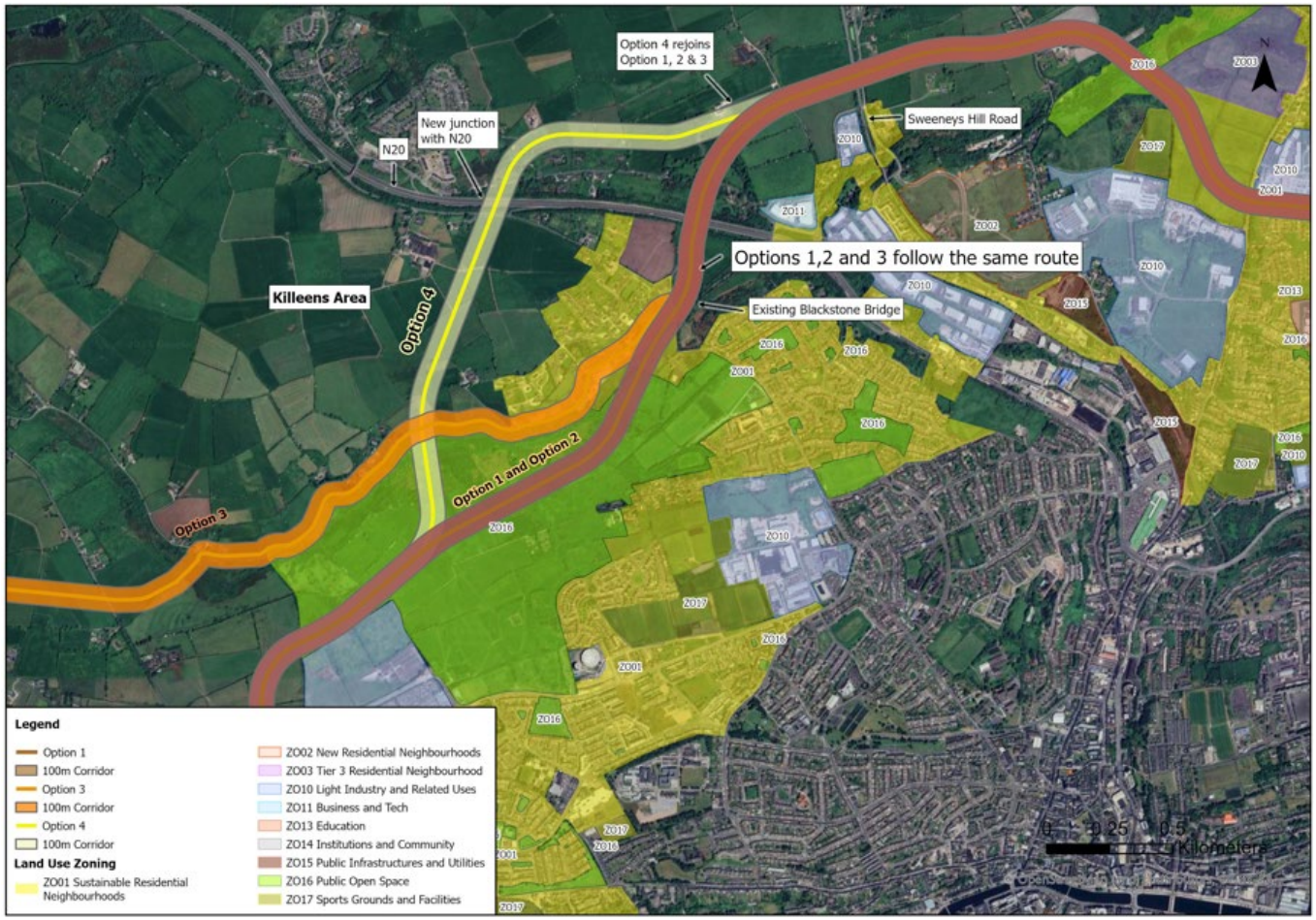


Figure 5-17: Route Option 4 – Western Section



Route Option 4 at the southwestern end is a variation on Options 1 and 2. It ties into the Carrigrohane Road at the same location as Route Option 1 and has the same crossing point over the River Lee. From the northern bank of the River Lee it turns northeast and joins the same path as Route Option 2. This option was developed to minimise impact on the woodlands north of the Lee Valley, and to reduce the amount of significant bends in the route.

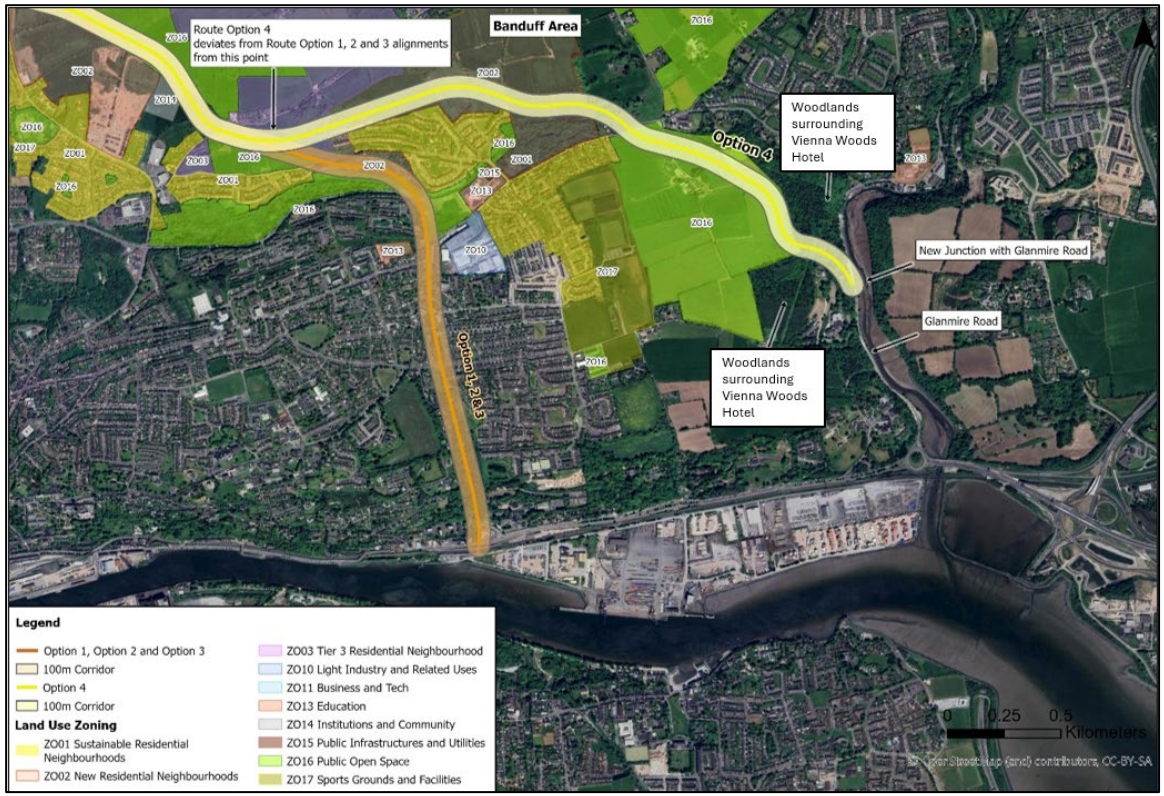
Figure 5-18: Route Option 4 – Northern Section



At the northwestern part of the route, Route Option 4 deviates to the north and west of the residential cluster along Lower Killeens Road. It traverses the Glenamought Valley and River Bride southwest of this residential area. This gives an alternative route through this area of undulating terrain compared to earlier options, and also avoids impact at Blackstone Bridge. Route Option 4 also serves to minimise impact on the lands zoned for public open space.

Option 4 then crosses the N20 close to the Killeens junction. Crossing the N20 will likely require the CNDMR to traverse over the dual carriageway due to the topography in this location. While junction strategy is developed at Phase 3, it is considered at this stage that a fully grade-separated junction with the N20 is essential for optimum connectivity with the wider transport network. This is also likely to require upgrades to adjacent roads, with a likely re-configuration or amalgamation with the grade-separated junction at Killeens due to proximity. Having crossed Commons Road, the route then turns east behind the ribbon development and rejoins the Option 1, 2 and 3 path at Sweeney's Hill.

Figure 5-19: Route Option 4 – Eastern Section



Route Option 4 follows an alternative route on its eastern end, aimed at providing increased access to zoned lands and avoiding existing constraints along the North Ring Road and Silversprings. The principle behind this is to give greater access linking existing and new business and residential communities but utilising the NIFTI Intervention Hierarchy 4 – New infrastructure.

Principal constraints in this area are the Cork Harbour SPA and Glanmire Woods pNHA which is located on the eastern banks of the Glashaboy river. There is a significant constraint along this route in the form of the woodlands surrounding the Vienna Woods Hotel on the western side of the river, which is required to be traversed in order to link to the Glanmire Road and complete the CNDMR network.

The location where Route Option 4 traverses the woodlands surrounding the Vienna Wood Hotel has been determined with the aim of minimising the impact on tree removal by targeting the narrowest section of the woodland where density is lower.

The entire CNDMR corridor width can be achieved along Route Option 4 as it avoids the constrained route along the North Ring Road. It avoids capacity and congestion issues at Silversprings Junction, and therefore is more favourable to public transport journey times, and provides more forgiving gradients for cyclists than the North Ring Road. Linking to the Glanmire Road will utilise the existing active travel infrastructure along this route and provide a link eastbound for users that will improve connectivity along this route.

5.3.5 Route Option 5

Route Option 5 is shown on the Route Option 5 with Constraints Mapped – Drawing no. MCT0825-RPS-00-XX-DR-G-AP0007 in **Appendix C** and in **Figure 5-20**.

Route Option 5 is a combination of Route Option 2, 3 and 4. At the western end of the study area the route it is the same as Route Option 3, until it crosses Blarney Road. Route Option 5 continues on the same trajectory and joins Route Options 2 and 4 just north of Hollyhill zoned industrial lands. Route Option 5 follows the Route Option 2 path through Glenamought Valley and across Blackstone Bridge and the N20. Route Option 5 continues along this same path, rejoined by Route Option 4 at Sweeney's Hill, and follows this combined route until Rathcooney Road. Route Option 5 then deviates along the same path as Route Option 2 to the east, tying in with the Glanmire Road north of Vienna Woods Hotel.

Figure 5-20: Route Option 5

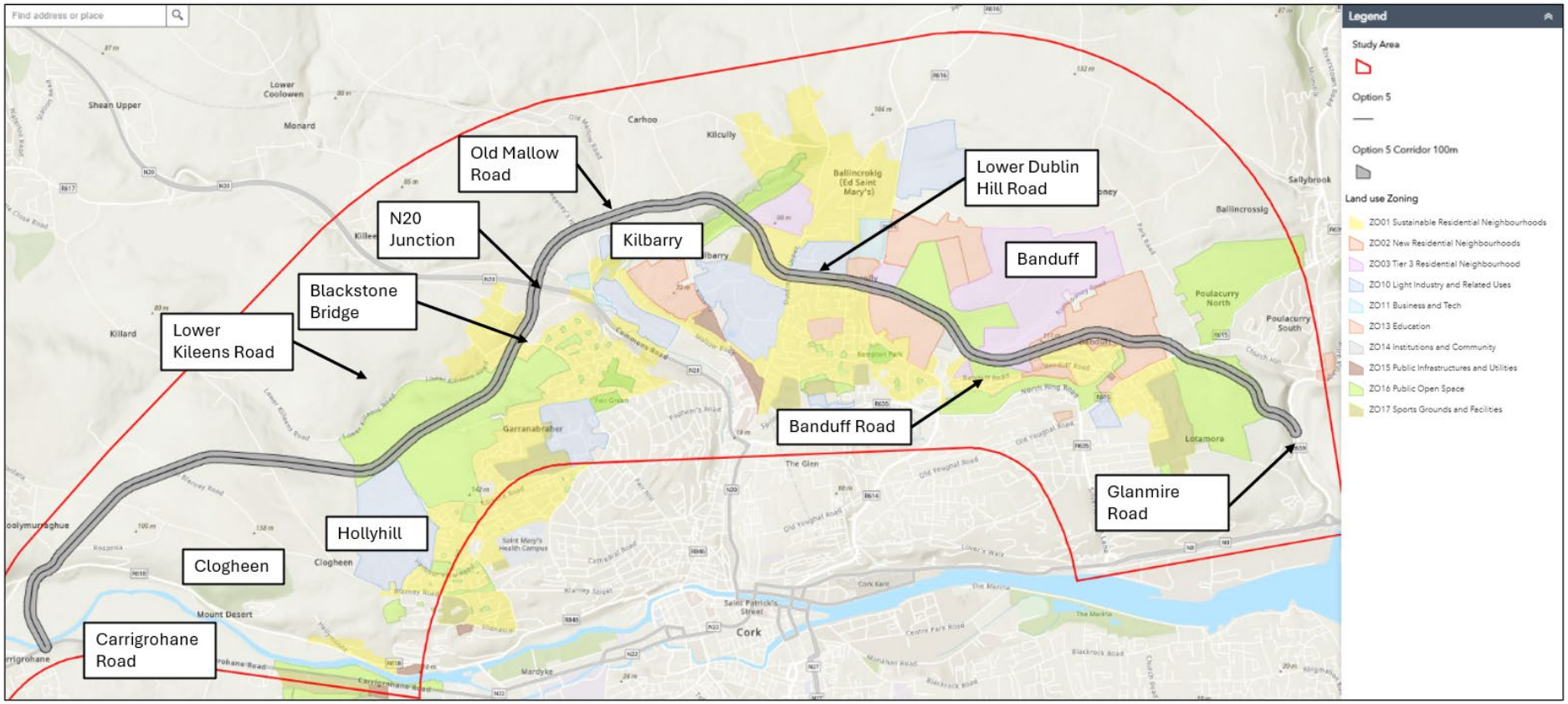


Figure 5-21: Route Option 5 – Western End

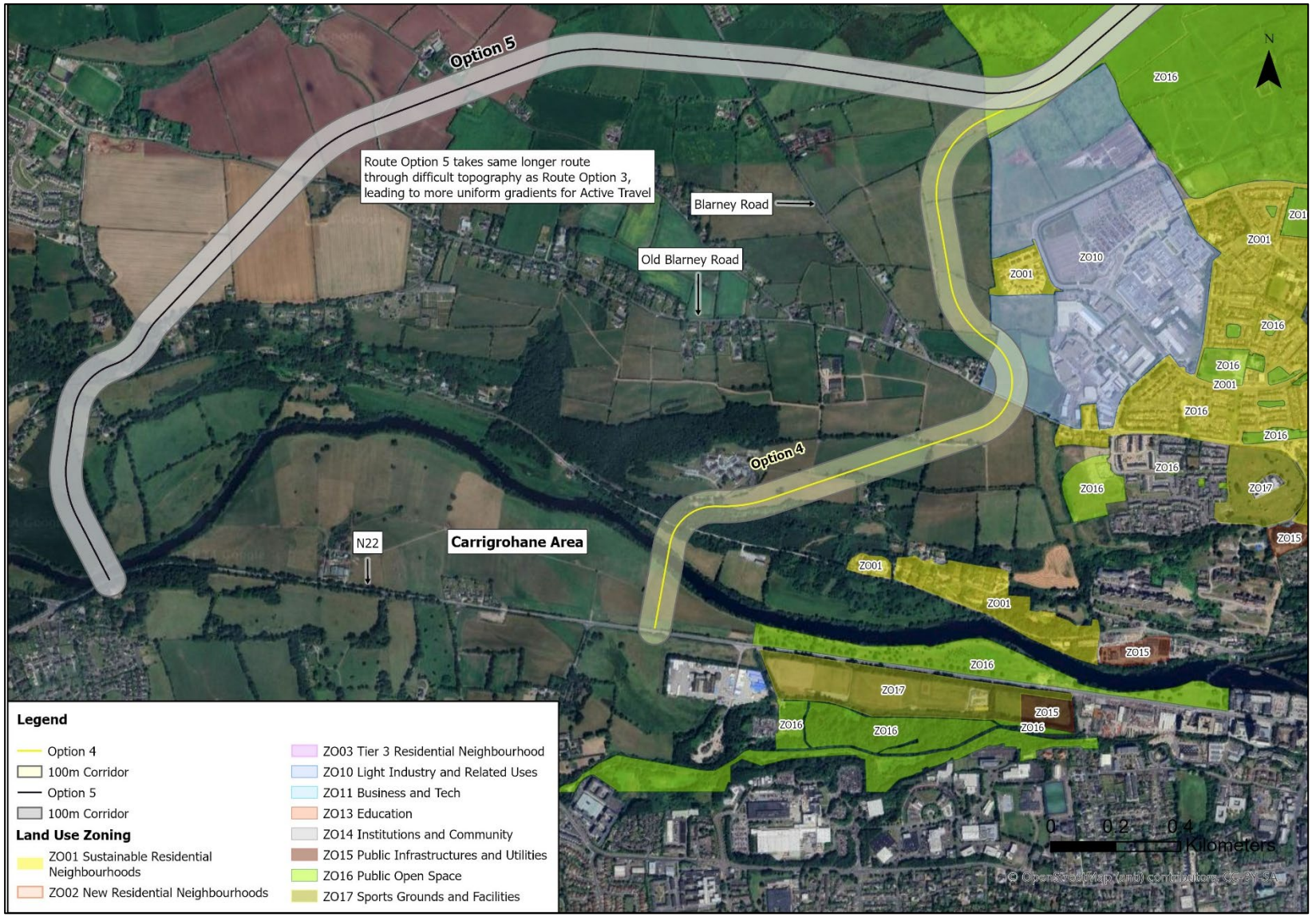


Figure 5-22: Route Option 5 – Northern

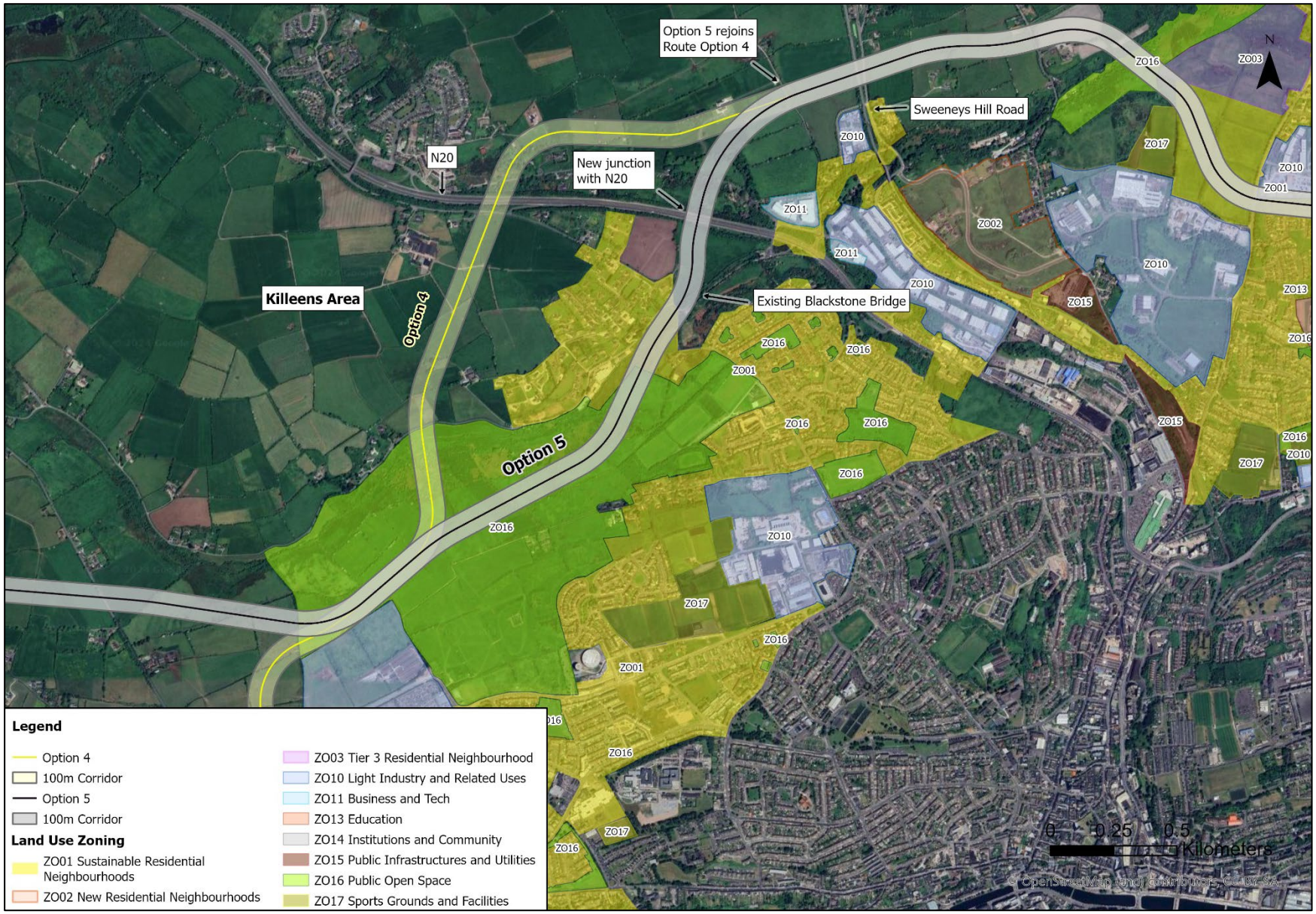
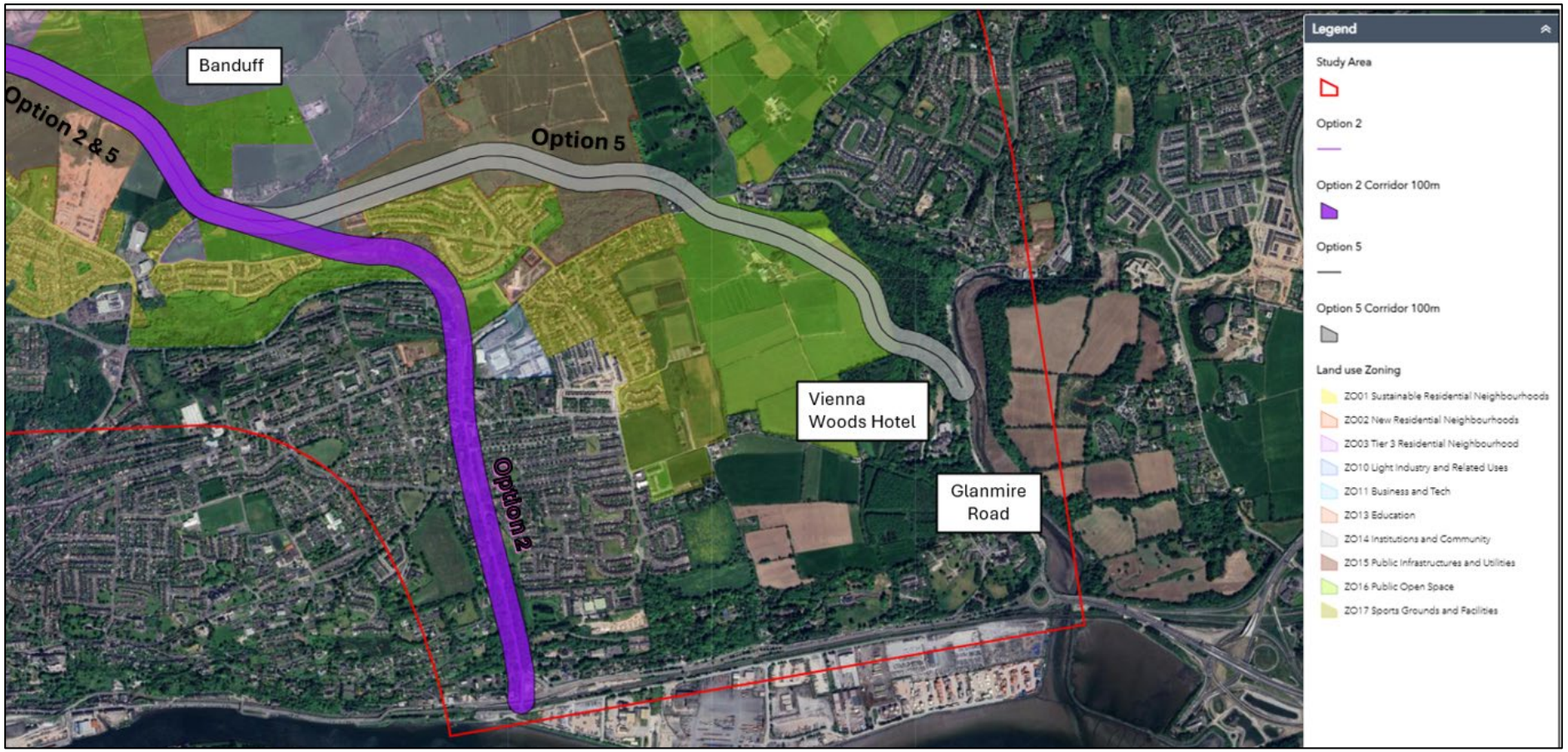


Figure 5-23: Route Option 5 – Eastern End

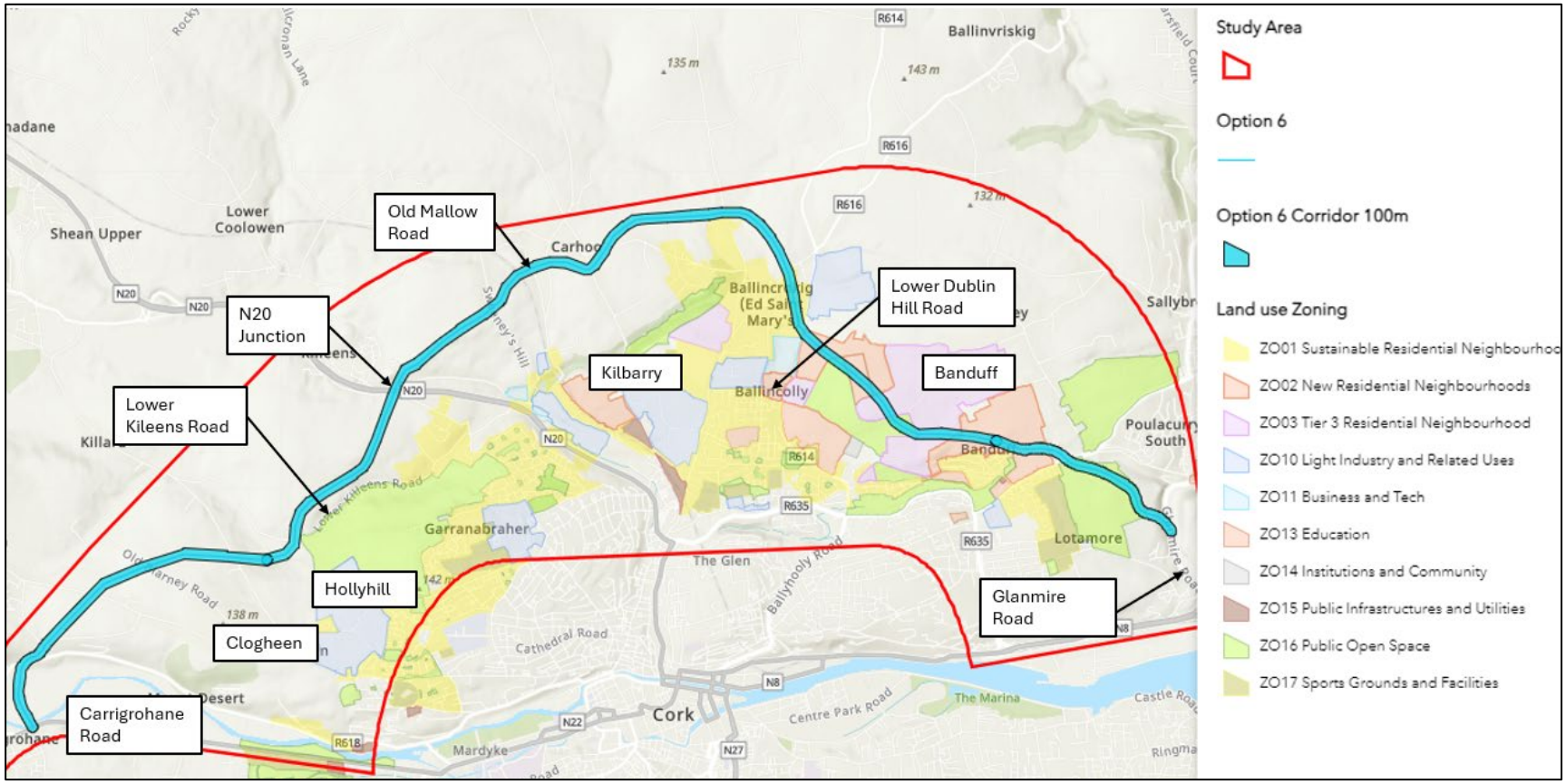


5.3.6 Route Option 6

Route Option 6 is shown on the Route Option 6 with Constraints Mapped – Drawing no. MCT0825-RPS-00-XX-DR-G-AP0008 in **Appendix C** and in **Figure 5-24**.

Route Option 6 outlines a potential alternative route that also avoids constraints but not fully bound to the defined Zone of Influence as defined in **Figure 5-5**. Route Option 6 aims to have minimal impact from topographical constraints whilst also attempting to avoid impacts on properties.

Figure 5-24: Route Option 6

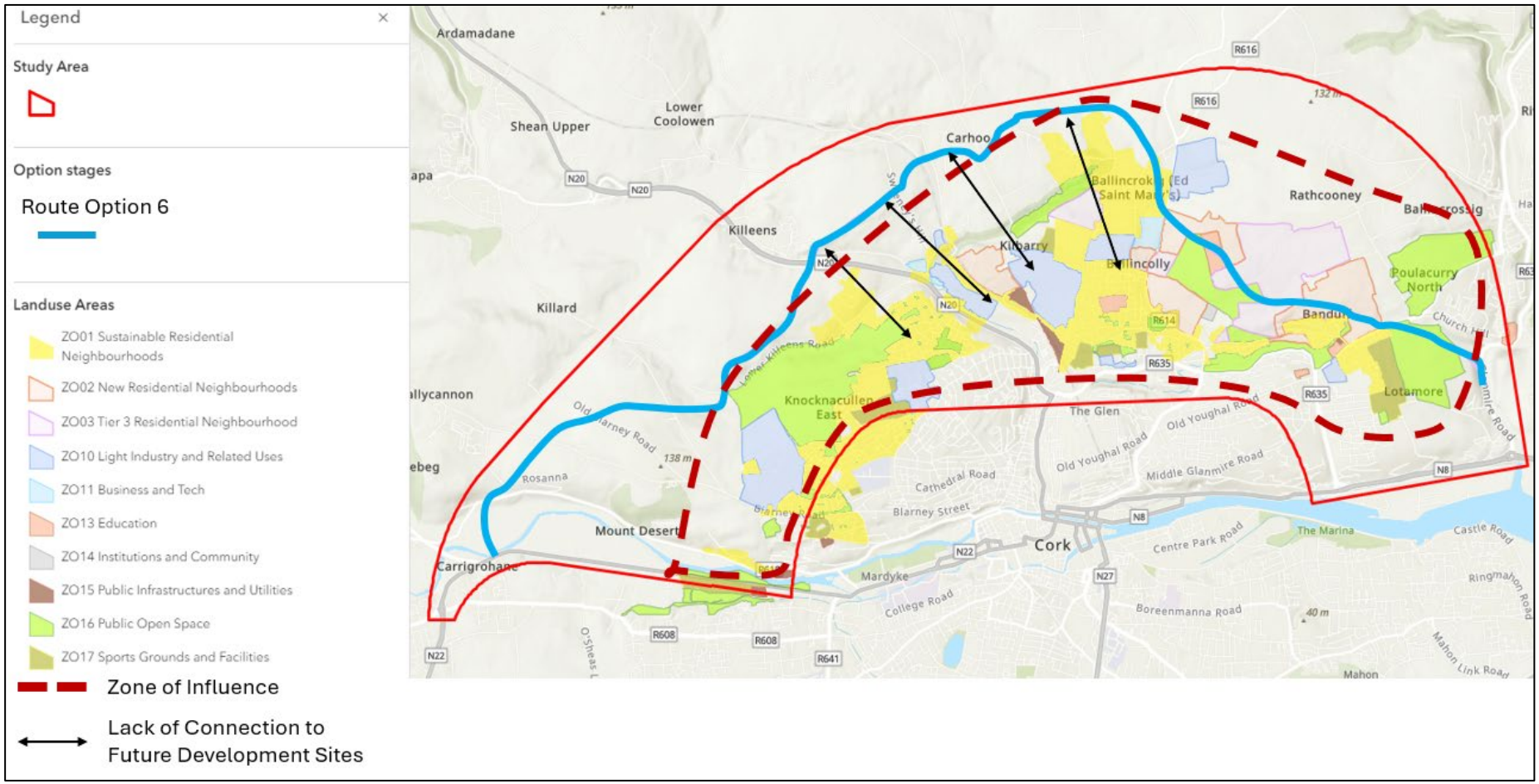


Route Option 6 follows Route Option 3 and 5 to the west (from Carrigrohane to Blarney Road) and Route Option 4 and 5 to the east (from Banduff to Glanmire Road). With the exception of following Route Option 4 across the N20, Route Option 6 meanders a path through the north of the study area, where it attempts to avoid constraints, particularly residential clusters.

Option 6 appears to offer little opportunity for existing and future communities as it has limited interaction with the land zoning types for a large area as shown in **Figure 5-25**. When compared to Options 1 to 5, Option 6 offers less opportunity to meet the Project Objectives particularly in relation to active travel based Project Objectives. By not interacting with existing and future communities directly it would create longer journey times for active travel users, which would reduce the impact on modal shift.

It would also have a negative effect on public transport routes by not directly interacting with the lands zoned for development. The limited connection with future communities also means that this option is less likely to reduce traffic on radial routes and as a result will be less successful in facilitating provision of sustainable transport measures such as BusConnects. Therefore, Option 6 was not considered further in the assessment process.

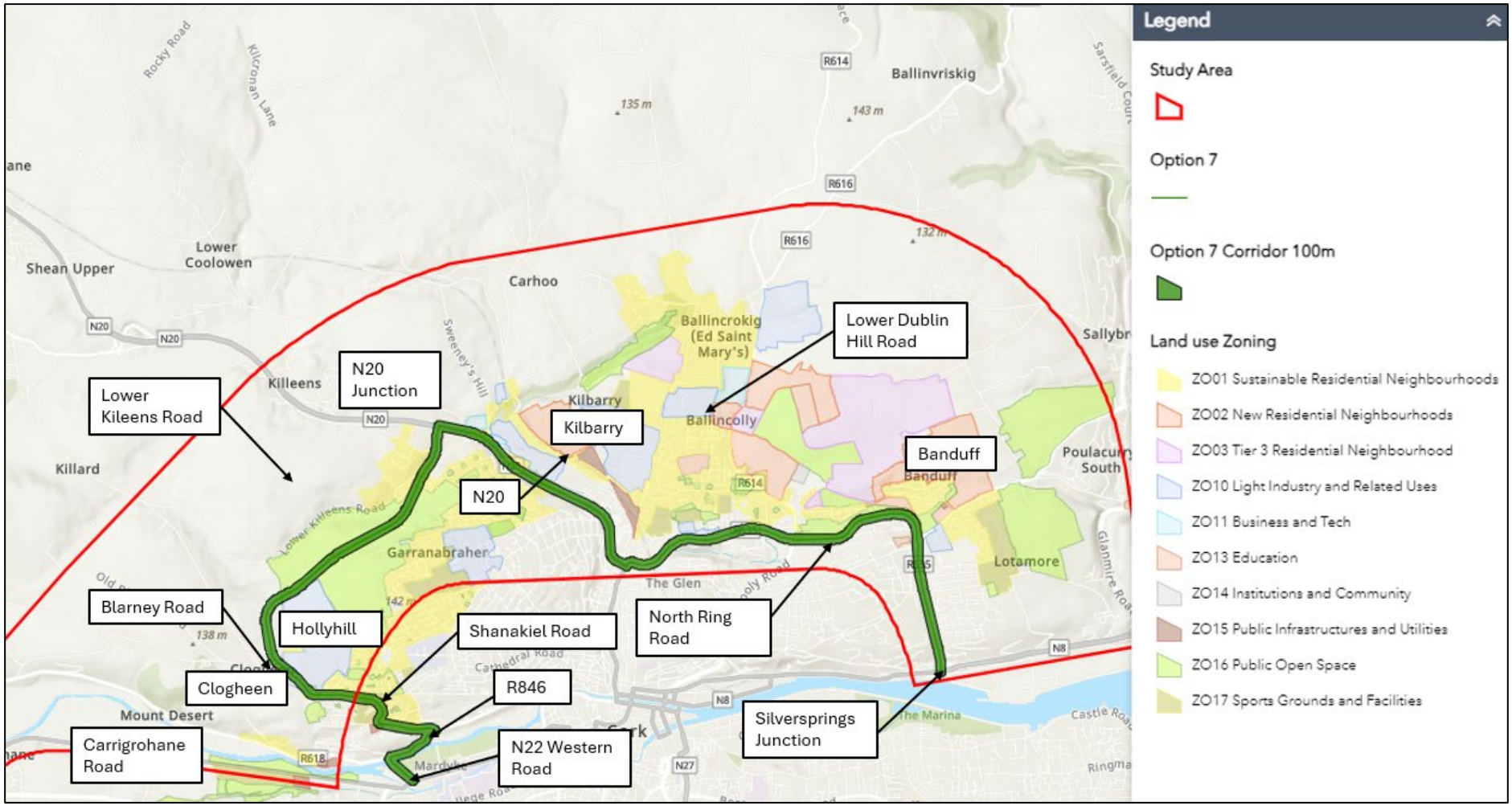
Figure 5-25: Route Option 6 Connectivity



5.3.7 Route Option 7

Route Option 7 is shown on the 'Route Option 7 with Constraints Mapped – Drawing no. MCT0825-RPS-00-XX-DR-G-AP0009' in **Appendix C** and in **Figure 5-26**. Route Option 7 was developed with the aim of utilising the NIFTI Intervention Hierarchy 3 – Improve, by using the existing road networks with a vision of improving these for the facilitation of the CNDMR.

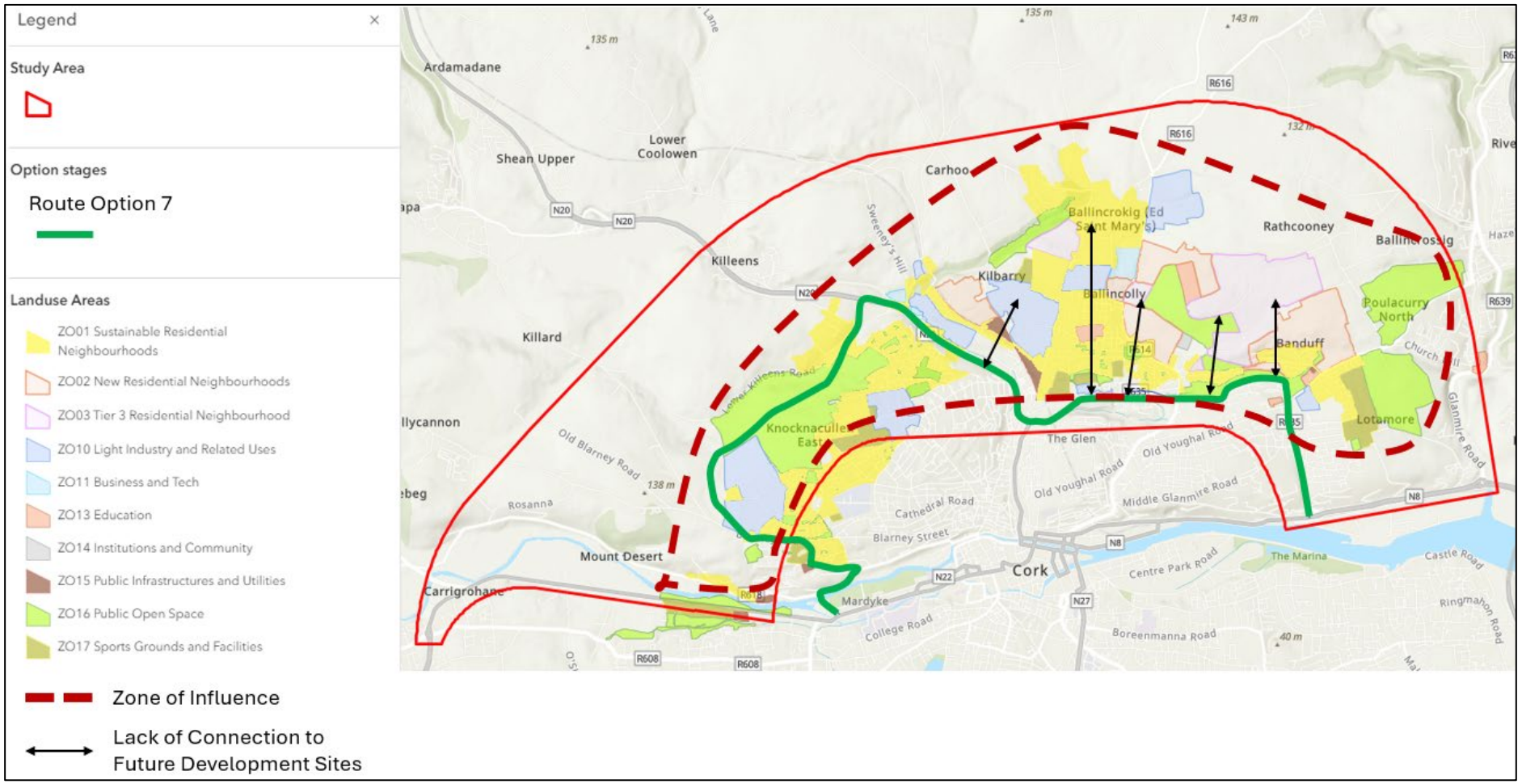
Figure 5-26: Route Option 7



Route Option 7 utilises sections of existing road across the majority of its length. Route Option 7 commences at the N22 Western Road and follows the R846 along Thomas Davis Bridge and east along Sunday's Well Road to Shanakiel Road. Route Option 7 then follows Blarney Road northwest and deviates offline at Hollyhill zoned industrial lands, traversing west around the Apple complex along the path of Route Option 2. It stays on the same path as Route Option 2 until it meets the N20 near Northpoint. At this point Route Option 7 joins the N20 and follows it southwest into Blackpool, and then follows the North Ring Road until it terminates at Silversprings Junction.

Mapping of this Route Option shows it offers little value in achieving the project objectives as it does not provide direct access to the future communities. **Figure 5-27** illustrates Route Option 7.

Figure 5-27: Route Option 7 Connectivity



At its south-western extents, there are significant existing topographical and built environment constraints over a large section of the route that would significantly constrain development and therefore would not align with the following environmental objectives of this project:

- E3: To protect existing communities and promote new communities through sensitive design and place making.
- E4: To protect, and minimise the impact on the built environment.

An example of the existing constrained built environment and topography is shown in **Figure 5-28**. These buildings are located at the southern section of the route at the Shanakiel Road.

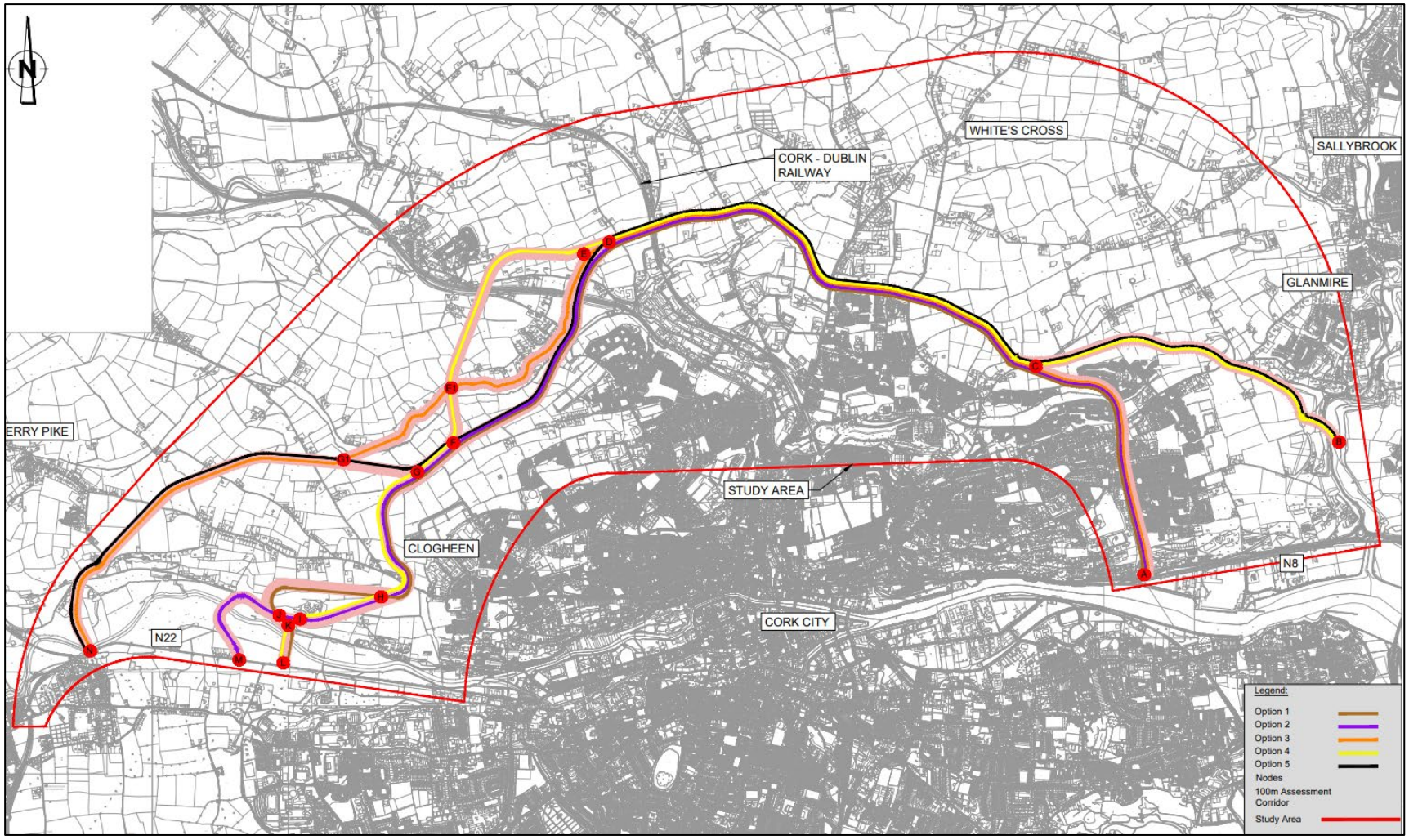
Figure 5-28: Topographical and Existing Built Environment Constraints along Shanakiel Road

As a result of the lack of connections to future communities, built environment constraints, and negative environmental impacts this option was not considered further.

5.3.8 Route Option Summary

Route Options 1 to 5 are being carried forward to the Longlist Appraisal and are as shown on Drawing no. MCT0825-RPS-00-XX-DR-C-DG0027 – Longlist of Options in Appendix C and in **Figure 5-29** below. Route Options 1 to 5 are considered to be most aligned with the Project Objectives and therefore merit consideration as part of the preliminary assessment of options.

Figure 5-29: Final Longlist of Options



5.4 Preliminary Assessment

The Preliminary Options Assessment involved a comparative Multi-Criteria Analysis (MCA) of the potential impacts of the five route options and examined their relative success in achieving the Project Objectives in accordance with TAF guidance.

5.4.1 Methodology

The TAF requires the MCA be carried out as a qualitative measurement of the route options against the Project Objectives but should use quantitative evidence where possible. Considering this, and the Logic Path Models guidance in the TAF, a set of measurable Key Performance Indicators (KPIs) have been developed. These KPIs related directly to the Project Objectives. Some of the Project Objectives are design or process lead and therefore a meaningful KPI with regard to option sifting cannot be applied as the design stage of each option will aim to satisfy these Project Objectives through standardised engineering approaches. The KPIs set out in **Table 5-1** have been developed for the purposes of options sifting.

Table 5-1: CNDMR Full List of Project Objectives and KPI's

Criteria	Project Objectives		KPI for Option Sifting
Transport User Impacts and other Economic Impacts:	**T1**	To deliver a scheme that provides value for money for the state	No KPI. A Cost Benefit Analysis is carried out at Detail Appraisal stage of the Option Selection in accordance with TAF guidance. Considering this, no KPI has been assigned to the Preliminary Options Assessment in relation to value for money, or cost benefits
	T2	To provide a sustainable transport route with journey time reliability from the eastern to western side of Cork City serving existing and planned communities within the northern side of the city and beyond	KPI is the sum of junction delays for straight-on movements at scheme junctions in model. This KPI will measure effects that junction delays may have on bus journey reliability
	T3	To improve the attractiveness of the northern side of Cork City for investment in employment and residential developments	KPI is an accessibility calculation based on modelled car journey times in existing model and all-mode trip length distribution, for development sites. This calculation is used to measure the attractiveness of the Northern side of Cork City based on its accessibility through reliable sustainable transport. Other aspects that could make the north of Cork City attractive for investments are design lead through the construction of attractive housing and employment centres and are not measurable at this stage.
Accessibility:	**A1**	To improve accessibility to jobs and services by all modes and reduce dependency on the private car	KPI is an accessibility calculation based on modelled car journey times in existing model and all-mode trip length distribution, for all zones
	A2	To create high quality, safe and convenient dedicated active travel infrastructure serving adjoining communities	No KPI. This is a design based Objective.
	A3	To form part of a series of integrated transport provisions for Cork City as part of CMATS	No KPI. This objective is a process objective to take forward the scheme in a way that is integrated with other proposals and will be applied commonly to all options, with no direct implications for option selection
	A4	To facilitate the rollout of sustainable transport measures and promotion of non-car travel patterns	KPI is a percentage reduction in AADT flow on radial routes identified as BusConnects Sustainable Transport Corridors to be provided north of the river Lee. This will facilitate the provision of the proposed BusConnect Sustainable Transport Corridors
	A5	To link communities and workplaces by sustainable and active travel modes	KPI is an accessibility calculation based on minimum-distance routes and cycling trip length distribution, for all zones
Land Use:	**L1**	To provide a sustainable transport route centred on non-car based transport modes to	KPI is an accessibility calculation based on minimum-distance routes and cycling trip length distribution, for development sites

Criteria	Project Objectives		KPI for Option Sifting
		unlock the significant development potential along the northern side of Cork City	
Safety:	**S1**	To achieve a reduction in road traffic accidents within the Cork Metropolitan Area	No KPI. These objectives are considered to be design objectives with no direct implications for option selection as current design standards will be used to ensure any option selected will be designed with cognisance of user safety
	S2	To provide a safer environment for cyclists	
	S3	To provide a safer environment for pedestrians and other vulnerable road users	
Climate Change:	**C1**	To support the achievement of carbon emissions targets for the transport sector under the Climate Action Plan, by reducing operational carbon emissions from vehicles within Cork	KPI is a percentage change from DM, CO2 emissions in traffic model
	C2	To facilitate and promote active travel and sustainable public transport thereby reducing emissions in support of the Climate Action Plan and a healthier living environment	Same KPI as L1 and therefore excluded
	C3	To facilitate increased physical activity through improving the attractiveness of cycling journeys within Cork	
	C4	To facilitate increased physical activity through improving the attractiveness of pedestrian journeys within Cork	
Local Environment:	**E1**	To minimise impact on the natural environment within the study area by a process of avoiding sensitive receptors where possible, choosing options that minimise impact, and mitigating remaining impact	KPI is a GIS-based calculation of length of route through various land designations and/or a buffer area around various land designations
	E2	To reduce the negative impact of transport generated air and noise emissions	KPI is a percentage change from Do-Minimum (DM), averaged over local air pollutants in existing traffic model
	E3	To protect existing communities and promote new communities through sensitive design and place making	No KPI. This as a design objective to be applied whichever option is selected, with no direct implications for option selection
	E4	To protect, and minimise the impact on, the built environment	KPI is a GIS calculation of numbers of buildings wholly or partly within the 100m corridor

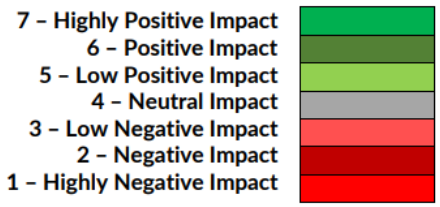
Following the assessment of each preliminary route option under each Project Objective KPI, an overall score was determined. Route Options were rated under each criterion based on the TAF guidance as shown in **Figure 5-30**.

The appropriate scores were assigned to each KPI and were then examined collectively to derive an overall preference for each route option.

Figure 5-30: TAF Scoring Scale for MCA

Box 7.4 MCA Scoring Scale for Transport Appraisals

The following MCA scoring scale example can be used to sift a longlist of options, or to assess scheme impacts at detailed appraisal stage:



Scores should be assigned to options based on their respective impacts on addressing identified issues or opportunities, meeting SMART objectives and probability of impacts occurring. The table below sets out some guidance for assigning scores for impacts and options:

7 – Highly Positive Impact	The option is likely to significantly improve conditions in the relevant criteria.
6 – Positive Impact	The option is likely to improve conditions in the relevant criteria.
5 – Low Positive Impact	The option is likely to somewhat improve conditions in the relevant criteria.
4 – Neutral Impact	The option will result in no changes to conditions in the relevant criteria.
3 – Low Negative Impact	The option is likely to somewhat worsen conditions in the relevant criteria.
2 – Negative Impact	The option is likely to worsen conditions in the relevant criteria.
1 – Highly Negative Impact	The option is likely to significantly worsen conditions in the relevant criteria.

These scores were then summarised in the form of a Stage 1 Performance Matrix to determine which options should proceed to Stage 2 – Detailed Project Appraisal.

5.4.2 Requirements for Carrying out Appraisal

The following section outlines the inputs that were required to carry out an appraisal of the Project Objectives against the measurable KPIs, in accordance with the TAF. This analysis provides a comparative assessment of the identified Route Options, the identification of the Emerging Preferred Option and finally the Preferred Option.

5.4.2.1 Traffic Modelling

The assessment of route options was carried out using a version of the local area traffic model described in the Traffic Modelling Report (Appendix E).

The model had a base year of 2019. The network started from a cordon out of the Southwest Regional Model (SWRM) regional model (most up to date base year is 2016 at time of this Report), was updated to reflect known changes in the intervening period and refined to include greater network and zoning detail in the corridor of interest.

The base year model was calibrated and validated to a combination of:

- Junction Turning Counts (JTC) from outer, mid, and inner cordons of Cork City cordon surveys carried out in November 2019.
- Data from TII Traffic Monitoring Unit permanent count sites.
- The 2016 counts that came with the SWRM network.
- Journey times from a leading internet journey planner.

Specific public transport data was not utilised as the analysis has been carried out using a Highway Local Area Model. This model includes the current public transport trips together with existing bus infrastructure provision. The impacts of BusConnects proposals, in terms of changes to services and provision of improved infrastructure, have not been specifically modelled (proposals are still under development). All options will facilitate the implementation of BusConnects measures, and it is not considered necessary to specifically model BusConnects impacts in combination with the scheme options in order to identify a preferred option.

Forecast traffic growth was taken from SWRM, by comparing an existing future year with-Strategy run (that includes CMATS measures) with the base year run. Growth for internal zones of the model was distributed based on development sites identified in the CDP.

The future year network includes:

- Dunkettle Interchange upgrade scheme.
- M20 scheme – assumed to be an online improvement within the study area
- M28 scheme – assumed to be an online improvement within the study area.
- Docklands bridges and associated road improvements.
- Road improvements within Glanmire associated with new development.
- East-west LRT route.
- Changes to bus network.

For this project, small adjustments were made, further refining the zoning in the vicinity of planned development sites, so as to more accurately locate the origins and destinations of the communities which the CNDMR is intended to serve.

The model is considered to be sufficient for a like-for-like comparison of route corridor options. It is recommended that at the next stage, to inform the design and junction strategy:

- The base year model should be updated to more recent count data and 2022 Census origin-destination patterns
- The future year scenario should be based on a SWRM run that includes the proposed BusConnects project, as this may have a significant impact on the balance of radial and orbital trips by each mode.

5.4.2.2 Travel Time Data Analysis

The Google database of journey times was interrogated to extract a sample of journey times between zones on the Norther side of Cork City and zones within the rest of the modelled area. These journey times are for four modes – Car, Walk, Cycle, Public Transport, in current travel conditions, for journeys departing at 8AM.

Implied speeds in this dataset vary between zone pairs, but the averages over this sample of journeys are:

- Car: 35 kph
- Walking: 4.3 kph
- Cycle: 16 kph
- Public Transport: 10 kph.

Public transport speeds are more variable (because public transport travel opportunities are specific to particular locations). The dataset does not include public transport data for some journeys (presumably those where there is effectively no public transport service available).

These observed times were approximated by a function of:

- Modelled future Do-Minimum journey time for commuting cars (in minutes)
- Length of minimum-distance routes from the future year Do-Minimum model (in km)

Regression analysis was used to derive the following estimators:

- Car time = 1.5 + 0.86 x model time + 0.15 x model shortest-distance

- Walk time = 1.1 + 13.5 x model shortest-distance
- Cycling time = 2.3 + 3.5 x model shortest-distance
- Bus time = 32.5 x SQRT(model shortest-distance) – 1.5 x (model shortest-distance) -15.5

The regression analysis estimates car journey times using a linear function of modelled time and shortest distance. For walking and cycling a linear function of distance (constant speed assumption) gives the best result. For buses a non-linear function based on the model shortest distance was derived.

5.4.3 Longlist Appraisal using Traffic Modelling

For the KPIs relating to accessibility, integration, transport, environmental and physical activity, an analysis was undertaken for each route option using output from the traffic model for car accessibility, and the regression analysis functions to determine accessibility by sustainable modes set out above, for the AM peak.

Accessibility and transport were estimated for every zone, for 4 modes, car, walking, cycling and bus as both accessibility to employment for people living in the zone and accessibility from population for businesses located in the zone.

The KPI statistics used are the gain in accessibility between the Do-Minimum and Do-Scheme model runs.

The analysis has three elements:

- The land-use that accessibility is measured to,
- The measure of travel times between each origin and destination,
- A weighting system that sets out the trade-off between the two – how people weigh up the destinations that are attractive but difficult to get to against those less attractive but closer, in determining how accessible they consider any particular origin location to be.

For this appraisal, each KPI statistic has been converted into a 1-7 score by associating the average value of the KPI statistic over the five routes with a score of 5.5 (slight-to-moderate positive) and using the ratio of the route-specific statistic to the average statistic to vary the individual scores. On this basis, a route scores the maximum 7 against any objective if it performs twice as well as the average, scores 4 if it has a minimal/zero KPI impact and could conceivably have a negative impact with a score below 4. Where there is little difference between the KPIs for different route options, scores will cluster around 5.5. Output from the traffic model was used to assess two environmental Objectives, E2 and C1, the results of which, have also been included in **Table 5-2.**

For objective A4, to facilitate the rollout of sustainable transport measures and promotion of non-car travel patterns, the impact of options on traffic flow on the routes identified through BusConnects as sustainable transport corridors has been analysed. As stated in Section 5.3.2.1, this does not include the modelling of the BusConnects network. The reduction of traffic flow on BusConnects route as a result of the CNDMR are considered to be beneficial to the BusConnects journey time reliability.

The location of the sustainable transport corridors together with the location where traffic flows have been analysed is presented in **Figure 5-31**.

Figure 5-31: BusConnects Sustainable Transport Corridors – Location of Traffic Flow Forecasts

Table 5-2: Longlist Option Appraisal Matrix results from Transport Modelling

Objective:	KPI		Option 1	Option 2	Option 3	Option 4	Option 5
T2 To provide a sustainable transport route with journey time reliability from the eastern to western side of Cork City serving existing and planned communities within the northern side of the city and beyond	Sum of all vehicle junction delays for straight-on movements at scheme junctions in peak hours	Statistic	338	354	375	296	386
		Score	**5.6**	**5.5**	**5.4**	**5.8**	**5.4**
T3 To improve the attractiveness of the northern side of Cork City for investment in employment and residential developments	Percentage change in all-mode accessibility to development sites	Statistic	4.3%	4.8%	4.7%	4.8%	3.3%
		Score	**5.5**	**5.7**	**5.6**	**5.7**	**5.1**
A1 To improve accessibility to jobs and services by all modes and reduce car dependency	Percentage change in all-mode accessibility for all zones	Statistic	2.8%	3.7%	3.5%	3.7%	3.3%
		Score	**5.2**	**5.6**	**5.5**	**5.6**	**5.4**
A4 To facilitate the rollout of sustainable transport measures and promotion of non-car travel patterns	Percentage reduction in AADT flows across a cordon of BusConnects sustainable corridor routes north of the river Lee.	Statistic	7.1%	8.5%	7.7%	8.8%	9.0%
		Score	**5.3**	**5.6**	**5.4**	**5.6**	**5.6**
A5 To link communities and workplaces by sustainable and active travel modes	Percentage change in non-car accessibility for all zones	Statistic	1.5%	1.4%	1.2%	1.3%	0.9%
		Score	**5.8**	**5.7**	**5.4**	**5.6**	**5.1**
L1 To provide a sustainable transport route centred on non car-based transport modes to unlock development potential	Percentage change non-car accessibility to development sites	Statistic	2.5%	2.4%	2.4%	3.1%	1.7%
		Score	**5.5**	**5.5**	**5.5**	**5.9**	**5.1**
C1 To support the achievement of carbon emissions targets by reducing operational carbon emissions from vehicles	Network-wide % change from DM, CO2 emissions	Statistic	0.0%	-0.3%	-0.1%	-0.5%	-0.4%
		Score	**4.0**	**5.7**	**4.6**	**6.9**	**6.3**
E2 To reduce the negative impact of transport generated air & noise emissions within the city	Network-wide % change from DM, averaged over local air pollutants (CO, NOX, HC, PM10)	Statistic	-0.7%	-1.0%	-0.7%	-1.4%	-1.3%
		Score	**5.1**	**5.4**	**5.1**	**6.1**	**6.0**
	Total		**42.0**	**44.7**	**42.5**	**47.2**	**44.0**
	AVERAGE		**5.3**	**5.6**	**5.3**	**5.9**	**5.5**
	Overall Impact		**Low Positive**	**Positive**	**Low Positive**	**Positive**	**Positive**

Objective T2 - *To provide a sustainable transport route with journey time reliability from the eastern to western side of Cork City serving existing and planned communities within the northern side of the city and beyond*: Option 4 is the highest performing option for objective T2, giving the lowest levels of junction delay for traffic using the scheme. Total junction delays (for ahead movements using the scheme) for Option 4 are approximately 12% lower than those for the next highest performing scheme (Option 1). Option 4 preforms better than Options 1, 2, and 3 primarily due to Option 4 joining the N8 via Glanmire Road at Dunkettle Roundabout. Options 1, 2, and 3 join the N8 at the Silversprings Junction via the Northern Ring Road – which is a more congested route. Option 4 takes traffic away from the Silversprings Junction . Although Option 5 also joins the N8 at Dunkettle Roundabout, it also has greater congestion at the junction with the N22, which is much closer to the congested N22/R618 junction.

Objective T3 - *To improve the attractiveness of the northern side of Cork City for investment in employment and residential developments*: Options 2, 3, and 4 score almost identically for objective T3 as the highest scoring options, followed by Option 1, with Option 5 having the lowest score. The main differences in the scoring of the options are due to:

- Options 3 and 5 score lower due to the greater distance between the scheme and built-up areas on the western side of the city
- Options 3 and 4 provide better access to Blarney
- Options 4 and 5 provide better access to and from Glanmire

Objective A1 - *To improve accessibility to jobs and services by all modes and reduce car dependency*: As this objective is relevant to all trips as opposed to those between to/from future communities the scoring will heavily reflect the impact on trips to/from the city. In general, the options that make travel to/from the city centre easier will score the highest for this objective. Option 1 has the lowest score, with Options 2 and 4 scoring the highest. There are many factors influencing how the Options impact on overall accessibility and some of those are summarised below.

- Option 5 is located furthest from the city centre and has the lowest improvement in sustainable travel accessibility. Options 1 and 2 are located the closest to the city centre
- For trips with an origin or destination outside of the city, Option 5 provides the shortest route in most cases – thereby giving a greater benefit for car trips. Option 4 provides the second shortest route.
- Options 1, 2 and 3 do not address congestion, and increase traffic, at the Silversprings Junction. Options 4 and 5 avoid this location and reduce traffic and congestion, thereby providing greater accessibility for cars and buses.
- Options 2, 3 and 5 tie into the N22 at locations west of the junction with Inchigaggin Lane, which is currently congested, particularly in the AM peak. This reduces traffic and congestion at the junction, improving accessibility.
- Options 1, 2 and 4 provide better access for all modes to western areas of the city – e.g. Hollyhill and Hollymount Industrial Estates

Objective A4 - *To facilitate the rollout of sustainable transport measures and promotion of non-car travel patterns*: Option 5 is the highest performing option for Objective A 4 as it results in the greatest overall reduction in flow on BusConnects Sustainable Transport Corridors located north of the river Lee. The next highest scoring options are Option 4 and Option 2, although there is relatively little difference between these options, and they all score 5.6. Option 1 is the lowest performing option, scoring 5.3. There are numerous factors that influence the reassignment of traffic onto the scheme and away from the Sustainable Transport Corridors and the main factors affecting the performance against this criterion are summarised below.

- Options 1, 2, and 3 utilise an improved R635 North Ring Road, which, together with Silversprings Junction is much more congested than the R639 Glanmire Road route utilised by Options 1 and 5. This makes Options 1, 2, and 3 more congested and less attractive.
- Options 4 and 5 provide a shorter and quicker route for traffic travelling between Glanmire and areas north and west of the city. They also provide a shorter route overall for trips between areas east and west of the city (e.g. between Ballincollig and Little Island). As a result, they attract more traffic and reduces flow on radial routes into the city.
- Options 3 and 5 provide a shorter route for the western section of the scheme making them more attractive for through trips and trips to/from the north and eastern areas of the city. These options are

however less attractive for traffic travelling between areas west of the city and Blarney Road (e.g. Hollyhill Industrial Estate).

- Options 3 and 4 are routed west of Lower Killeens Road; this increases their length relative to the other routes making them less attractive.
- Options 1 and 4 join the N22 Carrigrohane Road just east of the Inchigaggin Lane junction whereas all other options join the N22 just west of the Inchigaggin Lane junction. Options 1 and 4 therefore increase the traffic at the Inchigaggin Lane junction resulting in congestion, particularly in the AM peak hour. This makes options 1 and 4 less attractive.

Objective A5 - *To link communities and workplaces by sustainable and active travel modes:* Options 1 to 4 score similarly for Objective A5 with Option 1 having the highest score. Option 5 has the lowest score. As this objective is relevant to all trips as opposed to those between to/from future communities the scoring will heavily reflect the impact on trips to/from the city. As a result, Option 5 scores significantly lower as it located the furthest from the city at both the western and eastern extents of the scheme. Options 1 and 2 score the highest as they are located closest to the city and built-up areas.

Objective L1 *Percentage change non-car accessibility to development sites***:** Option 4 is the highest performing option for Objective L1, with Option 5 being the lowest performing option. Options 1, 2 and 3 have virtually identical performance for this objective. The scoring for this objective is similar to that for T3, as the same differences between the options apply in both cases.

Objective C1 - *To support the achievement of carbon emissions targets by reducing operational carbon emissions from vehicles* **:** Options 4 and 5 score significantly higher for Objective C1 than Options 1, 2, and 3. Emissions of CO_2 are predominantly determined by vehicle kilometres travelled and average speed. In this case, the scheme length east of the N20 is shorter for Options 4 and 5 (by approximately 500m. Also, Options 4 and 5 avoid the congestion and slow speeds on the section of the R635 Northern Ring Road between Old Youghal Road and the N8, resulting in more efficient speeds and reduced CO2 emissions.

Objective E2 - *To reduce the negative impact of transport generated air & noise emissions within the city:* Options 4 and 5 score significantly higher for Objective E2 than Options 1, 2, and 3. This is because they both take traffic away from the R635 Northern Ring Road which is congested and has significant residential areas nearby.

5.4.3.1 Longlist Appraisal using Traffic Modelling Results

Based on the results demonstrated in **Table 5-3,** the following options ranked highest based on the appraisal of KPI's relating to Accessibility, Integration and Transport.

1. Option 4
2. Option 2
3. Option 5

5.4.4 Natural and Built Environment Appraisal of Longlist

In terms of the natural and built environment impacts of the proposed options, the longlist was assessed against the Project Objectives KPIs as outlined in **Table 5-2** and in accordance with Section 7.2.8 and 7.2.9 of TAF Module 7 Detailed Guidance on Appraisal Techniques.

A summary of how the longlist was assessed is provided below under the various headings as outlined in TAF Module 7.

The project objectives, KPIs and the summaries for the associated topics are outlined below. The most recent available environmental data (2024) was used to assess the corridor options against the project objectives and key performance indicators.

5.4.4.1 Natural Environmental Appraisal of Objective E1

EN1: To minimise impact on the natural environment within the study area by a process of avoiding sensitive receptors where possible, choosing options that minimise impact, and mitigating remaining impact.

KPI: GIS-based calculation of length of route through various land designations and/or a buffer area around various land designations.

In relation to the above objective, a number of topics were assessed using various GIS based calculations on sensitive designations for that topic, for each route option. For E1 it was decided that the most relevant topics were Biodiversity, Soils & Geology, Water Quality/Hydrology/Hydrogeology, Landscape and Visual and Cultural Heritage. Refer to **Table 5-3** below. Each route was then scored from 1-7 based on Box 7.4 in TAF Module 7. The score for each route was summed for the five topics to arrive at an average score for the combined topics.

Table 5-3: Longlist Option Appraisal Matrix of Natural Environment Objectives

Project Objective	Route Options				
	1	2	3	4	5
Project Objective **E1** To minimise impact on the natural environment within the study area by a process of avoiding sensitive receptors where possible, choosing options that minimise impact, and mitigating remaining impact					
Biodiversity	2	2	2	1	1
Soils & Geology	2	2	3	2	1
Water Quality / Hydrology/Hydrogeology	3	2	1	2	2
Landscape & Visual	2	1	2	1	1
Cultural Heritage	1	1	1	1	1
Total Score	10	8	9	7	6
EN1 Average Score	2.0	1.6	1.8	1.4	1.2

Biodiversity

Options 1, 2 and 3 are considered to have a negative impact on biodiversity due to the following factors that are common to all 3 options. All three options:

- Primarily traverse agricultural lands and would require considerable green field development
- Are located approximately 2km to the west of Cork Harbour SPA at the point where the North Ring Road meets the Lower Glanmire Road near Tivoli
- Are also located approximately 1.5km upstream from the Cork Harbour Ramsar Site and Douglas River Estuary pNHA
- Traverse the Lee Valley pNHA at different points. Option 1 traverses this pNHA for 100m, Option 2 for 170m and Option 3 for 50m
- Traverse the woodland over the River Bride in the Bride Valley near Kilcully.
- Traverse areas of woodland associated with the Lee Valley pNHA (near the Bon Secours Care Village) as noted above.
- Require four river crossings each and cross the Glen River in Mayfield and the River Bride in the Bride Valley near Kilcully.
- Cross the River Lee at different points before intersecting with the Carrigrohane Road.

Options 1 and 2 cross the Kiln stream, north of Na Piarsaigh GAA club near Fairhill, while Option 3 crosses this watercourse further upstream (classified as the Shournagh stream). Options 2 and 3 also traverse an area of woodland southwest of Na Piarsaigh GAA Club in Fairhill.

Options 4 and 5 are considered to have a highly negative impact due to a number of factors relating to biodiversity.

The easternmost point of both options (Glanmire Road) is located immediately adjacent to Cork Harbour SPA. As bird species from the SPA will utilise adjacent lands (i.e. for foraging), the lands in the vicinity of the SPA must also be considered a constraint in addition to the site of the SPA itself. Option 4 and Option 5 primarily traverse agricultural lands and would require considerable green field development.

This area of the SPA, located along the Glashaboy River between Glanmire and the Dunkettle Roundabout, also overlaps with the areas designated as Glanmire Wood pNHA and Dunkettle Shore pNHA. The Cork Harbour Ramsar Site and Douglas River Estuary pNHA are located approximately 1.4km downstream of Options 4 and 5. Both options also traverse the Lee Valley pNHA (near the Bon Secours Care Village). Option 4 traverses this pNHA for a distance of 100m, and Option 5 for a distance of 50m.

Both options would traverse areas of woodland surrounding Vienna Woods Hotel, and pass through woodland in the River Bride Valley near Kilcully, and southwest of Na Piarsaigh GAA club near Fairhill. Both options traverse areas of woodland associated with the Lee Valley pNHA, as noted above.

Options 4 and 5 require three river crossings at various locations. Both options cross the River Bride at a location in the Bride Valley near Kilcully. Option 5 crosses the Kiln stream, north of Na Piarsaigh GAA club near Fairhill, while Option 4 crosses this watercourse further upstream (classified as the Shournagh stream). Both options cross the River Lee at different points before intersecting with the Carrigrohane Road.

Soils and Geology

Options 5 is considered to have the greatest negative impact of all options given the high levels of material excavation required for this route and the longest length of road of all options mapped as having rock at or near the surface (3,335m). Options 1, 2 and 4 are considered to have a negative impact given the significant lengths of road mapped as crossing over rock at or near the surface (Option 1: 2900m, Option 2: 2,310m and Option 4: 2, 080m). Option 3 is considered to have a slight negative impact based on this option having the shortest length (1,525m) of areas designated as having rock at or near the surface.

Water Quality / Hydrology/Hydrogeology

All Options cross relatively minor lengths of aquifer classified as RI (ranging from 20m in Options 3 and 5 to 150m in Options 1 and 4 and 190m in Option 2.

In terms of flooding Option 3 is considered to have a highly negative impact as this option traverses the most significant areas of high flood risk (930m) resulting in the greatest potential for flood risk.

Options 2, 4 and 5 can be considered to be of Intermediate preference with a less negative impact than Option 3 (these options cross lengths of 440m-640m of high flood risk) Option 1 is considered to have a slightly negative impact based on this option crossing the shortest lengths of high flood risk (340m).

Landscape & Visual

Options 1 and 3 are considered to have a negative impact due to a number of factors relating to landscape and visual amenity. In terms of landscape impacts they will have minor direct impacts on Landscape Preservation Zones and medium and minor direct impacts on Areas of High landscape Value when assessed according to current landscape best practice. While designated scenic routes will be crossed, the direct impact on the protected views from these routes will have a minor direct effect.

Options 2, 4 and 5 are considered to have a highly negative impact on landscape and visual amenity. Options 4 and 5 score poorly in terms of landscape amenity due to their major direct impact on Landscape Preservation Zones on the western side of the Glashaboy Valley. All three options also will have major direct effects on designated scenic routes, namely HPV1 and HPV5, resulting in a score of 1 (Highly Negative) for each of these options.

Option 4 would have visual impacts on the smallest number of residential dwellings within 100 metres of the route alignment, however, the other impacts this route would have on landscape and visual amenity results in this route alignment having a score of 1.

Cultural Heritage

All options could result in the potential removal of archaeological features which could result in negative impacts on archaeological sites within their environs as well as lands associated with country houses listed in the RPS, NIAH or RMP. Recorded archaeological sites are protected under the National Monuments Act (1930-2004) and Profound negative impacts for the emerging preferred option should be avoided by design where feasible and in consultation with the Cork City Council Archaeologist and the National Monuments Service of the Department of Local Government, Housing and Heritage. The design of the emerging preferred option at the locations and environs of all identified cultural heritage assets should also aim to reduce or avoid potential Significant negative impacts. Option 1: Highly negative as it will result in negative impacts by the removal of 3 no. recorded archaeological monuments (Standing Stones CO063-111----, CO074-014---- and CO074-013----) as well as Significant negative direct impacts on a burnt mound site (CO074-132----) and lands associated with Mount Desert House (CO074-091----).

Option 2: Highly negative as it will result in negative impacts on 4 no. recorded archaeological monuments (Standing Stones CO063-111----, CO074-014---- and CO074-013---- and Fulacht Fiadh CO074-027----) as well as Significant negative direct impacts on a burnt mound site (CO074-132----) and lands associated with Mount Desert House (CO074-091----).

Option 3: Highly negative as it will result in negative impacts on 1 no. recorded archaeological monument (Standing Stone CO063-111----) as well as Significant direct negative impacts on a burnt mound site (CO074-132----), lands associated with a Protected Structure (Ardnalee House PS 1162) and lands associated with the site of Kitsborough House (CO073-047---).

Option 4: Highly negative as it will result in negative impacts by the removal of 2 no. recorded archaeological monuments (Standing Stones CO063-111---- and CO074-012----). It will also result in Significant direct negative impacts on lands associated with Vienna Woods House (NIAH Garden 3022), Lauriston House (NIAH Garden 3015) and Mount Desert House (CO074-091—)

Option 5: Highly negative as it will result in negative impacts on 4 no. recorded archaeological monuments (Standing Stones CO063-111----, CO074-012----, CO074-013---- and CO074-014----) as well as Significant direct negative impacts on lands associated with a Protected Structure (Ardnalee House PS 1162) as well as lands associated with Vienna Woods House (NIAH Garden 3022), Lauriston House (NIAH Garden 3015) and Kitsborough House (CO073-047----). A Significant direct impact on a burnt mound (CO074-132----) will also result from this option.

Options 1, 2, 3 and 4 all have been assigned a score of 1 (Highly Negative) preference based on the number of their negative direct impacts. While Options 3 and 4 will result in fewest significant impacts (1 no and 2 no. respectively) they will both also result in Significant direct impacts (Option 3 – 3 no. / Option 4 – 4 no.) and neither can be considered as having “Intermediate” preference given the highly negative nature of these impacts. Of these two options, Option 4 has noticeably fewer cultural heritage assets within its study area corridor than Option 3 and based on this marginal difference has slightly less impact.

Options 5 is most highly negative on a marginal basis as it will result in the joint highest amount of significant direct negative impacts (4 no.), the highest amount of and Significant (5 no.) direct negative impacts, the highest amount of Moderate direct negative impacts (6 no.) and the study area for this option also contains the second highest amount of identified cultural heritage assets (40 no.).

5.4.4.2 Environmental Appraisal Built Environment – Objective E4

E4: To protect, minimise the impact on, the built environment.

KPI: GIS calculation of numbers of buildings wholly or partly within the 200m corridor.

The most relevant environmental topics to this objective and KPI are Population & Human Health and Material Assets. Each route option was scored and the score for both topics was averaged to reach on overall score as per TAF guidance. Refer to **Table 5-4**.

Table 5-4: Longlist Option Appraisal Matrix of Built Environment Objectives

Project Objective	Route Options				
	1	2	3	4	5
Project Objective **E4** To protect, and minimise the impact on, the Built environment					
Population & Human Health	**2**	**2**	**2**	3	2
Material Assets (Non-Agriculture)	2	2	2	3	3
Total Score	4	4	4	6	5
EN5 Average Score	2	2	2	3	2.5

Population and Human Health

Option 4 is rated best of the five options for Population & Human Health and is rated as Slight Negative. This is due to the fact that it has the lowest number of properties within 50m (70 properties) and the least number of properties within 300m of the scheme at 1,083.

Option 5 has the next lowest number of properties within 300m (1,627), however, conversely it has the highest number (145) of residential properties for any option ,within 50m of the scheme.

Route Options 1, 2 and 3 have similar numbers of properties within 300m at 2,032, 2,031 and 2,035 respectively.

Therefore Options 1,2,3 and 5 were given the same impact rating of Negative, whilst Option 4 with fewer properties being within 50m and 300m was rated as being Slight Negative. It also has the fewest number of properties within the 200m corridoor (914).

All options pass close to healthcare & community facilities as well as schools, which may have both positive impacts in terms of access to public transport and negative impacts in terms of air and noise.

Material Assets (Non-Agriculture

Of the five route options, Option 1 and Option 2 have the highest number of commercial properties within 0-50m and 0-300m, with Option 1 and 2 both having 7 commercial properties within 50m of their alignments, and 86 and 88 properties within 300m respectively. Option 3 has a slightly lower number of commercial properties within 300m at 72, however the number of properties within 50m of its alignment is similar to Options 1 and Option 2 at 20 properties.

Option 4 and Option 5 have the lowest, and similar level of properties within 300m at 49 and 42 properties respectively. However, Option 4 has the lowest number of commercial properties within 50m at 2, and Option 5 has the second lowest at 4.

In terms of forestry cover all options are similar; some options interacting more in the east and others in the west. In terms of water services Options 1, 2, 3 and 5 have the highest level of interaction with water mains (c.20, 18, 18, 19) while Option 4 intersects at 10 locations. Options 4 and 5 have less potential to interact with GNI pipelines.

5.4.4.3 Longlist Appraisal Results for Natural and Built Environment

Based on the results demonstrated in **Tables 5-3** and **Table 5-4,** following the appraisal of KPIs relating to Natural and Built Environment, the options are ranked in order of preference as follows.

1. Option 4
2. Option 1
3. Option 3
4. Option 5
5. Option 2

5.4.5 Physical Activity Appraisal of Longlist

All routes will include high quality active travel facilities. There are influencing factors that may discourage usage of the facilities for physical activity.

Options 1, 2 and 3 have a significant gradient constraint along the existing R635 that cannot be mitigated through design measures. Options 4 and 5 do not use the R635 and therefore have greater possibility to mitigate difficult, unattractive gradients through design.

Options 4 and 5 are longer and traverse through greater areas of sparse development, this can also be unattractive as there is increased distance between potential destinations and less passive surveillance.

As all Options include significant lengths of new active travel facilities where none currently exist, all Options are considered to have High Positive Impact. However, design will not be able to mitigate all areas of difficult terrain, particularly for Options 1, 2 and 3 along the R635.

5.5 Longlist of Options Appraisal Summary

Seven long-list do-something options were developed for the CNDMR. Each option was developed based on providing the best possible access to land zonings defined in the CDP, whilst also avoiding, where possible natural and built environment constraints. Key travel needs and desire lines were considered, taking account of the land zonings as defined in the CDP for the northern side of the city, and then reviewed against the key travel needs between these and the City Centre to ascertain the desired transport routes.

Of the seven options developed, five of these options were deemed to meet the project objectives. These five options were appraised using a Multi-Criteria Analysis (MCA) which assessed the potential impacts of each option and its relative success in achieving the project objectives in accordance with TAF.

Table 5-5 demonstrates the combined overall appraisal of the Options against the Project Objectives.

Table 5-5: Longlist Option Appraisal Matrix (combined)

Objective:	KPI		Option 1	Option 2	Option 3	Option 4	Option 5
T2 To provide a sustainable transport route with journey time reliability from the eastern to western side of Cork City serving existing and planned communities within the northern side of the city and beyond	Sum of junction delays for straight-on movements at scheme junctions in peak hours	**Score**	5.6	5.5	5.4	5.8	5.4
T3 To improve the attractiveness of the northern side of Cork City for investment in employment and residential developments	All-mode accessibility to development sites	**Score**	5.5	5.7	5.6	5.7	5.1
A1 To improve accessibility to jobs and services by all modes and reduce car dependency	All-mode accessibility for all zones	**Score**	5.2	5.6	5.5	5.6	5.4
A4 To facilitate the rollout of sustainable transport measures and promotion of non-car travel patterns	Percentage reduction in flow on radial routes identified for sustainable transport measures	**Score**	5.3	5.6	5.4	5.6	5.6
A5 To link communities and workplaces by sustainable and active travel modes	Non-car accessibility for all zones	**Score**	5.8	5.7	5.4	5.6	5.1
L1 To provide a sustainable transport route centred on non car-based transport modes to unlock development potential	Non-car accessibility to development sites	**Score**	5.5	5.5	5.5	5.9	5.1
C1 To support the achievement of carbon emissions targets by reducing operational carbon emissions from vehicles	Network-wide % change from DM, CO2 emissions	**Score**	4.0	5.7	4.6	6.9	6.3
C3 To increase physical activity through improving the attractiveness of cycling	KPI based on provision of new facilities against existing scenario	**Score**	7.0	7.0	7.0	7.0	7.0
E1 To minimise impact on the natural environment and biodiversity	GIS-based calculation of length of route through various land designations or buffers thereof	**Score**	2.0	1.6	1.8	1.4	1.2
E2 To reduce the negative impact of transport generated air & noise emissions within the city	Network-wide % change from DM, averaged over local air pollutants (CO, NOX, HC, PM10)	**Score**	5.1	5.4	5.1	6.1	6.0
E4 To protect, and minimise the impact on, the built environment	GIS calculation of numbers of buildings within the 200m corridor	**Score**	2.0	2.0	2.0	3.0	2.5
	TOTAL SCORE		**53.0**	**55.3**	**53.3**	**58.6**	**54.7**
	AVERAGE		**4.8**	**5.0**	**4.8**	**5.3**	**5.0**
	Overall Impact		**Neutral**	**Low Positive**	**Neutral**	**Low Positive**	**Low Positive**

This assessment found that all options vary in preference. Following the appraisal of Objectives relating to Transport User Impacts, Accessibility, Land Use, and Climate Change Objectives, the following options ranked best performing.

1. Option 4
2. Option 3
3. Option 5

Following the appraisal of Objectives relating to Natural and Built Environment, the following options ranked best performing.

1. Option 4
2. Option 1
3. Option 3

5.6 Longlist of Options Appraisal Conclusion

Following the Longlist Appraisal Options 4, 2 and 5 are considered to be the overall best performing options.

By examining the option development and the results of the appraisal in detail, it can be seen that there are High Positive Scores achieved within the best performing Options 4 and 5 in relation to Transport User Impacts, Accessibility, Land Use, and Climate Change Objectives. Option 2 scored consistently higher than Option 5 in relation to objectives that specifically target sustainable transport, i.e. T2, L1, T3, C1, and A1.

Table 5-5, indicates that the overall results for the best performing options are Low Positive. This is due to the negative impacts of the options on the Natural and Built Environment reducing the overall scores. Any change to the natural and built environment from construction activity is likely to score negatively against baseline conditions before mitigation measures are considered. This being the case, there are potential mitigation measures that could be introduced to reduce the impacts on the natural and built environment that have not been considered at this early Phase of the project.

For example, there are considerable parcels of lands zoned for Public Open Space within the Study Area that could be utilised for mitigating natural environment impacts. Similarly, the impacts to the built environment could be reduced through the design of the project and following public consultations.

The appraisal of the Longlist of options in accordance with TAF guidance and measurable KPI, results in the following Options being the overall three best performing Options (in no particular order).

1. Option 2
2. Option 4
3. Option 5

It is recommended, based on the appraisal of the five Options against the Project Objectives, that Options, 2, 4 and 5 proceed to the Detailed Appraisal stage of the project.

6 DETAILED APPRAISAL

6.1 Introduction

The following sections outline the findings of the Detailed Project Appraisal of the shortlisted options for the Cork Northern Distributor Multi-modal Route (CNDMR). This appraisal involved a detailed Transport and Accessibility Appraisal (TAA) of the shortlisted options using the six Transport Appraisal Framework (TAF) criteria and Department of Transport (DoT) TAA template. Each criterion is evaluated through an analysis of sub-criteria to allow for a more detailed assessment of each of the Route Options being considered.

The criteria and sub-criteria examined are:

- **Accessibility Impact**
  - Access to Services
  - Access to Recreational Facilities
  - Access to Jobs
  - Access to International Transport Gateways
  - Freight Access
- **Social Impact**
  - Accessibility impact on deprived groups
  - Transport users with different mobility needs
  - Gender Impacts
- **Land Use Impact**
  - Change in quality of public realm
  - Connectivity with existing public transport facilities
  - Connection to zoned lands as part of national and regional planning
- **Safety Impacts**
  - Change in collisions
- **Climate Change Impact**
  - Climate Change Mitigation
  - Climate Change Adaptation
- **Local Environment Impact**
  - Air Quality
  - Noise and Vibration
  - Biodiversity
  - Water Resources
  - Landscape and Visual Quality

6.2 Appraisal Scoring

The Detailed Appraisal Process was carried out using the full range of sub criteria recommended in the TAA.

All appraisal criteria use a standard scale. Each impact is scored on a scale of 1 (major or highly negative impact) to 7 (major or highly positive impact). A score of 4 represents a neutral impact. Each impact is scored as per the system presented in **Table 6-1 below**.

Table 6-1: Project Appraisal Guidelines Scoring

Quantitative Score	Appraisal Reference
7	High Positive
6	Positive
5	Slight Positive
4	Neutral
3	Slight Negative
2	Negative
1	High Negative

The quantitative scores have been determined by considering their positive and negative impacts relative to the Do-Minimum scenario. This follows the guidance set out in TAF Unit 7, with the exception of the analysis of Access to Services and Access to Recreational Facilities where the guidance states that the analysis should compare opening year to base year. One of the scheme's key objectives is to facilitate the compact urban development of the northern side of Cork City. It is therefore appropriate to carry out all assessments against a Do-Minimum scenario which includes the planned developments in the northern side of the city as identified in the Cork City Development Plan (CDP) 2022-2028.

6.2.1 Basis of comparison

Each option within the shortlist for the scheme is assessed against each of the TAA sub-criteria, using the guidance set out in TAF. Scores for the criterion as a whole are calculated automatically by the TAA Excel template. While an overall score for each criterion is recorded in the TAA, these scores are considered independently of one another and are not intended to lead to a numerical total across criteria for a given option as per the guidance set out in TAF.

The Project Need and strategic alignment has been set out in Section 3 of this report. The overarching aim of this project is to allow for the provision of sustainable transport infrastructure (active travel and public transport) to serve the existing and future communities in the north of the city.

The appraisal assesses each of the route options against the Project Objectives, this includes the development of zoned lands in the north of the city. The appraisal also considers the significant opportunity for improved accessibility to existing communities, employment centres etc all of which inform the identification of the preferred route corridor.

6.2.2 Shortlisted Options

Section 5 presented the result of the assessment for the longlist of options and its findings identified three Options, Options 2, 4, and 5 as recommended in Section 5 are to undergo the Detailed Project Appraisal as part of the Option Selection process.

A 100m wide assessment corridor was considered for each route option. The 100m corridor does not represent the actual width of the road scheme or the lands to be acquired. The corridor indicates the lands within which a scheme could feasibly be developed. This corridor width was chosen on the basis of known buffers for habitats and survey requirements, while also allowing some flexibility within the corridor to locally route around, or minimise impact on, particular features. All assessments have been carried out with respect to impacts on the full corridor widths, however judgement has been used by the specialists in considering the indicative route alignments developed, and how that might impact on decision making. The actual width of the CNDMR will be approximately 29m as per the cross section set out in Section 5.3.

In terms of Route Options 2, 4, and 5, these options include a varying degree of off-line and online upgrade. These Route Options are illustrated on Drawing no MCT0825-RPS-00-XX-DR-C-DG0028 – Shortlist of Options in **Appendix C** and in **Figure 6-1**. The full description for each route option is outlined in **Table 6-2** below.

Figure 6-1: Shortlist of Options

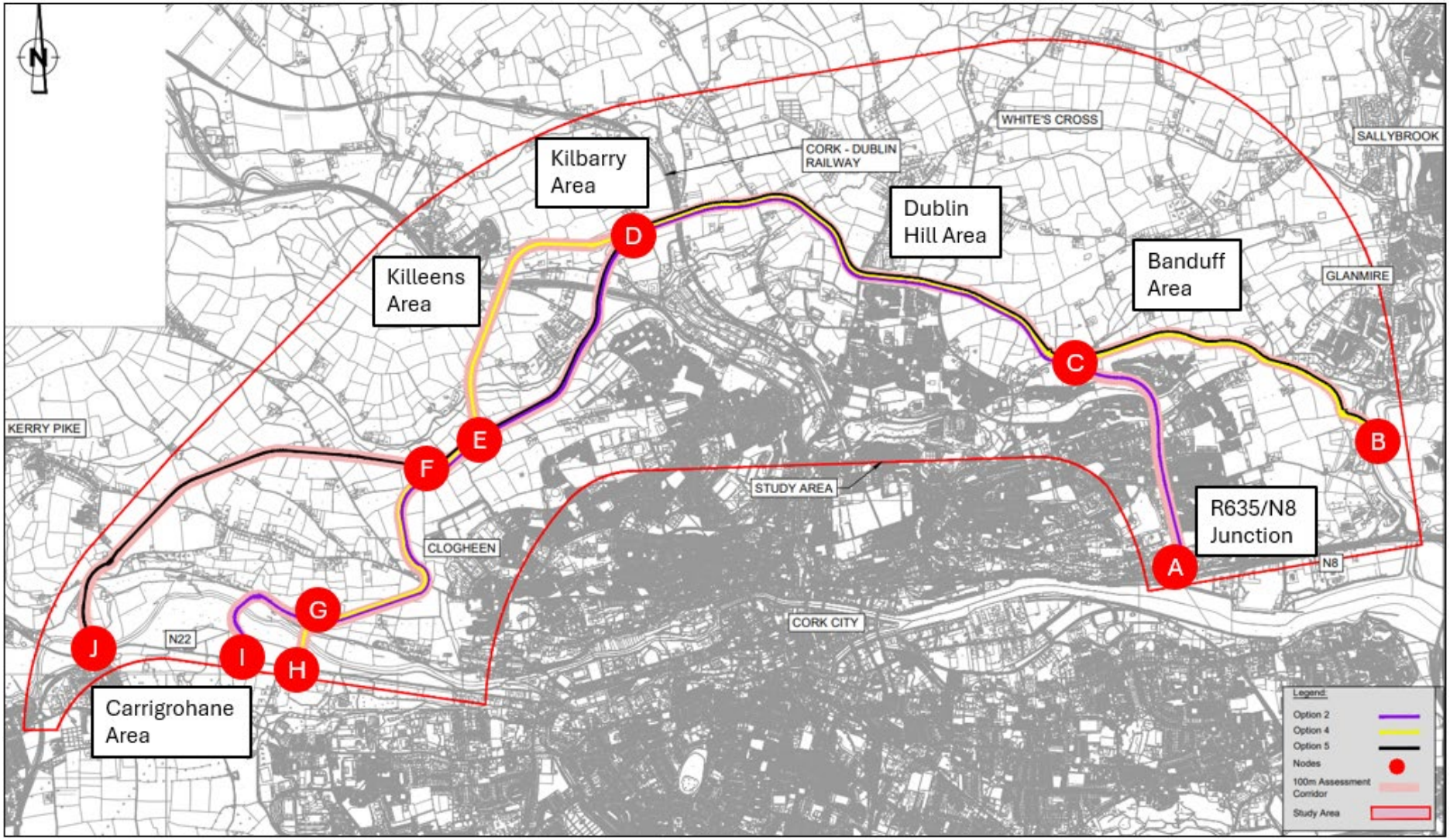


Table 6-2: Short-list of Route Option Descriptions

Option	Length	Description
Option 2	12.9km	Travelling from east to west, Option 2 begins at the existing Tivoli Road bridge at Silversprings Junction (R635/N8) (**Node A**). It then runs north via the existing R635 through Mayfield towards the intersection of the R615 at Node C (Tinker's Cross). From **Node C**, Option 2 then runs in a northwestern direction tying into the junction of Ballyhooly Road/ Dublin Hill Lower. Option 2 then travels along Dublin Hill Lower and crosses the Glennamought Valley north of Delany Rovers GAA club connecting with Old Whitechurch Road before travelling south west over the main Cork to Dublin rail line and on to **Node D**. Option 2 then turns southwest traveling along the western extents of the Gateway Business Park crossing the N20 Cork to Limerick Road and continuing towards the junction of Lower Killeens Road/ Upper Fairhill. Option 2 continues to travel south west to **Node E** and **Node F** before passing north of the Apple Campus. It then connects with Blarney Road to the west of Clogheen Business Park and on to **Node G** before connecting with the N22 Carrigrohane Road to the west of Inchigaggin Lane at **Node I**.
Option 4	13.0km	Traveling from east to west Option 4 begins at the R639 in Glanmire, just north of Vienna Woods Hotel access road (**Node B**). It then runs off-line to the west and intersects the R615 Old Youghal Road (west of the Barn Restaurant) and on to **Node C,** before following the alignment of Option 2 as described above to the north of the Ard na Ri housing estate, over the Cork to Dublin rail line to **Node D**. Option 4 then runs west towards the Killeens area but takes a western route around the same topographical constraint referenced in Option 2 before tying into **Nodes E, F & G**. Option 4 then heads directly south to **Node H** tying into the N22 to the east of Inchigaggin Lane (Refer to **Figure 6-1**).
Option 5	14.0km	Option 5 is the same as Option 4 up to **Node D**. It then follows the same route as Option 2 between **Nodes D,E & F**. Option 5 then runs in a southwestern direction before joining the N22 at **Node J** (N22/R618 junction). (Refer to **Figure 6-1**).

In addition to the shortlisted options noted above a Do-Minimum option was considered which established a baseline against which the shortlisted options were assessed. The Do-Minimum scenario included:

- Dunkettle Interchange upgrade scheme (now constructed).
- M20 Scheme – that portion within the CNDMR study area is assumed to be an on-line improvement as per the published route.
- M28 Scheme – that portion within the CNDMR study area is assumed to be an on-line improvement.
- Docklands bridges and associated road improvements referenced in the Draft Docklands Masterplan.
- Glanmire Road Improvements – various projects to improve the accessibility, sustainability, capacity, and safety of the transport network in the Glanmire, Riverstown and Sallybrook area some of which have now been constructed while others are at design stage.
- East-west Light Rail Route.
- Cork BusConnects as proposed under the Cork Metropolitan Area Transport Strategy (CMATS) – although not modelled explicitly, the demand forecasts include the impacts of BusConnects on vehicular trips, as modelled for the CMATS. The proposals are still being developed and could not therefore be included in the model used to assess options.

6.3 Accessibility Impact Appraisal

Accessibility has been appraised based on the impact a route corridor' will have on access to key services. The Project Need as set out in Section 2 of this Report notes that the CNDMR will cater for the access needs of existing communities, employment centres etc while also serving the needs of future planned communities within Cork City. This improved access includes access to centres of employment, development lands, walking and cycling links, access to (and enhancement of) public transport service, strategic orbital public transport provision etc. The CNDMR will also provide strategic orbital displacement associated with changes brought about by BusConnects and changes to travel patterns anticipated by future City Centre improvements.

Project Need, as described in Section 2 of this Report considers both access from existing communities to key services as well as access from future planned communities using land zoning and GIS data in line with the guidance set out in TAF Unit 7.0. Other factors such as a route's interaction with cycle infrastructure for completion of links to the city centre is considered in the appraisal. The scoring for each Option is based on the TAA guidance as set out in **Table 6-3 below.**

Table 6-3: Project Appraisal of Accessibility Scorecard

Accessibility Score	Percentage Change
High Negative	> -16%
Negative	-6% to -15%
Low Negative	-2% to -5%
Neutral	-1% to +1%
Low Positive	2% to 5%
Positive	6% to 15%
High Positive	>16%

6.3.1 Access to Services

The appraisal process used for the 'Access to Services' criteria is based on the potential number of residencies each route option generates in terms of improved access to services. As noted earlier, this appraisal includes both existing communities and future communities associated with the delivery of zoned lands within the study area. **Table 6-4** shows the existing population within 1km [*10 min walk; 3 min cycle*] of the CNDMR route corridors and the potential new population based on housing densities (50 units per hectare) as described in the Cork City and County Joint Housing Strategy and Housing Need Demand Assessment November 2021. The potential population figures for new and existing residencies has been calculated using an assumed occupancy of 2.5 people per residence. This duration of walk is considered to be reasonably attractive to access the CNDMR and the range of transport modes it will provide.

Table 6-4: Potential New Population Figures

Route Corridor	Existing Residencies	Existing Population	Total Residential Zoned Lands	Future Residences	Future additional population.	Overall Population	Percentage Increase
Option 2	9062 units	22655	135ha.	6772 units	16931	39586	+75%
Option 4	7949 units	19873	188ha.	9403 units	23509	43381	+118%
Option 5	7865 units	19663	188ha.	9403 units	23509	43171	+120%

6.3.1.1 Access to Urban Areas

There are three urban centres within, or, in close proximity to the Study Area other than Cork City Centre. These are:

- Blackpool
- Mayfield, and
- Glanmire

For the purpose of this criteria, the urban centres have been appraised based on the distance between these areas and the individual route corridor options. The appraisal assessment for this criterion is presented in **Table 6-5**.

Table 6-5: Project Appraisal of Accessibility to Urban Areas

Route Option	Summary of Impacts	Impact Level
Option 2	The urban centre of **Blackpool** is located approximately 1.3km from Route Option 2 this equates to a 13 minute walk along the existing footpath network. Residents, both existing and future, who live within 1.7km along Route Option 2 will be able to access Blackpool in 30 mins on foot. In terms of cycling residents living within 10.0 km along Route Option 2 will be able to access Blackpool in 30 mins. This level of accessibility encompasses the entire future residential population as presented in **Table 6-4**, with a potential 75% increase in population (16,931 people) accessing Blackpool by bike. This is greater than 16% and is therefore considered a High Positive. The urban centre of **Mayfield** is located approximately 0.5 km from Route Option 2 this equates to a 5 minute walk along the existing footpath network. Existing and future residents who live within a distance of 2.5km along Route Option 2 will be able to access Mayfield within 30mins on foot. In terms of cycling residents living within 11km either side of Mayfield along Route Option 2 will be able to access Mayfield in 30 mins. This level of accessibility encompasses the entire future residential population as presented in **Table 6-4,** with a potential 75% increase in population (16,931 people) accessing Mayfield by bike. This is greater than 16% and is therefore considered a High Positive. The urban centre of **Glanmire** is located approximately 3.1 km from Route Option 2 and is not walkable in 30 minutes. Existing and future residents who live within a 9 km distance along Route Option 2 will be able to access Glanmire within 30mins by bike This level of accessibility encompasses the entire future residential population as presented in **Table 6-4**, with a potential 75% increase in population (16,931 people) accessing Glanmire by bike. This is greater than 16% and is therefore considered a High Positive.	High Positive

Route Option	Summary of Impacts	Impact Level
	Taking into account both existing and future planned residential areas, Option 2 will cater for an additional population of 16,931 people within a 1 kilometre zone. This is a 75% increase compared to the estimated 22,655 people currently living within 1 km of Option 2. The location of Route Option 2 will allow for access to three urban areas within a 30 minute cycle. Option 2 is also well linked to the urban areas of Blackpool and Mayfield for pedestrians. Route Option 2 is considered to have a High Positive Impact	
Option 4	The urban centre of **Blackpool** is located approximately 1.3km from Route Option 4. This equates to a 13 minute walk along the existing footpath network. Residents, both existing and future, who live 1.7km along Route Option 4 will be able to access Blackpool in 30 mins on foot. In terms of cycling residents living within 10.0 km along Route Option 4 will be able to access Blackpool in 30 mins. This level of accessibility encompasses the entire future residential population as presented in **Table 6-4**, with a potential 118% increase in population (23,509 people) accessing Blackpool by bike. This is greater than 16% and is therefore considered a High Positive. The urban centre of **Mayfield** is located approximately 0.5 km from Route Option 4. This equates to a 5 minute walk along the existing footpath network. Existing and future residents who live within 2.5km along Route Option 4 will be able to access Mayfield within 30mins on foot and in terms of cycling residents living within 11km either side of Mayfield along Route Option 4 will be able to access Mayfield in 30 mins. This level of accessibility encompasses the entire future residential population as presented in **Table 6-4**, with a potential 118% increase in population (23,509 people) accessing Blackpool by bike. This is greater than 16% and is therefore considered a High Positive. The urban centre of **Glanmire** is located approximately 1.9 km from Route Option 4 and is a 19 minute walk along an existing footpath network. Existing and future residents who live within 1.0 km along Route Option 4 will be able to access Glanmire within 30mins on foot and in terms of cycling residents living within 10km of Glanmire along Route Option 4 will be able to access Glanmire in 30 mins. This level of accessibility encompasses the entire future residential population as presented in **Table 6-4**, with a potential 118% increase in population (23,509 people) accessing Glanmire by bike. This is greater than 16% and is therefore considered a High Positive. Taking into account both, Option 4 will cater for an additional population of 23,509 people within 1 kilometre when existing and future planned residential areas are considered. This is a 118% increase compared to the estimated 19,873 people currently living within 1 km of Option 4. The location of Route Option 4 will allow for access to three urban areas within a 30 minute cycle. Option 4 is also well linked to all three urban centres. Route Option 4 is considered to have a High Positive Impact based on the accessibility to urban centres to the north of cork city.	High Positive
Option 5	The urban centre of **Blackpool** is located approximately 1.3km from Route Option 5. This equates to a 13 minute walk along the existing footpath network. Residents, both existing and future, who live within 1.7km along Route Option 5 will be able to access Blackpool in 30 mins on foot. In terms of cycling residents living within 10.0 km along Route Option 5 will be able to access Blackpool in 30 mins. This level of accessibility encompasses the entire future residential population as presented in **Table 6-4**, with a potential 120% increase in population (23,509 people) accessing Blackpool by bike. This is greater than 16% and is therefore considered a High Positive.	High Positive

Route Option	Summary of Impacts	Impact Level
	The urban centre of **Mayfield** is located approximately 0.5 km from Route Option 5. This equates to a 5 minute walk along an existing footpath network. Existing and future residents who live within 2.5km along Route Option 5 will be able to access Mayfield within 30mins on foot and in terms of cycling residents living within 11km either side of Mayfield along Route Option 5 will be able to access Mayfield in 30 mins. This level of accessibility encompasses the entire future residential population as presented in **Table 6-4**, with a potential 120% increase in population (23,509 people) accessing Blackpool by bike. This is greater than 16% and is therefore considered a High Positive. The urban centre of **Glanmire** is located approximately 1.9 km from Route Option 5. This equates to a 19 minute walk along an existing footpath network. Existing and future residents who live within 1.0 km along Route Option 5 will be able to access Glanmire within 30mins on foot and in terms of cycling residents living within 10km either side of Glanmire along Route Option 5 will be able to access Glanmire in 30 mins. This level of accessibility encompasses the entire future residential population as presented in **Table 6-4**, with a potential 120% increase in population (23,509 people) accessing Blackpool by bike. This is greater than 16% and is therefore considered a High Positive. Taking into account both existing and future planned residential areas, Option 5 will cater for an additional population of 23,509 people within 1 kilometre of it, this is a 118% increase compared to the estimated 19,663 people currently living within 1 km of Option 5. The location of Route Option 5 will allow for access to three urban areas within a 30 minute cycle. Option 5 is also well linked to all three urban centres. Route Option 5 is considered to have a High Positive Impact based on the accessibility to urban centres to the north of Cork City.	

6.3.1.2 Access to Schools and Educational Facilities

Similar to the appraisal of access to urban areas, access to schools and educational facilities was based on the number of existing and future residents who live within a 1km of each of the route options. Additionally, any school or educational facilities within this 1km (10 minute) walk from each of the route options were considered in the appraisal. These schools are listed in **Table 6-6**.

Table 6-6: Schools within 1km (10minute walk) from CNDMR Route Options

Type	Name	Distance to Route Option 2 (m)	Distance to Route Option 4 (m)	Distance to Route Option 5 (m)
Post Primary School	Mayfield Community School	760	762	762
Post Primary School	St Aidan's Community College	483	483	483
Post Primary School	Colaiste An Phiarsaigh	>1km	525	625
Primary School	Scoil Naomh Micheal	909	>1km	>1km
Primary School	Mhuire ar Chnoc Haoine	927	927	975
Primary School	Gaelscoil an Ghoirt Alainn	949	849	>1km
Primary School	Scoil Mhuire Banrion	328	>1km	849
Primary School	Naomh Eoin Easpal	180	607	607
Primary School	Scoil Oilibheir	416	415	415
Primary School	Gaelscoil Peig Sayers	874	>1km	874
Primary School	S N Mhuire	942	933	942

Type	Name	Distance to Route Option 2 (m)	Distance to Route Option 4 (m)	Distance to Route Option 5 (m)
Primary School	Scoil Na nOg	>1km	629	629
Primary School	Lower Glanmire NS	>1km	118	119
Primary School	Clogheen Mixed NS			563

This criterion assesses accessibility under active travel and public transport modes. The CNDMR is designed to accommodate future bus services which will ultimately form a wider bus network with the bus services identified via the BusConnects programme of work. For the purposes of this study, the travel time to each educational facility based on an average travel speed of 40km/h. **Table 6-8** demonstrates the potential bus travel times along the entirety of the route options. **Table 6-7** details the appraisal of the route options under the access to schools and educational facilities criteria.

Table 6-7: Potential Bus Journey Time along Route Options

Route Option	Length	Average Moving Speed	Time to Travel Entire Route
Route Option 2	12.9km	40km/h	19.5mins
Route Option 4	13.0km	40km/h	19.5mins
Route Option 5	14.0km	40km/h	21mins

Table 6-8: Project Appraisal of Accessibility to Schools and Educational Facilities

Route Option	Summary of Impacts	Impact Level
Option 2	The location of Route Option 2 will allow for improved access to **two** existing post primary and **eight** existing primary schools within 1 kilometre walk of its corridor. All schools within its 1 kilometre catchment could be accessed within a 30 minute period from both the existing and new communities located within 1km of its route. This is considered to be a High Positive for the existing and potential new communities within 1km of Route Option 2.	High Positive
Option 4	The location of Route Option 4 will allow for improved access to **three** existing post primary and **nine** existing primary schools within 1 kilometre walk of its corridor. All schools within a 1 kilometre catchment of Option 4 could be accessed within a 30 minute period from both the existing and new communities located within 1km of its route. This is considered to be a High Positive for the existing and potential new communities within 1km of Route Option 4.	High Positive
Option 5	The location of Route Option 5 will allow for improved access to **three** existing post primary and **seven** existing primary schools within 1 kilometre walk of its corridor. Not all schools within its 1 kilometre catchment will be accessible within a 30 minute period from both the existing and new communities. Therefore, a Positive rating has been applied for the existing and potential new communities within 1km of Route Option 5.	Positive

6.3.1.3 Hospitals and Healthcare Facilities

Accessibility to hospitals and healthcare facilities was considered is the same manner as presented for schools and educational facilities. Using housing statistics obtained from GeoDirectory data within 1km of the route options. The 1km distance was chosen as it represents a ten-minute walking time. This means residents can access the CNDMR sustainable travel facilities within 10minutes walk. With regards to hospitals and healthcare facilities, a GIS search for hospitals, healthcare facilities and HSE run facilities within the Study Area was carried out. The following healthcare facilities are within 1km (10minute) walk from the various route options were considered in the appraisal. These facilities are listed in **Table 6-9** below.

Table 6-9: Hospitals, Healthcare and HSE Facilities within 1km of Route Options

Type	Name	Distance to Route Option 2 (m)	Distance to Route Option 4 (m)	Distance to Route Option 5 (m)
Pharmacy	Glenheights Pharmacy	608	608	608
Pharmacy	Irwin's Pharmacies	0	686	686
Pharmacy	Wallace's Pharmacy	438	438	438
Nursing home	St. Joseph's Hospital	35	39	1242
General Practitioner	Mayfield Family Practice	0	686	686
General Practitioner	Meadow Park Surgery	377	377	377
General Practitioner	Parklands Surgery	575	992	575
General Practitioner	Wellness Centre	401	401	636
General Practitioner	Dr.O'Brien	209	714	714
General Practitioner	Knight's Hill Medical Centre	553	709	710
Dental Practice	Dental Practice	377	377	377
Dental Practice	Iona Dental Surgery	617	761	761
Health Centre	Lotamore House	>1km	846	848
Health Centre	Mayfield Health Centre	752	769	770
Special Education Centre	Cope Foundation Bonnington	765	>1km	>1km

Under this criteria access is considered using active travel and public transport modes with bus travel times to each healthcare facility based on an average travel speed of 40km/h. **Table 6-7** demonstrates the potential bus travel times along the entirety of the route options. **Table 6-10** details the appraisal of the route options under the access to hospitals and healthcare facilities criteria.

Table 6-10: Project Appraisal of Accessibility to Hospitals and Healthcare Facilities

Route Option	Summary of Impacts	Impact Level
Option 2	The location of Route Option 2 will allow for improved access to **14** healthcare facilities within 1 kilometre walk of its corridor. All healthcare facilities within its 1-kilometre catchment could be accessed within a 30 minute period from both the existing and new communities located within 1km of its route. This is considered to be a High Positive for the existing and potential new communities within 1km of Route Option 2.	High Positive
Option 4	The location of Route Option 4 will allow for improved access to **14** healthcare facilities within 1 kilometre walk of its corridor. All healthcare facilities within its 1-kilometre catchment could be accessed within a 30 minute period from both the existing and new communities located within 1km of its route. This is considered to be a High Positive for the existing and potential new communities within 1km of Route Option 4.	High Positive
Option 5	The location of Route Option 5 will allow for improved access to **13** healthcare facilities within 1 kilometre walk of its corridor. Not all healthcare facilities within its 1 kilometre catchment could be accessed within a 30 minute period by public transport from both the existing and new communities located within 1km of its route. Therefore, a Positive rating has been applied for the existing and potential new communities within 1km of Route Option 5.	Positive

6.3.1.4 Major Land Transport Hubs and Interchange Facilities such as Rail and Bus stations

Accessibility to major land transport hubs and interchange facilities was considered in the same manner as presented for educational and healthcare facilities. Access is considered using active travel and public transport modes. The CNDMR public transport mode will be bus only. The travel time for bus along the route options was considered in this appraisal to assess potential travel times for access to major land transport hubs and interchange facilities. Using the scheme length and an average moving speed of 40km/h for bus travel. **Table 6-7** demonstrates the potential bus travel time along the entirety of the route options. **Table 6-11** details the appraisal of the route options under the access to Major Land Transport Hubs and Interchange Facilities.

Table 6-11: Project Appraisal of Accessibility to Major Land Transport Hubs and Interchange Facilities

Route Option	Summary of Impacts	Impact Level
Option 2	Accessibility to the proposed new rail stations located at Blackpool/Kilbarry, Tivoli and Monard, as defined in CMATS are the same under all options. The proposed Park and Ride facility at Dunkettle as defined in CMATS is **2.9km** from Route Option 2. A High Positive rating has been applied to this option as the CNDMR will improve active and sustainable travel accessibility to the proposed new train stations and the planned Dunkettle Park and Ride facility.	High Positive
Option 4	Accessibility to the proposed new rail stations located at Blackpool/Kilbarry, Tivoli and Monard, as defined in CMATS are the same under all options. The proposed Park and Ride facility at Dunkettle as defined in CMATS is **1.5km** from Route Option 4. A High Positive rating has been applied to this option as the CNDMR will improve active and sustainable travel accessibility to the proposed new train stations and the planned Dunkettle Park and Ride facility	High Positive
Option 5	Accessibility to the proposed new rail stations located at Blackpool/Kilbarry, Tivoli and Monard, as defined in CMATS are the same under all options. The proposed Park and Ride facility at Dunkettle as defined in CMATS is **1.5km** from Route Option 5. A High Positive rating has been applied to this option as the CNDMR will improve active and sustainable travel accessibility to the proposed new train stations and the planned Dunkettle Park and Ride facility.	High Positive

6.3.1.5 Access to Recreational Facilities

Accessibility to recreational facilities was measured based on the interaction each route option has with lands zoned for Public Open Space. **Table 6-12** describes the score applied to each route option to be measured as part of the Access to Recreational Facilities sub-criteria.

Table 6-12: Project Appraisal of Accessibility to Recreational Facilities

Route Option	Summary of Impacts	Impact Level
Option 2	Route Option2 passes through **2.8km** of land zoned for Public Open Space. This gives opportunity for access to parks and playgrounds that will form part of these developments.	Positive
Option 4	Route Option 4 passes through **2.9km** of land zoned for Public Open Space. This gives opportunity for access to parks and playgrounds that will form part of these developments.	Positive
Option 5	Route Option 5 passes through **2.8km** of land zoned for Public Open Space. This gives opportunity for access to parks and playgrounds that will form part of these developments.	Positive

6.3.1.6 Access to Sports Clubs and Facilities

Accessibility to sports clubs and facilities was measured based on the proximity of each route option to existing sporting clubs within 1 kilometre of the route. **Table 6-13** describes the score applied to each route option to be measured as part of the Access to Sports Clubs and Facilities sub-criteria.

Table 6-13: Project Appraisal of Accessibility to Sports Clubs and Facilities

Route Option	Summary of Impacts	Impact Level
Option 2	Option 2 is within 1km of 21 sports clubs and facilities. Compared to other Options this is a High Positive rating.	High Positive
Option 4	Option 4 is within 1km of 17 sports clubs and facilities. Compared to other Options this is a Positiverating	Positive
Option 5	Option 5 is within 1km of 14 sports clubs and facilities. Compared to other Options this is a Slight Positive rating.	Slight Positive

6.3.1.7 Access to Jobs

The access to jobs appraisal was based on the number of jobs within 1km of the route options being considered. This was measured using Geo Directory data.

The measure of commercial properties within the 1km of each of the different the routes option is used as the means of appraising access to areas with employment. The 1km distance was chosen as it represents a ten-minute walking time. This means residents can utilise the CNDMR sustainable travel corridor to access the commercial properties within 10minutes walk. **Table 6-14** shows the number of commercial properties recorded within 1km of each route option. **Table 6-15** details the appraisal carried out.

Table 6-14: Commercial Properties within 1km of Route Options

Property Type	Number within 1km of Route Option 2 (m)	Number within 1km of Option 4 (m)	Number within 1km of Route Option 5 (m)
Commercial	550	489	529

Table 6-15: Project Appraisal of Accessibility to Jobs

Route Option	Summary of Impacts	Impact Level
Option 2	All Options pass within 1km of lands zoned for Business and Technology and Light Industry and Related Uses, including a large existing employment centre in the Hollyhill Industrial Centre that employs >5,000 people. Route Option 2 offers a direct route between residential zoned lands, business and industry zoned lands. Route Option 2 is within 1km of 550 existing commercial units. Route Option 2 has the potential to connect a large population with a direct route between existing and proposed residential areas and centres of employment. Option 2 is therefore considered to have a High Positive Impact.	High Positive
Option 4	All Options pass within 1km of lands zoned for Business and Technology and Light Industry and Related Uses, including a large existing employment centre in the Hollyhill Industrial Centre that employs >5,000 people. Route Option 4 offers a less direct route between residential zoned lands and business and industry zoned lands than Route Option 2. Route Option 4 is within 1km of 489 existing commercial units. Route Option 4 has been assigned a Positive Impact rating.	Positive
Option 5	All Options pass within 1km of lands zoned for Business and Technology and Light Industry and Related Uses, including a large existing employment centre in the Hollyhill Industrial Centre that employs >5,000 people. Route Option 5 offers a less direct route between residential zoned lands and business and industry zoned lands than Route Option 2. Route Option 5 is within 1km of 529 existing commercial units. Route Option 5 has been assigned a High Positive Impact rating.	High Positive

6.3.2 Access to International Gateways

The TAF guidance suggests two Key Performance Indicators for this criterion;

- Change in frequency of public transport connection to major international gateway as a result of the scheme.
- Change in HGV/LGV ability to access international gateway following intervention.

The CNDMR will support the delivery of a new orbital route and will reduce the volume of traffic in the city centre and on radial roads into the city centre. It will not therefore have a direct impact on public transport services to either Cork Airport of the ferry port at Ringaskiddy. It will facilitate improvements to bus services in the city in particular along the proposed sustainable transport corridors through the reduction in traffic flow on such corridors. Although the delivery of the sustainable transport corridors as envisaged by the BusConnects programme of works will reduce travel times between the city centre and the airport, the CNDMR will have little direct impact on public transport connections to major international gateways.

The CNDMR provides a new orbital route connecting the N22 west of the city to the N8 east of the city, removing the need to travel through the city centre, or use the congested N40 South Ring Road. For some movements the proposed scheme will improve access to the ferry port at Ringaskiddy, and potentially to the airport. The CNDMR will provide a significantly quicker route for trips to and from the ferry port. The advantages provided for trips to and from the airport are less significant but will attract some trips.

The positive impact of Route Options 4 and 5 for this criterion are likely to be very similar, and greater than that for Route Option 2. Route Option 2 utilises an improved section of the R635 North Ring Road between Youghal Road and Silversprings Junction. This is currently congested during peak periods and is also a longer route to the Dunkettle Interchange than Route Options 4 and 5 and therefore will be less attractive for trips to and from the ferry port, in particular.

Table 6-16 describes the score applied to each option for Access to International Gateways.

Table 6-16: Project Appraisal of Accessibility to International Gateways

Route Option	Summary of Impacts	Impact Level
Option 2	Route Option 2 provides improved and more reliable journey times to and from the ferry port at Ringaskiddy and marginally better for Cork Airport for trips currently using the N20, or nearby roads, north of the city. The benefits are lower than those for Route Options 4 and 5 as the route is longer and there is congestion forecasted for the section of the scheme between Old Youghal Road and Silversprings Junction.	Slight Positive
Option 4	Route Option 4 provides an improved route to and from the ferry port at Ringaskiddy and Cork Airport for traffic currently using the N20, or nearby roads, north of the city. It avoids congestion at the Silversprings Junction.	Positive
Option 5	Route Option 5 provides an improved route to and from the ferry port at Ringaskiddy and Cork Airport for traffic currently using the N20, or nearby roads, north of the city. It avoids congestion at the Silversprings Junction.	Positive

6.3.3 Freight Access

The TAF suggests two Key Performance Indicators for this criterion;

- Change in dedicated freight access facilities, such as dedicated lanes, or freight terminals.
- Change in ability of LGVs to access urban centres following the intervention.

The CNDMR does not provide any dedicated freight facilities and will therefore have no direct impact on the first sub-criterion.

The CNDMR will provide a new orbital route around the north of Cork City connecting the N22 west of the city with the N8 east of the city. It will not therefore have a direct impact on access to the city centre. It will however reduce the volume of traffic on radial routes into the city centre and will therefore result in a general improvement for LGV access.

Table 6-17 describes the score applied to each option for change in ability of LGVs to access urban centres

Table 6-17: Project Appraisal of Accessibility for LGV's

Route Option	Summary of Impacts	Impact Level
Option 2	Route Option 2 results in a reduction in vehicles on radial routes into the city centre north of the City Centre. This will therefore reduce congestion and delays to LGVs entering the city centre.	Slight Positive
Option 4	Route Option 4 results in a reduction in vehicles on radial routes into the city centre north of the City Centre. This will therefore reduce congestion and delays to LGVs entering the city centre.	Slight Positive
Option 5	Route Option 5 results in a reduction in vehicles on radial routes into the city centre north of the City Centre. This will therefore reduce congestion and delays to LGVs entering the city centre.	Slight Positive

6.3.4 Accessibility Impact Scoring

The scores under each sub-criteria of the Accessibility Impacts were combined in the TAA template. The overall score for each Route Option is shown in **Table 6-18**.

Table 6-18: Accessibility Impact Combined Score

Route Option	Accessibility Criteria Combined Score
Option 2	Positive
Option 4	Positive
Option 5	Positive

From the above assessment it is clear that each route option offers a similar level of accessibility with respect to both local services and to the wider strategic attractions in the city. However, both Route Option 2 and Route 4 perform slightly better in terms of accessibility to local services (schools, healthcare) and have been assigned a higher rating than Option 5.

6.4 Social Impacts

6.4.1 Approach

The social inclusion objectives are concerned with increasing the ability with which people with differing transport availability can access important services. Those services can be transport links, such as bus stops and train stations, or more broadly concerned with travel times/costs to various key destinations. This objective also seeks to avoid/mitigate physical severance of existing or proposed areas and communities.

Route Options which produce journey time savings will be considered to have a positive effect on accessibility. Similarly, options which minimise severance of local areas and communities will have a positive effect. Options which improve transport and movement for cyclists and pedestrians will be assessed positively in respect of this criteria.

TAF notes that the accessibility and social inclusion appraisal should consider how the project impacts on the following groups:

- Impact on Deprived Groups
- Transport Users with Different Mobility Needs
- Gender Impacts

6.4.2 Deprived Geographic Areas

Traditionally for transport schemes, the impacts/improvements a scheme can bring to deprived areas have been assessed in terms of CLÁR designated sites within a study area. The CLÁR programme (Ceantair Laga Árd-Riachtanais) provides funding for small-scale infrastructural projects in rural areas, aims to support sustainable development in identified areas by attracting people to live and work there. The scheme is funded by the Department of Rural and Community Development and is delivered by local authorities in consultation with groups in local communities.

In the case of the CNDMR scheme, there are no formal CLÁR designated sites within the study area, or within the Northern side of Cork City generally. This does not mean there are not deprived geographical areas within the study area, but instead that there are not specific areas designated for funding under the CLÁR programme.

Therefore, it is important to look at other aspects of deprivation and potential for regeneration within the study area, and how the proposed CNDMR scheme might interact with such areas. To this end we have consulted the CDP and the Regional Spatial & Economic Strategy (RSES) for the Southern Region. Both the RSES and the CDP specifically highlight the need to support ongoing regeneration of the Cork City RAPID areas (Revitalising Areas through Planning Investment and Development).

There are four defined RAPID areas in Cork:

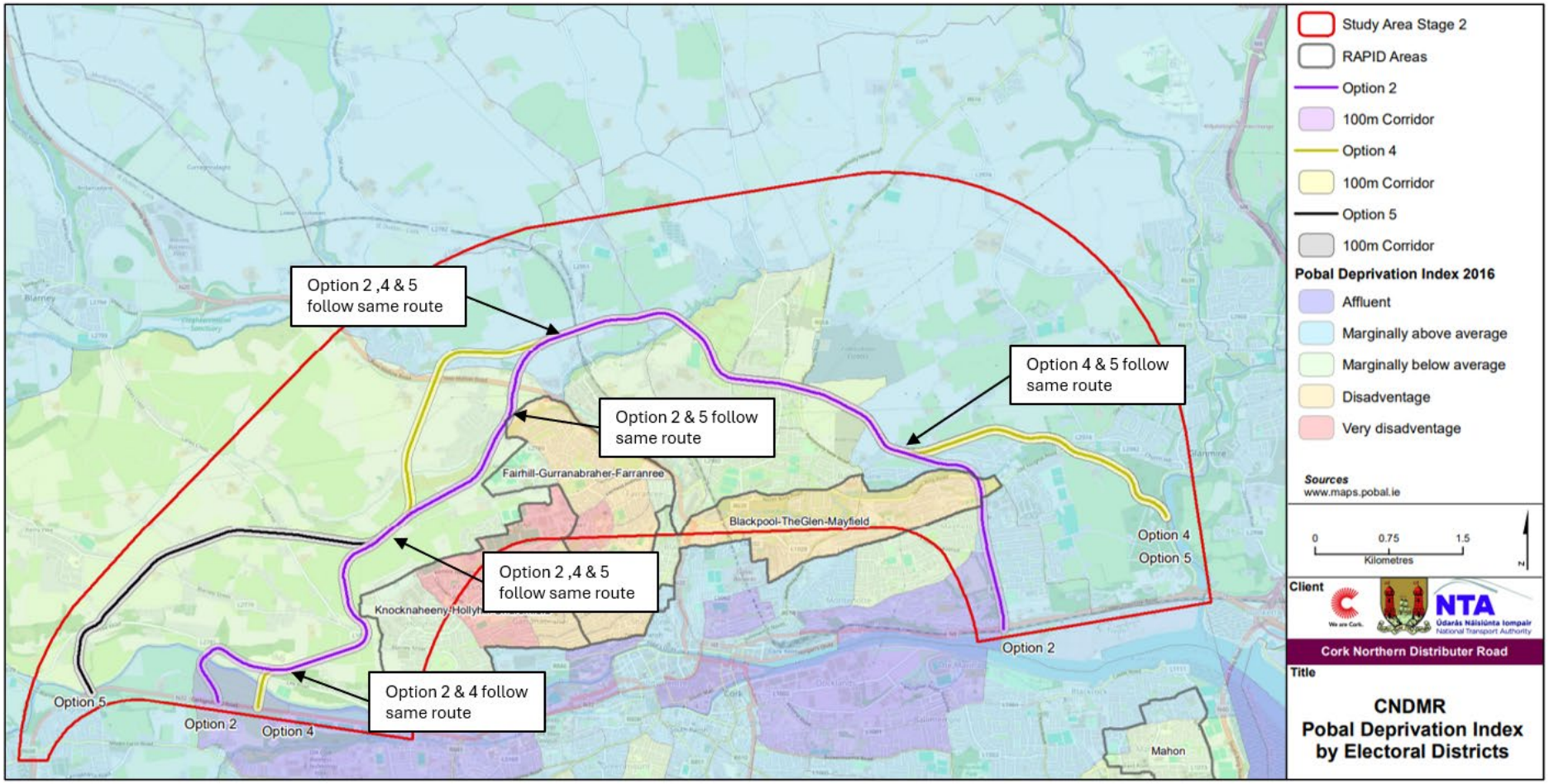
- Knocknaheeny / Hollyhill / Churchfield
- Blackpool / The Glen / Mayfield
- Fairhill / Gurranabraher / Farranree
- Togher / Mahon / Ballyphehane

The RSES also specifically identifies the Blackpool Valley / Kilbarry / Old Whitechurch Road area of the Northern side of Cork City as an area of opportunity for significant mixed-use regeneration including residential and enterprise development on the northern side to the city.

The extent to which the CNDMR route options interact with the areas above has been used as a key means of assessing performance against the project objectives of improving access to employment and services, along with providing safe and convenient modes of active/sustainable travel between communities.

Figure 6-2 below highlights the RAPID and regeneration areas identified above, in the context of the CNDMR route options.

Figure 6-2: CNDMR Pobal Deprivation Index



Option 2 directly intersects the RAPID area in Mayfield and traverses the boundary of the RAPID area in Hollyhill (at Hollyhill Industrial Estate). It also directly intersects the north environs regeneration area in Kilbarry / Old Whitechurch Road. It is therefore likely that Option 2 would bring positive benefits to these areas in terms of access to employment and services, along with safe and sustainable modes of transport to and from these areas. Option 2 is considered to have a Positive Impact.

Option 4 traverses the boundary of the RAPID area in Hollyhill (at Hollyhill Industrial Estate). It also directly intersects the north environs regeneration area in Kilbarry / Old Whitechurch Road. It is therefore likely that Option 4 would bring slight positive benefits to these areas in terms of access to employment and services, along with safe and sustainable modes of transport to and from these areas. Option 4 is considered to have a Slight Positive Impact.

Option 5 directly intersects the north environs regeneration area in Kilbarry / Old Whitechurch Road. However, the route does not directly serve the RAPID area at Hollyhill. It is therefore unlikely that Option 5 will bring discernible positive benefits to these areas, but it is recognised that equally it would not have a negative impact. Therefore Option 5 is considered to have a Neutral Impact.

Table 6-19: Appraisal of Deprived Geographic Areas

Route Option	Summary of Impacts	Impact Level
Option 2	Direct interaction with 2 RAPID areas and one area of regeneration	Positive
Option 4	Direct interaction with 1 RAPID area and one area of regeneration	Slight Positive
Option 5	No direct interaction with RAPID areas, however, interacts with one area of regeneration	Neutral

6.4.3 Transport Users with Different Mobility Needs

In the context of the CNDMR scheme, each option will follow current standards and guidelines in relation to providing facilities for transport users with different mobility needs. The scale and number of such facilities will be identified in the Detailed Design stage of the project. A Positive impact score is applied to all Route Options as a conservative approach to this sub-criteria.

Table 6-20: Appraisal of Transport Users with Different Mobility Needs

Route Option	Summary of Impacts	Impact Level
Option 2	Approach to provision of facilities will be in accordance with current standards and guidelines.	Positive
Option 4	Approach to provision of facilities will be in accordance with current standards and guidelines.	Positive
Option 5	Approach to provision of facilities will be in accordance with current standards and guidelines.	Positive

6.4.4 Gender Impacts

For the purposes of comparing gender impacts, the routes will be assessed based on their proximity to built-up areas that can provide passive surveillance, which can lead to an increased sense of safety for all genders. It is noted that increased public lighting and the provision of segregated cycling facilities are also factors which can positively impact the use of the proposed new infrastructure by all genders, however each route option will include such facilities so have not been considered a differential assessment criteria. **Figure 6-3** presents each of the route options in terms of its proximity to built-up areas. Based on this data, Route Option 2 traverses closest to established built up areas with existing developments and lands zoned for future development at the eastern and western ends of the routes compared with Option 4 and Option 5. Option 4 provides the potential for greater passive surveillance compared to Option 5 as the western extents of Option 5 passes through a large sparsely populated area in comparison to Option 4 (and Option 2). **Table 6-21** presents the findings of the appraisal under this heading.

Figure 6-3: Route Options Interaction with Existing and Proposed Developments

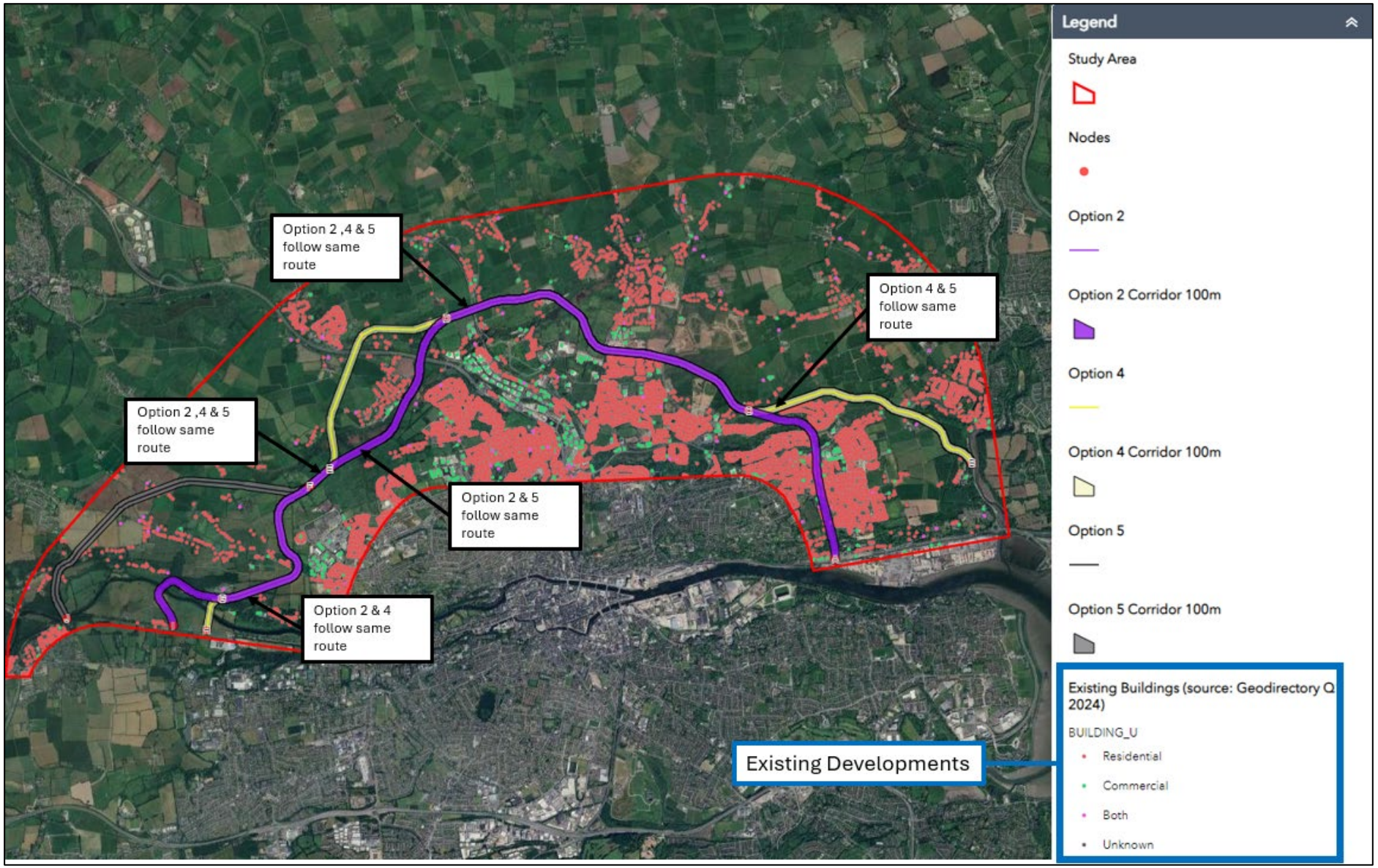


Table 6-21: Appraisal of Gender Impacts

Route Option	Summary of Impacts	Impact Level	Impact Score	Preference Rating
Option 2	Good passive surveillance from existing built-up areas and potential new developments	Positive	7	High Positive
Option 4	Less passive surveillance from existing built-up areas and potential new developments than Option 2	Positive	6	Positive
Option 5	Has the least passive surveillance from existing built-up areas and potential new developments of the options considered as its western extent passes through a large sparsely populated area	Slight Positive	5	Slight Positive

6.4.5 Social Impact Scoring

The scores under each sub-criteria of the Social Impacts were combined in the TAA template. The overall score for each Route Option is shown in **Table 6-22**.

Table 6-22: Accessibility Impact Combined Score

Route Option	Social Impact Criteria Combined Score
Option 2	Positive
Option 4	Positive
Option 5	Slight Positive

In summary, Route Option 2 performs best as it runs closer to the existing built up area and has the greatest interaction with designated RAPID areas in the city. Option 4 outperforms Option 5 as it interacts better with the designated RAPID areas and has a higher level of passive surveillance.

6.5 Land Use Impacts

The land use impacts were appraised against the following three criteria.

1. Public Realm
2. Connectivity with existing Public Transport Facilities
3. Connection to zoned lands as part of national and regional planning

6.5.1 Impact on Public Realm

The impact of the CNDMR on the public realm was considered with regard to the city centre environment. The scheme will directly provide new facilities for sustainable travel, and indirectly enable other schemes that will allow a wide range of additional public realm and sustainable transport measures to be developed – e.g. BusConnects. The CNDMR has the potential to enhance the city centre public realm by helping to reduce the volume of traffic in the city centre. The impact of each option under this criterion was assessed by determining the change in flows through a cordon around the city centre, north of the River Lee – see **Figure 6-4**. The percentage reductions for each of the options are presented in **Table 6-23**.

Figure 6-4: Traffic Flow Assessment Locations – Northern Cordon

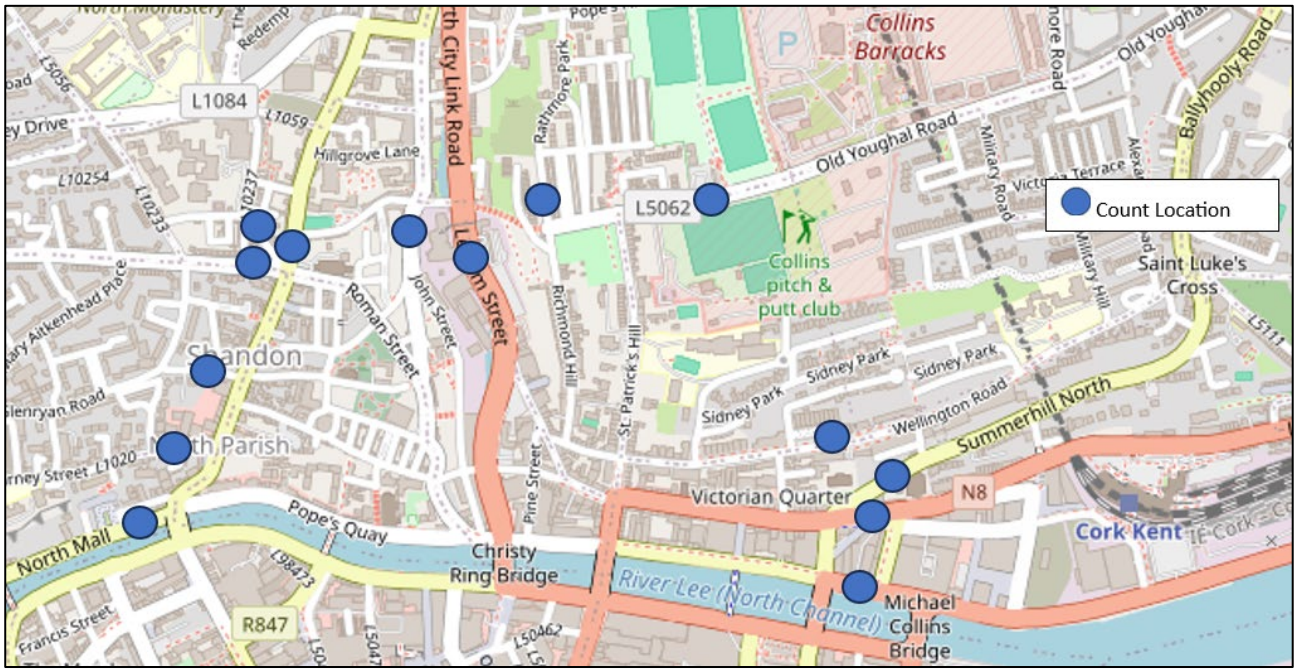


Table 6-23: Reduction in AADT Flows in the City Centre

	Flow Across Cordon	Reduction in AADT	Percentage Reduction
Route Option 2	131,306	6,356	4.8%
Route Option 4	129,100	8,562	6.5%
Route Option 5	126,739	10,923	7.9%

Route Option 4 and 5 both perform significantly better than Option 2 in terms of reducing traffic flow in the city centre (all of the forecast reductions presented are due to traffic reassignment rather than mode switch and are therefore an underestimate of the likely reductions). The differences in the performance of each option are primarily due to the following reasons:

- Route Option 2 utilises an enhanced R635 North Ring Road, which, together with Silversprings Junction is a much more congested route compared to Route Options 4 and 5, which utilise an improved R639 Glanmire Road. This congestion results in less traffic diverting away from the city centre.
- Route Options 4 and 5 provide a shorter and quicker route for traffic travelling between Glanmire and areas north and west of the city. They also provide a shorter route overall for trips between areas east and west of the city (e.g. between Ballincollig and Little Island). As a result, these two options attract more traffic with a resultant reduction in traffic flow on the radial routes into the city.
- Route Option 4 joins the N22 Carrigrohane Road just east of the Inchigaggin Lane junction, whereas Route Options 2 and Option 5 join the N22 to the west of the Inchigaggin Lane junction. Route Option 4 therefore increases the traffic at the Inchigaggin Lane junction resulting in some congestion, particularly in the AM peak period which results in less traffic reassigning away from the city centre compared to Option 5.
- Route Option 5 provides a shorter route between areas west of the city and north and north-eastern areas of the city than Option 4, making it more attractive for these trips resulting in the greatest reduction in traffic in the city centre.

6.5.2 Connectivity with existing Public Transport Facilities

This sub-criteria was assessed based on the public transport proposals that are planned for within CMATS, including both the enhancements to the heavy rail network and the BusConnects programme of works.

Figure 6-5: Options Interaction with CMATS Cycle Routes

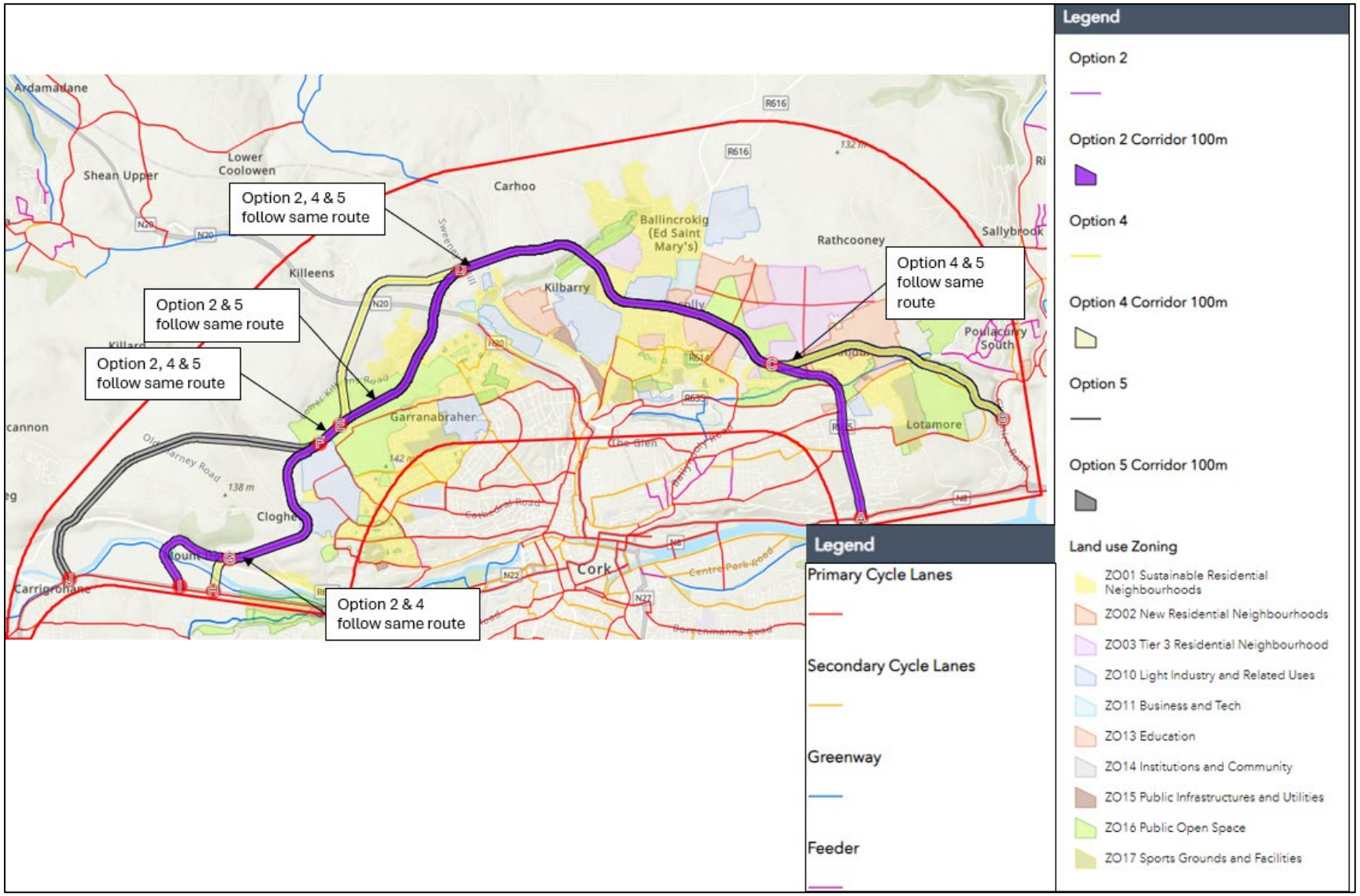
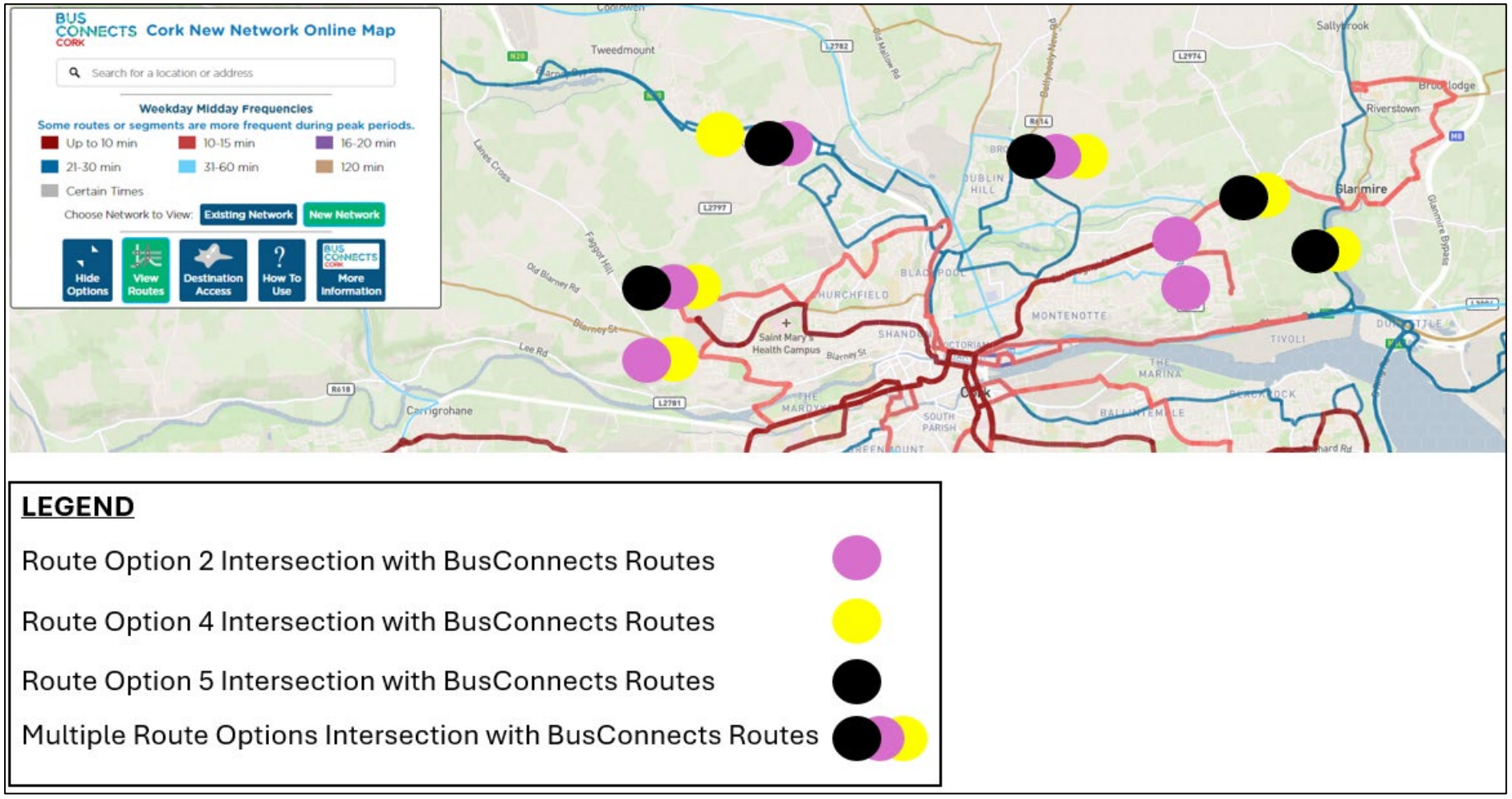


Figure 6-6: Options Interaction with BusConnects Routes



6.5.3 Connection to Zoned Lands as part of National and Regional Planning

This sub-criteria focused on the interaction of each route option with zoned lands as identified in the Cork City Development Plan 2022-2028.

Table 6-24 details the appraisal connection to zoned lands and all other Land Use Impacts.

Table 6-24: Details the appraisal of Land Use Impacts.

Impact	Route Option	Summary of Impacts	Impact Level
Public Realm	Option 2	Option 2 results in the lowest overall reduction in traffic in the city centre.	Slight Positive
	Option 4	Option 4 results in a greater reduction in city centre traffic than Option 2, but a slightly lower reduction than Option 5.	Positive
	Option 5	Option 5 provides the shortest route between areas located to the east and the west of the city. and results in the greatest overall reduction in traffic in the city centre.	Positive
Connectivity with existing Public Transport Facilities	Option 2	All options intersect within the same proximity to the proposed new rail stations as defined in CMATS and to Kent Station in Cork City. Option 2 has greatest number of intersections with high frequency BusConnects Routes (Refer to Figure 6-6). Option 2 is considered to have a High Positive rating.	High Positive
	Option 4	All options intersect within the same proximity to the heavy rail infrastructure. Option 4 has second greatest number of intersections with high frequency BusConnects Routes (Refer to Figure 6-6). Option 4 has been assigned a Positive rating.	Positive
	Option 5	All options intersect within the same proximity to the heavy rail infrastructure. Option 5 has the same number of intersections with BusConnects Routes (Refer to Figure 6-6) as Option 4. Option 5 has been assigned a Slight Positive rating based on the rural section of the route to the west and its lack of linkage to the BusConnects proposals on this part of the route.	Slight Positive
Connection to zoned lands as part of national and regional planning	Option 2	Option 2 passes through 5.5km of zoned lands for residential, industry, business and tech, education, institutions, infrastructure and public open space as defined in the Development Plan. This is less than Option 4, however Option 2 does serve established zoned lands and therefore a Positive rating has been assigned.	Positive
	Option 4	Option 4 passes through 6.1km of zoned lands for residential, industry, business and tech, education, institutions, infrastructure and public open space as defined in the Development Plan. This is greater than Option 2 and a Positive rating is assigned.	Positive
	Option 5	Option 5 passes through 6.8km of zoned lands as defined in the Development Plan. This is greater than both Option 2 and Option 4 and a High Positive rating has been applied.	High Positive

6.5.4 Land Use Impact Scoring

The scores under each sub-criteria of the Land Use Impacts were combined in the TAA template. The overall score for each Route Option is shown in **Table 6-25**.

Table 6-25: Land Use Impact Combined Score

Route Option	Land Use Impact Criteria Combined Score
Option 2	Positive
Option 4	Positive
Option 5	Positive

In summary each option has been assigned a similar rating, however it should be noted that: Option 2 performed best in terms of interaction with the planned BusConnects programme of works; Option 5 performed best in terms serving zoned lands; while Option 4 was the more consistent option under each of the different sub criteria.

6.6 Safety

6.6.1 Safety Objectives

The Safety objectives for the project are stated as:

- To achieve a reduction in road traffic accidents within the Cork Metropolitan Area;
- To provide a safer environment for cyclists; and
- To provide a safer environment for pedestrians and other vulnerable road users.

6.6.2 Accident Assessment

The TAF Unit 7.0 recommends that as part of a qualitative assessment on Safety, that the following should be considered. The TAF guidance lists the use of TII COBALT Tool as a method of carrying out the Safety appraisal and this has therefore been used.

6.6.3 Accident Assessment

The impact of the different options on collisions over a thirty-year appraisal period has been assessed using the COBALT software that implements the accident rate models set out in TII PAG Unit 6.4 (used in the absence of other relevant guidance). This is based on an assumed opening year of 2029 for assessment purposes.

The accident impacts were assessed for the modelled network applying default collision rates taken from the National Parameters Value Sheet (a TII published document under PAG Unit 6.11). Modelled flows on the network for the Do-Minimum and scheme options were converted to AADT, and collision changes determined using COBALT.

The COBALT analysis is relatively crude as it only takes account of the type of road and the speed limit. It does not take account of observed accidents, whether the road meets current design standards or the impacts of individual junctions. Also, the analysis does not take account of the safety benefits of providing segregated cycle facilities.

The output from the COBALT analysis is presented in **Table 6-26** together with preference ratings for each option. The figures presented are the absolute changes in collisions and casualties over a 30-year period.

Table 6-26: Collision and Casualty Forecast reductions over Thirty-Year Appraisal Period

	Route Option 2	Route Option 4	Route Option 5
Collisions	94.2	-1.1	18.2
Fatal casualties	1.3	1.9	2.2
Serious casualties	5.7	2.0	3.2
Slight casualties	130.8	3.5	31.7
Preference Rating	Positive	Positive	Positive

Option 2 results in a significantly higher reduction in collisions than Options 4 and 5, with Option 4 resulting in a slight increase in collisions (1.1 over the 30-year appraisal period).

All of the options assessed are forecast to produce reductions in casualties, with Option 2 producing a greater reduction compared to Option 4 and Option 5.

Options 4 and 5 result in greater savings in fatal casualties. This is as a result of Option 4 and 5 taking traffic away from higher speed roads (>60kmh) and onto lower speed roads (≤60kmh) – primarily the N8 east of Dunkettle Roundabout and the N22 west of Cork (for Option 5). The lower speed roads have a higher number of collisions (hence fewer collision savings for Options 4 and 5) but also have a much lower proportion of fatal casualties, resulting in a greater reduction in fatal casualties for Options 4 and 5.

Based on the reductions in collisions and fatalities, and giving the greatest priority to reductions in fatal casualties, all Route Options are considered to be Positive on balance.

6.7 Climate Change

The Climate Change impacts were appraised using GIS mapping, traffic modelling and a desk-based assessment of the routes' vulnerability to climate change adaption. Projected targets for modal share were also used.

The main factors affecting climate change impacts are the total vehicle-kilometres travelled and average speeds which will vary for each route as follows:

- For trips that travel between areas west of Cork City and Glanmire/Dunkettle Interchange, both Route Options 4 and 5 provide a shorter route than Route Option 4, resulting in lower emissions.
- For these same trips, Route Option 5 provides a slightly shorter route than Route Option 4.
- For trips to/from the Hollyhill and Hollymount Industrial Estates, Route Option 5 result in longer trip lengths than Route Options 2 and 4.
- Option 2 has greater congestion at the eastern end, on the R635 North Ring Road between Old Youghal Road and Silversprings Junction than Options 4 and 5. Options 4 and 5 take traffic away from this section of road thereby reducing overall congestion.

Table 6-27 summarises the overall rating provided to Climate Change as part of the Stage 2 Appraisal.

It should be noted that the analysis presented below does not include the impacts of mode shift away from the private car to sustainable transport as a result of the scheme. The impacts of mode shift have not been assessed at this stage for the following reasons:

- The impact of the scheme on mode shift will crucially depend on the combined impacts of the scheme and the BusConnects proposals – in particular the Sustainable Transport Corridors and increased service frequency. Work on developing and refining the BusConnects proposals is still ongoing and the modelling required to forecast their impact on mode share is also ongoing. As a result the SWRM is not sufficiently developed to allow detailed modelling of modal shift impacts of the scheme.

- The objective of this stage of work is to identify a preferred corridor for the scheme. Although each route will result in different levels of mode shift it is considered that differences between the schemes in this respect will be relatively minor. An assumption that all schemes will have the same impact on mode share has therefore been applied (the mode shares taken from CMATS analysis, which included the version of BusConnects envisioned at the time).

Table 6-27: Climate Change Impact

Impact	Route Option	Summary of Impacts	Impact Level
Percentage Change in mode share from private vehicles to public transport and active travel modes	Option 2	Targeted percentage sustainable transport share to be greater than 3%. Using the TAA Climate Mitigation Scorecard for Mode Shift, based on the targeted Mode Share being greater than 3% for existing and new communities a score of High Positive is applied.	High Positive
	Option 4	Targeted percentage sustainable transport share to be greater than 3%. Using the TAA Climate Mitigation Scorecard for Mode Shift, based on the targeted Mode Share being greater than 3% for existing and new communities a score of High Positive is applied.	High Positive
	Option 5	Targeted percentage sustainable transport share to be greater than 3%. Using the TAA Climate Mitigation Scorecard for Mode Shift, based on the targeted Mode Share being greater than 3% for existing and new communities a score of High Positive is applied.	High Positive
Percentage change in private car kilometres travelled.	Option 2	Targeted percentage reduction in KMs travelled, relative to the Do-Minimum, by private car from existing and new communities surrounding the CNDMR has been considered. This represents a benefit in terms of accessibility and is estimated to be greater than the maximum -3% reduction given in the TAA Climate Mitigation Scorecard for percentage car km change. This route results in longer travel distances for east-west trips (e.g. between Ballincollig and Glanmire/Dunkettle Interchange) than Options 4 and 5. The scoring has therefore been reduced to Positive as a comparative score.	Positive
	Option 4	Targeted percentage reduction in KMs travelled, relative to the Do-Minimum, by private car from existing and new communities surrounding the CNDMR has been considered. This represents a benefit in terms of accessibility and is estimated to be greater than the maximum -3% reduction given in the TAA Climate Mitigation Scorecard for percentage car km change. Therefore, a score of High Positive is applied.	High Positive
	Option 5	Targeted percentage reduction in KMs travelled, relative to the Do-Minimum, by private car, from existing and new communities surrounding the has been considered. This represents a benefit in terms of accessibility and is estimated to be greater than the maximum -3% reduction given in the TAA Climate Mitigation Scorecard for percentage car km change. This Option results in longer travel distances for trips to/from the Hollyhill and Hollymount Industrial Estates than both Options 2 and 4. The scoring has therefore been reduced to Positive as a comparative score.	Positive
Percentage change in CO2 emissions	Option 2	The percentage change in CO2 emissions was measured using the traffic modelling carried out for the longlist appraisal of options relative to the Do-Minimum. Option 2 results in a 0.1% reduction in the total CO2 emissions in the wider city area. This is largely as a result of traffic using the scheme which will be less congested, with traffic travelling at a more efficient speed thereby reducing CO2 emissions. The estimate of a 0.1% reduction does not take account of mode switch to more sustainable modes and will therefore be an underestimate of the reduction in CO2. Also the reduction has been determined for the whole modelled area, which is much larger than the study area. Although the TAF guidance suggests a neutral impact for a reduction below 0.25%, this option is rated Positive as there is likely to be significant mode switch.	Positive
	Option 4	The percentage change in CO2 emissions was measured using the traffic modelling carried out for the longlist appraisal of options relative to the Do-Minimum. Option 4 results in a 0.5% reduction in the total CO2 emissions in the wider city area. The estimate of a 0.5% reduction does not take account of mode switch to more sustainable modes and will therefore be an underestimate of the reduction in CO2. Also the reduction has been determined for the whole modelled area, which is much larger than the study area. Although the TAF guidance suggests a Slight Positive impact for a reduction between 0.5% and 1%, this option is rated High Positive as there is likely to be significant mode switch.	High Positive
	Option 5	The percentage change in CO2 emissions was measured using the traffic modelling carried out for the longlist appraisal of options relative to the Do-Minimum. Option 5 results in a 0.4% reduction in the total CO2 emissions in the wider city area. The estimate of a 0.4% reduction does not take account of mode switch to more sustainable modes and will therefore be an underestimate of the reduction in CO2. Also the reduction has been determined for the whole modelled area, which is much larger than the study area. Although the TAF	Positive

Impact	Route Option	Summary of Impacts	Impact Level
		guidance suggests a Slight Positive impact for this reduction this option is rated Positive as there is likely to be significant mode switch.	
Climate Adaption	Option 2	There is limited observed baseline flooding along the route. There may be a limited impact post scheme due to increased hard surface area, however the use of SuDS will aim to maintain greenfield runoff rates. Option 2 traverses large areas of high flood risk at its southwestern extents and a regionally important aquifer. Over the majority of its route, it is outside of high-risk flood zones. Based on the Adaption Scorecard, there is limited baseline impact, and likely to be limited impact following construction with best practice design principles applied. The overall impact for Option 2 is considered to be Negative	Negative
	Option 4	There is limited observed baseline flooding along the route. There may be a limited impact post scheme due to increased hard surface area, however the use of SuDS will aim to maintain greenfield runoff rates. Based on the Adaption Scorecard, there is limited baseline impact, and likely to be limited impact following construction with best practice design principles applied. The Impact for Option 4 is considered to be Slight Negative. based on comparison with Option 2 and Option 5.	Slight Negative
	Option 5	There is limited observed baseline flooding along the route. There may be limited impact post scheme due to increased hard surface area, however the use of SuDS will aim to maintain greenfield runoff rates. Option 5 traverses large areas of high flood risk at its southwestern extents compared to Option 4. Over the majority of its route, it is outside of high-risk flood zones. Based on the Adaption Scorecard, there is limited baseline impact, and likely to be limited impact following construction with best practice design principles applied. The Impact of Option 5 is considered to be Negative.	Negative

6.7.1 Climate Change Impact Scoring

The scores under each sub-criteria of the Climate Change Impacts were combined in the TAA template. The overall score for each Route Option is shown in **Table 6-28**.

Table 6-28: Climate Change Impact Combined Score

Route Option	Climate Change Impact Criteria Combined Score
Option 2	Neutral
Option 4	Slight Positive
Option 5	Neutral

6.8 Local Environmental Impact

The Local Environmental Impacts were appraised using GIS mapping, traffic modelling and a desk-based assessment of the routes in accordance with the TAA guidance.

Table 6-29 summarises the overall rating provided to Climate Change as part of the Stage 2 Appraisal.

Table 6-29: Local Environmental Impact

Impact	Route Option	Summary of Impacts	Impact Level
Air Quality	Option 2	Option 2 has the second lowest NOx kg/year and PM10 kg/year emissions and has the lowest overall exposure index suggesting an improvement in air quality compared to the Do – Minimum Option. However nearly double the quantity of residential properties are located within 50m of the proposed alignment compared to Option 4. The impact of Option 2 is considered to be slight positive.	Slight Positive
	Option 4	Option 4 has the lowest predicted NOx kg/year and PM10 kg/year emissions and has a negative overall exposure index. suggesting an improvement in air quality compared to the Do – Minimum Option. This option has the lowest number of residential receptors within 50m. Ecological receptors can be sensitive to road traffic emissions through subsequent nitrogen deposition, especially on nutrient sensitive species and habitats, Option 4 has the potential to impact environmentally sensitive areas, however the positive human environment gains offered by this route results in a net positive.	Positive
	Option 5	Option is the least preferred option causing a "Negative Impact" to an increase in exposure to NO_x kg/year and PM_{10} kg/year compared to the Do – Minimum option.	Slight Negative
Noise and Vibration	Option 2	Noise modelling was undertaken in order to quantify the number of receptors likely to experience noise levels in excess of 60 dB Lden as a result of the implementation of each option. The Potential Impact Rating (PIR) for Option 2 is 3955. Option 2 is likely to result in levels of over 60 dB Lden at 200 receptors. Consequently, Options 2 is classed as having a Negative Impact.	Negative
	Option 4	Option 4 has a significantly lower PIR than Options 2 and 5 with a rating of 1929. The results of the noise modelling show that Option 4 is likely to result in levels of over 60 dB L_{den} at 81 receptors, which is 12 more receptors than Option 5. Therefore, Option 4 is classed as having a Slight Negative Impact.	Slight Negative
	Option 5	The Potential Impact Rating (PIR) for Option 5 is slightly higher than Option 4 AT 2017. Option 5 is likely to result in levels of over 60 dB Lden at 69 receptors. Consequently, Options 5 is classed as having a Negative Impact.	Slight Negative
Biodiversity	Option 2	Option 2 traverses agricultural lands and would require considerable greenfield development. It is located 2km to the west of Cork Harbour SPA. Option 2 also passes through woodland at the River Bride, southwest of Na Piarsaigh GAA Club (Fairhill) and near the Bon Secours Care Village. This option crosses the Glen River in Mayfield and the River Bride in the Bride Valley near Kilcully. It also crosses the Kiln/Shournagh stream (tributary of the River Bride), north of Na Piarsaigh GAA club and the River Lee before intersecting with the Carrigrohane Road. Option 2 is classes as having a negative impact in terms of Biodiversity.	Negative
	Option 4	Option 4 primarily traverses agricultural lands and would require considerable green field development. The easternmost point of Option 4 (Glanmire Road) is located immediately adjacent to Cork Harbour SPA and lands in this area may be used by SCI bird species. This area of the SPA, located along the Glashaboy River between Glanmire and the Dunkettle Roundabout, also overlaps with the areas designated as Glanmire Wood pNHA and Dunkettle Shore pNHA. The Cork Harbour Ramsar Site and Douglas River Estuary pNHA are located approximately	High Negative

Impact	Route Option	Summary of Impacts	Impact Level
		1.4km downstream of Option 4. This option also goes through the Lee Valley pNHA for a distance of 100m and is within 400m of Annex I woodland habitat. Option 4 traverses woodland surrounding the Vienna Woods Hotel and passes through woodland at the River Bride and also a section of woodland southwest of Na Piarsaigh GAA Club (Fairhill). Option 4 requires 3 river crossings – Kiln/Shournagh stream (tributary of the River Bride), the River Bride and the River Lee. Option 4 is classed as having a High Negative Impact in terms of biodiversity.	
	Option 5	Option 5 primarily traverses agricultural lands and would require considerable green field development. Option 5 runs adjacent to the Cork Harbour SPA for a length of approximately 1.1km. The Cork Harbour Ramsar Site and Douglas River Estuary pNHA are located approximately 1.4km downstream of Option 5. This option also traverses the Lee Valley pNHA for a distance of 50m. Option 5 traverses woodland surrounding the Vienna Woods Hotel and passes through woodland in the River Bride Valley near Kilcully and also a section southwest of Na Piarsaigh GAA Club at Fairhill. Option 5 requires also requires 3 river crossings – Kiln/Shournagh stream (tributary of the River Bride), the River Bride and the River Lee. Option 5 is considered to have a High Negative impact in terms of biodiversity.	High Negative
Water Resources	Option 2	Option 2 is considered to have a Negative impact as it traverses the most significant areas of high flood risk and regionally important aquifer.	Negative
	Option 4	Option 4 is considered to have a Slight Negative impact as it traverses less areas of high flood risk and regionally important aquifer compared with Option 2.	Slight Negative
	Option 5	Option 5 is considered to have Slight Negative impact based on the shorter lengths of high flood risk and regionally important aquifer traversed in comparison to Options 2 and 4.	Slight Negative
Landscape and Visual	Option 2	Options 2, 4 and 5 are considered to have a highly negative impact on landscape and visual amenity. All three options also will have major direct effects on designated scenic routes, namely HPV1 and HPV5, resulting in a score of 1 (Highly Negative) for each of these options.	High Negative
	Option 4	Options 2, 4 and 5 are considered to have a highly negative impact on landscape and visual amenity. Options 4 and 5 score poorly in terms of landscape amenity due to their major direct impact on Landscape Preservation Zones on the western side of the Glashaboy Valley. Compared to these, Option 4 has a lesser impact. All three options also will have major direct effects on designated scenic routes, namely HPV1 and HPV5, resulting in a score of High Negative Impact for each of these options. Option 4 would have visual impacts on the least number of residential dwellings within 100 metres of the route alignment. Considering this, Option 4 is considered to have a Negative Impact in comparison to Option 2 and Option 5	Negative
	Option 5	Options 2, 4 and 5 are considered to have a highly negative impact on landscape and visual amenity. Options 4 and 5 score poorly in terms of landscape amenity due to their major direct impact on Landscape Preservation Zones on the western side of the Glashaboy Valley. All three options also will have major direct effects on designated scenic routes, namely HPV1 and HPV5, resulting in a score of 1 (Highly Negative) for each of these options.	High Negative

6.8.1 Local Environment Impact Scoring

The scores under each sub-criteria of the Climate Change Impacts were combined in the TAA template. The overall score for each Route Option is shown in **Table 6-30**.

Table 6-30: Impact Combined Score

Route Option	Local environment Impact Criteria Combined Score
Option 2	Negative
Option 4	Slight Negative
Option 5	Negative

6.9 TAA Summary

Table 6-31 combines the impact recorded under each of the TAA criteria assessed.

Table 6-31: TAA Summary and Scores

Route Option	Accessibility	Social	Land Use	Safety	Climate Change	Local Environment
Option 2	Positive	Positive	Positive	Positive	Neutral	Negative
Option 4	Positive	Positive	Positive	Positive	Slight Positive	Slight Negative
Option 5	Positive	Slight Positive	Positive	Positive	Neutral	Negative

The findings of this TAA are brought forward for use in the Cost Benefit Analysis as described in Section 7 of this report.

7 COST BENEFIT ANALYSIS

A cost-benefit analysis has been carried out for the three options identified for detailed appraisal (Option 2, Option 4 and Option 5). The methodology adopted comprises a fixed trip matrix appraisal using a SATURN model cordoned from the SWRM. This model was then validated against available traffic data – **see Transport Modelling Report in Appendix E**.

While the methodology applied does not take into account the potential for the scheme to attract greater users of sustainable transport and a consequent reduction in car trips, given the proposed provision for cyclists, pedestrians, and public transport, there will clearly be an increase in sustainable transport trips. The approach adopted is considered to be appropriate, as all options are likely to have a broadly similar positive impact on sustainable travel. The use of a highway only model is therefore appropriate in determining a preferred route corridor from a cost benefit perspective. This methodology was previously set out in Section 6.9 of the Strategic Assessment Report **(refer to Appendix A)**

The cost benefit analysis includes:

- Transport Economic Efficiency impacts – using TUBA; and
- Accident Impacts – using COBALT.

7.1 TUBA Analysis

TUBA carries out the analysis of transport economic efficiency by:

- Taking future year journey distances, volumes and times from the transport model, for Do-Minimum and Do-Scheme options,
- Combining these to calculate benefits for each modelled hour,
- Multiplying up by numbers of hours in the year to give an estimate of benefits for each modelled year,
- Interpolating between these modelled years to give an estimate of total benefits over the 30-year appraisal period, and then
- Comparing the overall economic benefit with the costs of the scheme.

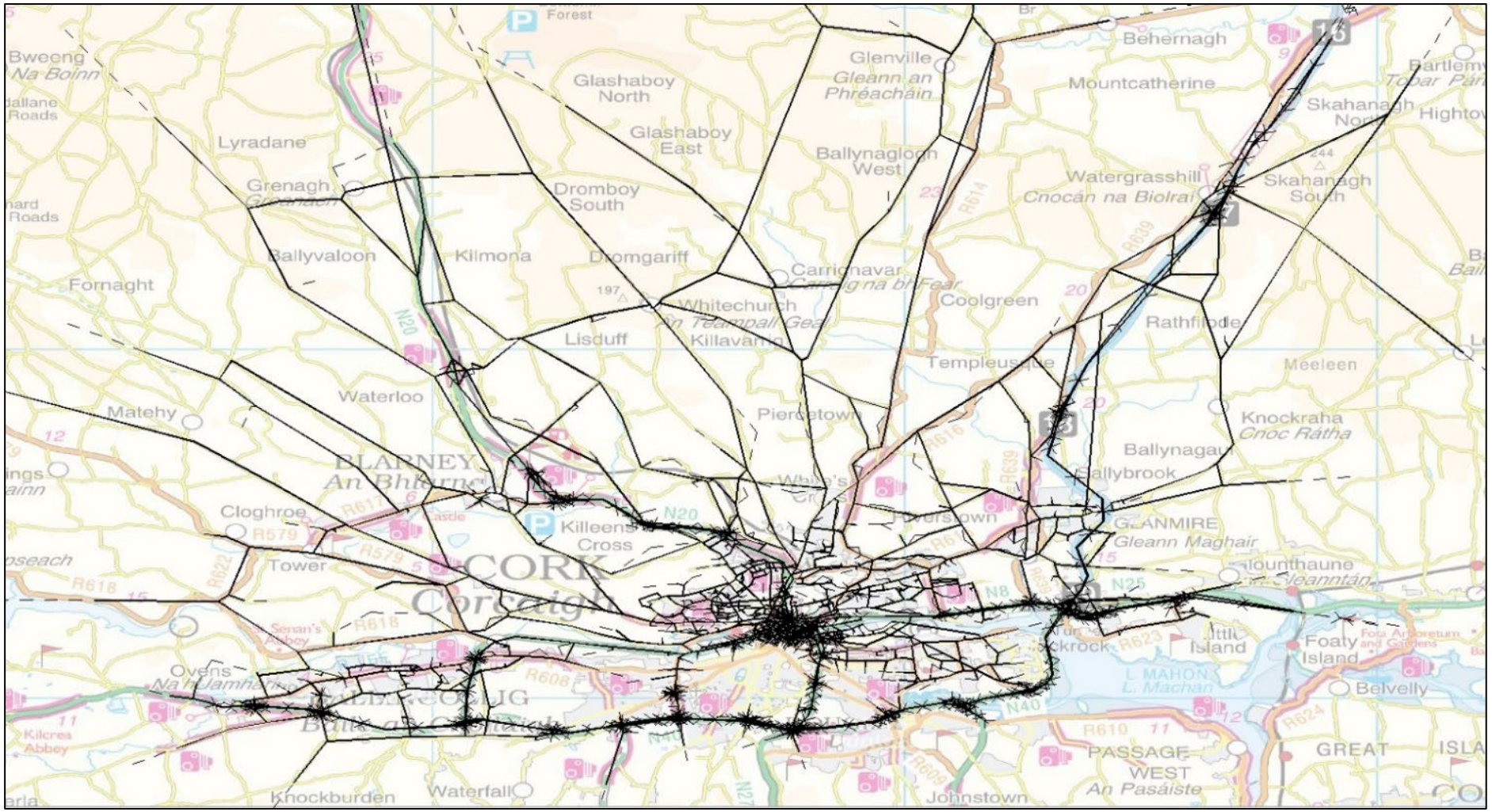
The analysis has been carried out in accordance with TII PAG Unit 6.5: - Guidance on Using TUBA.

7.1.1 Transport Modelling

The SATURN transport model and the data on which it is based are fully described in the accompanying Transport Modelling Report and are briefly summarised in this section.

The extent and detail of the model is illustrated in **Figure 7.1**.

Figure 7-1: Extent of Transport Model



The model is based on a cordon from the SWRM, with enhanced local detail. It covers the same 10 user classes and 4 time periods as the NTA regional modelling system. Section 7.1.3 describes how the dimensions of the transport model are applied within the TUBA software.

The Core forecasting scenario is based on:

- Demand growth rates between the 2016 SWRM base year and 2043 (forecast year for the CMATS analysis) reference case model run, interpolated/extrapolated to other years as required.
- Redistribution of growth within the scheme corridor, so as to concentrate growth in trip ends on the development areas in the Cork City Development Plan.
- A Furness procedure which factors the base year matrices to be consistent with future year trip-ends.

Forecast runs were undertaken for the assumed opening year of 2029 and design year 2044.

The future year Do-Minimum network includes the following other schemes:

- Dunkettle Interchange upgrade scheme.
- M20 scheme – that portion within the CNDMR study area is assumed to be an online improvement.
- M28 scheme – that portion within the CNDMR study area is assumed to be an online improvement.
- Docklands bridges and associated road improvements.
- Glanmire Road improvements – various projects to improve the accessibility, sustainability, capacity, and safety of the transport network in the Glanmire, Riverstown and Sallybrook areas (partially implemented).
- East-west LRT route.
- Changes to bus/cycle network on MacCurtain Street and surrounding streets (now implemented).

7.1.2 Transport Modelling Output

The three alternative options were assessed using the transport model and their forecast impacts on traffic flows determined. These forecasts do not include the impacts of modal switch resulting from the sustainable transport measures that are an integral element of the scheme – for the reasons set out in section 6.7.

The following table presents the changes in AADT flow on a number of links in Cork for the Do-Minimum and the three scheme options in the Design Year of 2044.

Table 7-1: Forecast 2044 AADT Flows

Location	Do-Minimum	Option 2	Option 4	Option 5
Cathedral Road	7,850	6,090	6,070	6,180
Ballyhooly Road	9,690	7,820	7,860	8,310
Watercourse Road	11,450	7,860	7,820	10,880
St Patrick's Quay/MacCurtain St	25,580	24,450	22,050	21,470

7.1.3 TUBA Input Assumptions

Each TUBA scheme file references a set of matrices that were exported from the SATURN transport model. These comprise:

- x 3 matrix types - trips, times, distances
- x 4 time slices (corresponding to the 4 modelled hours in the transport model)
- x 5 user classes (see below)

- x 2 cases (Do-Minimum and Do-Scheme)
- x 2 modelled years (Opening Year 2029, Design Year 2044)
- = a total of 240 matrices for each run.

The transport model distinguishes 10 vehicle categories. **Table 7-2** summarises the vehicle types used in the transport model, the categories used in TUBA, and the correspondence between them.

Table 7-2: Vehicle Type Correspondence

User class in transport model	Description	Calibration level	Submode in TUBA economics file	Trip Purpose in TUBA
1	Cars – Business	Light	1 = car	0 = all
2 *	Cars – Commuting			
3	Cars – Education			
4	Cars – Other Home-Based			
5	Cars – Non-Home-Based			
6	Taxi			
7 *	Light Goods Vehicles	Medium	2 = LGV	0 = all
8 *	Heavy Goods Vehicles – OGV1	Heavy	3 = OGV1	0 = all
			5 = PSV	0 = all
9	Heavy Goods Vehicles – OGV2		4 = OGV2	0 = all
10				

* = user classes for which times/distances were skimmed.

Volume matrices were exported from SATURN at the level of light / medium / heavy, this being the level of disaggregation of the data to which the model was calibrated. Trip volumes are exported from SATURN in units of PCUs per hour and read into TUBA in units of vehicles per hour, so volume data needs to be further factored by the inverse of the PCU factor for each vehicle type.

Table 7-3: Calculation of Volume Factors by Vehicle Type

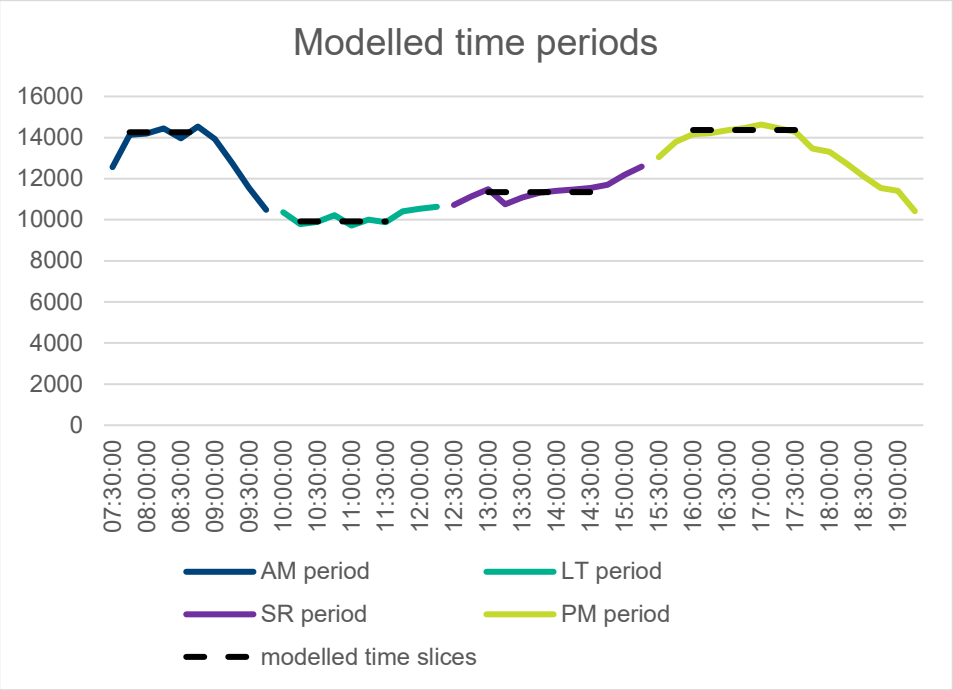
Vehicle mix	CAR	LGV	OGV1	OGV2	PSV
Vehicle type	Light	Medium	Heavy		
[A] Share of modelled flow	100%	100%	46.6%	30.7%	22.6%
[B] pcu factor	1.0	1.0	2.0	3.0	3.0
Compound factor applied = [A]/[B]	1.000	1.000	0.233	0.102	0.075

Trip distances were written from SATURN in units of metres, and read in kilometres, so a factor of 0.001 was applied.

Trip times were written from SATURN in units of seconds, and read in hours, so a factor of 1/3600 = 0.000278 was applied.

The four modelled hours in the transport model are as follows:

Figure 7-2: Modelled Hour and Time Periods



Every cost-benefit analysis requires a basis on which to treat each non-modelled hour of the year, either by equating it to some fraction of a modelled hour, or by discarding it from the analysis. For this comparative CBA between scheme options, the following basis was adopted:

- As a conservative assumption, no benefit was claimed for weekends or for off-peak hours (before 07:30 and after 19:30).
- Annualisation factors were based on the data in **Figure 7-2** above. Each 15-minute interval within a modelled time-slice period was treated as one-quarter of a modelled hour.
- The remaining 15-minute intervals of the 12-hour day were each allocated to the model period that best represents them. Benefit per vehicle was assumed to vary linearly with flow (so that the total benefit over all vehicles varies with the square of flow). So that for example an interval with 90% of the flow level of the corresponding modelled hour was counted as the equivalent of 81% of an interval, because nine-tenths as many vehicles would each get nine-tenths as much benefit.
- Then the total equivalent hours per working day were totalled, and the number of hours in a typical week multiplied by 250 working days per year (discarding 10 days corresponding to Bank Holidays and the week between Christmas and New Year).

The following table shows the calculation.

Table 7-4: Calculation of Annualisation factors

Time slice	Hours modelled directly	Equivalent hours in rest of period	Total equivalent hours per day	x 250 working days per year
AM	1.25	0.932	2.182	546
LT	1.5	1.117	2.617	654
SR	2	1.059	3.059	765
PM	1.75	1.694	3.444	861

7.1.4 Scheme Costs

The cost-benefit analysis uses Stage 2 Option Comparison Cost Estimates. The option cost estimates were developed in line with the NTA's Cost Management Guidelines 2024 and using the template *011_B23_FWCE-Band-3-Phase 2 Option Comparison Cost Estimate,* for input to TUBA. The latest available information from comparative schemes has been used to develop the base costs, along with the NTA's published guidance on contingency and inflation calculation. **Table 7-5** presents a summary of the Option Comparison Cost Estimates for the three shortlisted options. These account for the following:

- 20% inflation to bring costs to 2028 assumed construction start (based on NTA Inflation Bulletin 2024)
- 30% contingency applied as per NTA Contingency Calculator
- 5% Programme Risk applied
- VAT included

Table 7-5: Option Comparison Cost Estimates

	Option 2	Option 4	Option 5
Cost Heading	**Budget (Incl VAT) (2028 price)**	**Budget (Incl VAT) (2028 price)**	**Budget (Incl VAT) (2028 price)**
Target Cost (incl Construction, Preparation & Administration, Transport Management, Land & Property etc)	€249,225,991	€290,987,411	€290,769,913
Programme Risk 5%	€12,461,300	€14,549,371	€14,538,496
Total Scheme Budget	**€261,687,291**	**€305,536,781**	**€305,308,409**

7.1.4.1 Future Cost Range

The above estimates, which are based on the latest available information and assumptions on completion timelines, are considered sufficient for CBA comparison of options at this stage. However future factors affecting inflation, supply chains, and domestic/global markets could have significant impact on the actual scheme costs in time. Therefore for funding reasons it is prudent to consider a cost range within which the scheme is likely to fit.

Based on benchmarking of per km rates across recent major schemes in this jurisdiction, a cost range has been established with a Lower Bound estimate of €210m (incl VAT) and an Upper Bound estimate of €520m (incl VAT). This range will likely shorten as more detailed costings are carried out at later scheme phases, and uncertainty around scheme risks reduce.

7.1.4.2 Cost Profile

At this stage the following indicative profiling of costs over time has been used, consistent with a scheme completion in 2031. Cost profiling will be reviewed at later stages of the scheme development.

Table 7-6: Profile of Scheme Implementation Costs Over Time

Year	Construction	Preparation & Administration	Transport Management Related	Land & Property
2022		5%		
2023		5%		
2024		5%		
2025		30%		
2026		30%		
2027		25%	1%	50%
2028	15%		36%	50%
2029	40%		40%	
2030	40%		20%	
2031	5%		4%	

7.1.5 Economic Results

The results of the cost-benefit analysis described above are presented in **Table 7-7**, using the standard TUBA disaggregation of benefits.

Table 7-7: TUBA Results (€m)

Item	Option 2	Option 4	Option 5
Benefits			
Commuting User Benefits	74,491	86,508	81,438
Other User Benefits	87,642	103,240	97,824
Business User Benefits	116,109	138,808	132,217
Indirect taxation impact	-5,393	-6,408	-6,019
Carbon Benefits	14,485	17,171	15,967
Residual value	257,420	294,879	272,378
Present Value of Benefits (PVB)	**544,754**	**634,198**	**593,805**
Costs			
Investment Costs	134,872	157,308	157,210
Maintenance Costs	8,992	9076	9766
Present Value Costs (PVC)	**143,864**	**166,384**	**166,976**
Value for Money			
Net Present Value (NPV = PVB – PVC)	**400,890**	**467,814**	**426,829**
Benefit to Cost Ratio (BCR = PVB / PVC)	**3.79**	**3.81**	**3.56**

From the above it can be seen that all options provide major transport economic efficiency benefits, primarily due to travel time savings.

- In terms of Benefits, Option 4 provides the greatest transport benefits followed by Option 5, with Option 2 providing lower benefits – the benefits for Option 2 are 14% lower than for Option 4. The main reasons for differences in the benefits provided by the scheme options are:
- Option 2 results in greater congestion on the R635 between Old Youghal Road and the N8 at Dunkettle Roundabout, whereas Options 4 and 5 reduce congestion here.
- Options 4 and 5 have shorter journey length for trips travelling to/from the Glanmire and Dunkettle interchange areas.
- Overall journey lengths for east-west trips are lower for Options 4 and 5
- Option 5 has a slightly lower overall journey length for east-west trips but increases journey lengths for trips to and from Hollyhill and Hollymount industrial estates.

In terms of Costs, Option 4 and Option 5 have comparable costs, with Option 2 having lower costs. This is based on the slightly shorter route length for Option 2.

The value for money of a transport scheme is determined using Net Present Value and Benefit to Cost Ratio.

Of the three options analysed, Option 4 provides the greater Net Present Value and the higher Benefit to Cost Ratio. Option 4 is therefore the best performing option on terms of Transport Economic Efficiency.

7.2 Accident Costs

7.2.1 Use of COBALT Software

The impact of the scheme on safety has been assessed using COBALT, using default collision rates and parameters for the network – as set out in PAG Unit 6.11 – National Parameters Values Sheet.

COBALT models are relatively simple, applying a default single collision rate (Personal Injury Collisions/ million vehicle-kilometres, or PIC/mvkm) for a given road type.

The forecast number of accidents over the appraisal period are determined by multiplying the accident rate for a link by the volume of traffic using the link (AADT) for each forecast year.

The network used for the accident analysis was the same as that covered by the SATURN model and forecast flows were taken from the model for the Do-Minimum and Do-Scheme networks.

7.2.2 COBALT Results

As discussed in Section 6.6.2, COBALT is a relatively crude tool for estimated collision and casualty savings which does not take account of specific local factors. Importantly for this project it does not take account of the safety benefits to cyclists of providing segregated facilities

The predicted collision and casualty savings due to the scheme are presented in the table below.

Table 7-8: COBALT Results Summary

	Option 2	Option 4	Option 5
Collisions	94	-1.1	18.2
Fatal casualties	1.3	1.9	2.2
Serious casualties	5.7	2	3.2
Slight casualties	130.8	5.5	31.7
Present Value (€m)	3,628	2,357	3,151

Of the three options analysed, Option 2 provides the greatest reduction in collisions and the greatest associated economic benefit. Options 4 and 5 however, provide a slightly greater reduction in fatal casualties.

This is as a result of Option 4 and 5 taking traffic away from higher speed roads (>60kmh) and onto lower speed roads (≤60kmh) – primarily the N8 east of Dunkettle Roundabout (which has a very high traffic flow) and the N22 west of Cork (for Option 5). The lower speed roads have a higher number of collisions (hence fewer collision savings for Options 4 and 5) but also have a much lower proportion of fatal casualties, resulting in a greater reduction in fatal casualties for Options 4 and 5.

7.3 Combined Cost Benefit Analysis Results

Combining TUBA and COBALT outputs gives the following CBA results for the three options.

Table 7-9: Cost Benefit Analysis Summary of Results

Item	Option 2	Option 4	Option 5
Benefits			
Commuting User Benefits	74,491	86,508	81,438
Other User Benefits	87,642	103,240	97,824
Business User Benefits	116,109	138,808	132,217
Indirect taxation impact	-5,393	-6,408	-6,019
Carbon Benefits	14,485	17,171	15,967
Residual value	257,420	294,879	272,378
Accident Benefits	3,628	2,357	3,151
Present Value of Benefits (PVB)	548,382	636,555	596,956
Costs			
Investment Costs	134,872	157,308	157,210
Maintenance Costs	8,992	9076	9766
Present Value Costs (PVC)	**143,864**	**166,384**	**166,976**
Value for Money			
Net Present Value (NPV = PVB – PVC)	**404,518**	**470,171**	**429,980**
Benefit to Cost Ratio (BCR = PVB / PVC)	**3.81**	**3.83**	**3.58**

When the Transport Economic Efficiency and Accident benefits are combined, Option 4 provides the greater Net Present Value and the higher Benefit to Cost Ratio. Option 4 is therefore the best performing option in terms of Cost Benefit Analysis. It is noted that for Benefit to Cost Ratio Option 2 is only marginally lower, with Option 5 being the lowest.

8 FINANCIAL APPRAISAL

According to TII publication (PE-PAG-02031-Project Appraisal Guidelines Unit 7.0 – Multi-Criteria Analysis, February 2024), the recommendation regarding a preferred option for the scheme should consider the results from the various appraisals including the financial appraisal results. Therefore, financial appraisals for all the shortlisted options (Option 2, Option 4, and Option 5) are presented in this section.

In line with current guidance set out in the Transport Appraisal Framework (June 2023) and PAG Unit 11 (December 2023), discounted cash flow analysis, exchequer cash flow analysis and affordability assessment are completed.

1. **Discounted Cash Flow (DCF) Analysis** - which quantifies the financial cash inflows and outflows from the perspective of the Sponsoring Agency. The DCF analysis is required for all projects, regardless of size.

2. **Exchequer Cash Flow Analysis** - which quantifies the financial cash flows from the perspective of the exchequer. This takes into account the central funding provided to a project by the exchequer, as well as the indirect inflows and outflows such as taxation and duties. Exchequer Cash Flow Analysis should be conducted when it adds significantly to the project, such as when there are significant income streams/ tax impacts/ multiple sources of funding that are relevant from an Exchequer perspective.

3. **Affordability Assessment**, which establishes the amount of funding that will be required for a project, as well as the anticipated sources of that funding.

The financial appraisal focuses on financial impact of the CNDMR scheme. The financial appraisal for the shortlisted options:

- Is based on cashflow inputs including annualised inflows and outflows, including capital costs and maintenance costs;

- Includes discounted cash flows based on an incremental approach, showing summary of the inflows and outflows for the CNDMR scheme for the shortlisted options, discounted at the appropriate financial discount rate; and

- Includes exchequer cash flows based on an incremental approach, showing summary of the inflows and outflows for the CNDMR scheme for the shortlisted options, discounted at the appropriate financial discount rate.

8.1 Time Horizon

The planning for the scheme started from 2022. The main construction contract for the scheme is assumed to commence in 2028 and to conclude in 2031 at the earliest. The appraisal period of this scheme is 30 years from scheme opening, and therefore the period analysed goes from 2031 to 2060 inclusive. The modelling work carried out assumed an opening year of 2028 and for the purposes of this analysis the 2028 model output matrices (used in the cost benefit analysis) are assumed to apply for 2031. In effect therefore the analysis has excluded 3 years of growth and will slightly underestimate the scheme benefits. This will apply equally to all options and will not impact on the identification of a preferred corridor.

8.2 Discounted Cash Flow Analysis

Discounted Cash Flow (DCF) Analysis - which quantifies the financial cash inflows and outflows from the perspective of the Sponsoring Agency. The DCF analysis is completed in this section for all the shortlisted options.

8.2.1 Cash Inflows

Cash inflows normally include Operating Revenues and Residual Value according to Transport Appraisal Framework Appraisal Guidelines for Capital Investments in Transport (Module 7 - Detailed Guidance on Appraisal Techniques).

In this scheme, there are no cash inflows involved. Residual value has been excluded.

8.2.2 Cash Outflows

The cash outflows for this scheme include Capital Costs and Operating & Maintenance Costs.

8.2.2.1 Capital Cost

Capital Costs include all fixed assets (e.g. land acquisition costs, construction cost of pavement and structures, ITS equipment). In addition to non-fixed assets (e.g. start-up and technical costs such as design, planning, project management, technical assistance, construction supervision, publicity etc.).

The costs are spread over the years of the design and construction phase, on the assumption of cash disbursements in line with activity, following the proportions in **Table 7-6** previously. The latest available information from comparative schemes has been used to develop the base costs, along with the NTA's published guidance on contingency and inflation calculation. These account for the following:

- 20% inflation to bring costs to 2028 assumed construction start (based on NTA Inflation Bulletin 2024)
- 30% contingency applied as per NTA Contingency Calculator
- 5% Programme Risk applied
- VAT included

The detailed Total Scheme Budgets for each shortlisted option are present in **Tables 8-1, 8-2 and 8-3**.

Table 8-1: Total Scheme Budget (including cost profile) for Option 2

Option 2															
Base Cost Expenditure Heading	Base Cost (no VAT)	20% Inflation	Contingency 30%	VAT	VAT cost	Budget € (2028 price)	Yearly Profiles (Euro)								
							Pre 2024	2024	2025	2026	2027	2028	2029	2030	2031
TOTAL	141,367,353	27,099,212	50,039,574	/	*30,719,852*	249,225,991	Sunk Cost	1,268,327	2,536,654	2,536,654	6,642,880	41,827,263	91,110,168	88,722,486	12,044,907
						Yearly Target cost	2,536,654	1,268,327	2,536,654	2,536,654	6,642,880	41,827,263	91,110,168	88,722,486	12,044,907
						Target Cost	249,225,991								
						Programme Risk 5%	12,461,300								
						Yearly Total	€ 2,663,486	€ 1,331,743	€ 2,663,486	€ 2,663,486	€ 6,975,024	€43,918,626	€ 95,665,676	€ 93,158,611	€12,647,152
						Total Scheme Budget	€261,687,291								

Table 8-2: Total Scheme Budget (including cost profile) for Option 4

Option 4															
Base Cost Expenditure Heading	Base Cost (no VAT)	20% Inflation	Contingency 30%	VAT	VAT cost	Budget € (2028 price)	Yearly Profiles (Euro)								
							Pre 2024	2024	2025	2026	2027	2028	2029	2030	2031
TOTAL	164,939,749	31,686,041	58,403,700	/	*35,957,922*	290,987,411	Sunk Cost	1,508,177	3,016,354	3,016,354	7,613,744	48,677,982	106,419,736	103,633,025	14,085,686
						Yearly Target cost	3,016,354	1,508,177	3,016,354	3,016,354	7,613,744	48,677,982	106,419,736	103,633,025	14,085,686
						Target Cost	290,987,411								
						Programme Risk 5%	14,549,371								
						Yearly Total	€ 3,167,171	€ 1,583,586	€ 3,167,171	€ 3,167,171	€ 7,994,431	€51,111,882	€ 111,740,723	€ 108,814,676	€14,789,970
						Total Scheme Budget	€305,536,781								

Table 8-3: Total Scheme Budget (including cost profile) for Option 5

Option 5														
Base Cost Expenditure Heading	Base Cost (no VAT)	20% Inflation	Contingency 30%	VAT	VAT cost	Budget € (2028 price)	Yearly Profiles (Euro)								
							Pre 2024	2024	2025	2026	2027	2028	2029	2030	2031
TOTAL	164,828,290	31,655,717	58,361,586	/	*35,924,320*	290,769,913	Sunk Cost	1,507,217	3,014,435	3,014,435	7,637,764	48,661,462	106,315,981	103,531,917	14,072,268
						Yearly Target Cost	3,014,435	1,507,217	3,014,435	3,014,435	7,637,764	48,661,462	106,315,981	103,531,917	14,072,268
						Target Cost	290,769,913								
						Programme Risk 5%	14,538,496								
						Yearly Total	€ 3,165,157	€ 1,582,578	€ 3,165,157	€ 3,165,157	€ 8,019,652	€51,094,535	€ 111,631,780	€ 108,708,513	€14,775,882
						Total Scheme Budget	€305,308,409								

8.2.2.2 Operating & Maintenance Costs

The scheme length for maintenance purposes is taken as **Table 8-5**. This length was multiplied by the annual maintenance costs from PAG unit 6.11 - National Parameters Values Sheet - PE-PAG-02030 (May 2024), with the dual-carriageway cost (€42,879/km/year) assumed applicable in the Do-Scheme cases.

The maintenance costs have been profiled over a 30-year period using data taken from the National Secondary Roads Needs Study; the same profile was assumed to apply to the second 30-year period. The profile applied is set out below in **Table 8-4**.

The yearly inflation rate is 2% from 2029 onwards and 13.5% of VAT is applied. The summary of maintenance costs including VAT & Inflation for all shortlisted options are presented in the **Table 8-5**.

Table 8-4: Proportion of maintenance costs over 30 years

Year	Proportion of maintenance costs (%)
2031	0.69
2032	0.69
2033	0.69
2034	0.69
2035	0.69
2036	1.39
2037	1.39
2038	1.39
2039	1.39
2040	7.64
2041	0.69
2042	0.69
2043	0.69
2044	0.69
2045	0.69
2046	1.39
2047	1.39
2048	1.39
2049	1.39
2050	1.39
2051	2.78
2052	2.78
2053	2.78
2054	2.78
2055	58.38
2056	0.69
2057	0.69
2058	0.69
2059	0.69
2060	0.69
Total	**100**

Table 8-5: Maintenance costs for all shortlisted options

Option	Length (m)	30-year Maintenance cost	30-year Maintenance cost (Include VAT & Inflation)
Option 2	12.90	€ 25,926,164	€ 45,015,171
Option 4	13.02	€ 26,167,338	€ 45,433,917
Option 5	14.01	€ 28,157,020	€ 48,888,570

8.2.3 Discounted Cash Flows

The discount rates used in the Financial Appraisal are set following guidance by the Department of Public Expenditure & Reform and the National Development Finance Agency. A rate of 2.91%[1] has been used for discounting project cash flows in the DCF analysis, in line with DPER / NDFA guidance.

The inflation factors are following the NTA inflation bulletin and assumed as 2% onward from the year 2031 to 2060.

The summary of cash flows over the analysis periods for all shortlisted options are shown in **Table 8-6**.

Table 8-6: Summary of the cash flows results for all shortlisted options (€m)

DCF summary table (€m)	Capital Cost (Target Cost)	Operation Cost (Maintenance Cost)	Total Financial Net Present Value (FNPV)
Option 2	241.616	45.015	-241.634
Option 4	281.938	45.434	-278.990
Option 5	281.727	48.889	-280.247

It can be seen that there is little difference in terms of discounted cash flow between Options 4 and 5 (Option 5 is only 0.6% greater than Option 4. Option 2 has the lowest FNPV – approximately 13% lower than Option 4.

8.2.4 Sensitivity test for discounted cash flow analysis

Following guidance on sensitivity testing, the impact on FNPV of alternative cost assumptions has been carried out. The sensitivity tests assumed changes in target costs of ±10% and ±20%. The results of the sensitivity tests are presented overleaf.

Table 8-7: Sensitivity test for discounted cash flow analysis – cost variation

Sensitivity to Cost (€m)	Low Scenario		Central Scenario	High Scenario	
	-20%	-10%	0%	10%	20%
Option 2					
Target Cost	199.381	224.303	249.226	274.149	299.071
Total Scheme Budget Cost	209.350	235.519	261.687	287.856	314.025
Total Financial Net Present Value (FNPV) over construction and appraisal periods	-197.085	-219.359	-241.634	-263.908	-286.182
Option 4					
Target Cost	232.790	261.889	290.987	320.086	349.185

[1] https://www.gov.ie/en/policy-information/1a0dcb-project-discount-inflation-rates/

Sensitivity to Cost (€m)	Low Scenario		Central Scenario	High Scenario	
Total Scheme Budget Cost	244.429	274.983	305.537	336.090	366.644
Total Financial Net Present Value (FNPV) over construction and appraisal periods	-227.005	-252.998	-278.990	-304.983	-330.975
Option 5					
Target Cost	232.616	261.693	290.770	319.847	348.924
Total Scheme Budget Cost	244.247	274.778	305.308	335.839	366.370
Total Financial Net Present Value (FNPV) over construction and appraisal periods	-228.301	-254.274	-280.247	-306.220	-332.194

8.3 Exchequer Cash Flow Analysis

Following the PAG Unit 11.0-Financial Appraisal, Exchequer Cash Flow Analysis should be conducted when it adds significantly to the project, such as when there are significant income streams/ tax impacts/ multiple sources of funding that are relevant from an Exchequer perspective. Therefore, Exchequer Cash Flow Analysis has been completed for all shortlisted options in this section.

8.3.1 Exchequer Cash Flow Analysis for options

The Exchequer Cash Flow Analysis builds on the Financial Net Present Value, with minor adjustments to include additional direct and indirect inflows and outflows associated with the project which solely impact the exchequer. For this scheme, the positive tax impacts (VAT in the table below) are identified as additional inflows. The outflows are the same as in discounted cash flows including capital costs and maintenance costs.

The results of the exchequer cash flow analysis including total financial net present value are summarised in the table below.

Table 8-8: Summary of the exchequer cash flows results for all shortlisted options (€M)

DCF summary table (€M)	VAT (from Capital cost and operating cost)	Capital Cost (Target Cost)	Operation Cost (Maintenance Cost)	Total Financial Net Present Value (FNPV)	Total Financial Net Present Value (FNPV) NO VAT
Option 2	34.651	249.226	45.015	-241.634	**-212.327**
Option 4	35.958	290.987	45.434	-278.990	**-245.069**
Option 5	35.924	290.770	48.889	-280.247	**-246.184**

8.3.2 Sensitivity test for exchequer cash flow analysis

Following guidance on sensitivity testing, the impact on FNPV for exchequer cash flow analysis of alternative cost assumptions has been carried out. The sensitivity tests assumed changes in target costs of ±10% and ±20%. The results of the sensitivity tests are presented below.

Table 8-9: Sensitivity test for exchequer cash flow analysis – cost variation

Sensitivity to Cost (€m) for Exchequer Analysis	Low Scenario		Central Scenario	High Scenario	
	-20%	-10%	0%	10%	20%
Option 2					
VAT in Total	28.792	31.721	34.651	37.581	40.510
Total Financial Net Present Value (FNPV) over construction and appraisal periods - Exchequer	-173.190	-192.759	-212.327	-231.896	-251.464
Option 4					
VAT in Total	32.817	36.243	39.670	43.096	46.523
Total Financial Net Present Value (FNPV) over construction and appraisal periods - Exchequer	-199.415	-222.242	-245.069	-267.896	-290.723
Option 5					
VAT in Total	33.202	36.625	40.048	43.472	46.895
Total Financial Net Present Value (FNPV) over construction and appraisal periods - Exchequer	-200.562	-223.373	-246.184	-268.995	-291.805

8.4 Affordability Assessment

The current cost estimate for the scheme has been developed using the NTA Cost Management Guidelines. An affordability assessment confirms the role played by participants in the funding process. Since the funding is singularly provided by the sanctioning authority for this scheme, it is unnecessary to carry out a source of funding analysis.

8.5 Conclusion of Financial Appraisal

It is concluded that all three shortlist options appraised offer value for money to the exchequer, with Option 2 having a marginally lower Capital Cost of all three options. However, on the basis of the outcomes of the CBA in Section 7, it is still concluded that Option 4 is the best performing option from a financial appraisal perspective as it offers the overall best value for money to the exchequer in terms of return on benefits.

9 APPRAISAL OF THE EMERGING PREFERRED OPTION

9.1 Consideration of Combinations

When assessing route options along varying and overlapping corridors, it is important to consider if combinations of different option arrangements would lead to a different choice in preferred option, due to benefits that may otherwise be unclear or minimised in the assessment process. This is a particularly critical exercise as it tests the robustness of the assessment process and evaluates each of the options, node by node.

The TAA process (Section 6) indicates that Option 4 is the preferred solution when assessed under the range of criteria, however its impact scores indicate that Option 2 also performs well.

The Cost Benefit Analysis (Section 7) indicates that Option 4 is the best performing option in terms of Benefits over Costs with a BCR of 3.83 while Option 2 has a BCR of 3.81.

The Financial Appraisal (Section 8) indicates that Option 2 offers greater value for money than Option 4 as it has a lower capital cost. While the Cost Benefit Analysis has determined that Option 4 is preferred as it generates higher benefits even though it has a higher capital cost. The choice of a lower capital investment (Option 2) for lower overall benefits must be considered.

To address these issues, the areas of difference between Option 2 and Option 4 need to be more closely examined. In the case of both options they have a robust business case with similarly high BCR's. The differences in the capital cost outcomes of the Financial Appraisal are directly related to route length at this early stage, which is an outcome of option choice as part of the TAA process.

The best approach is therefore to examine the differences between the two options and carry out a Comparative Assessment using the TAA criteria, on the discreet sections of both Option 2 and Option 4 that differ along the route corridors. There are three key areas of difference along the route corridors for Option 2 and Option 4, as indicated in the following figures. These are –

- Eastern Tie-In to Node C [Glanmire / Silversprings to Rathcooney Road]
- Node D to Node E [Sweeney's Hill to Nash's Boreen]
- Node G to Western Tie-In [Lee Road to Carrigrohane Road]

Figure 9-1: Option 2 & 4 - Eastern Tie-In to Node C [Glanmire / Silversprings to Rathcooney Road]

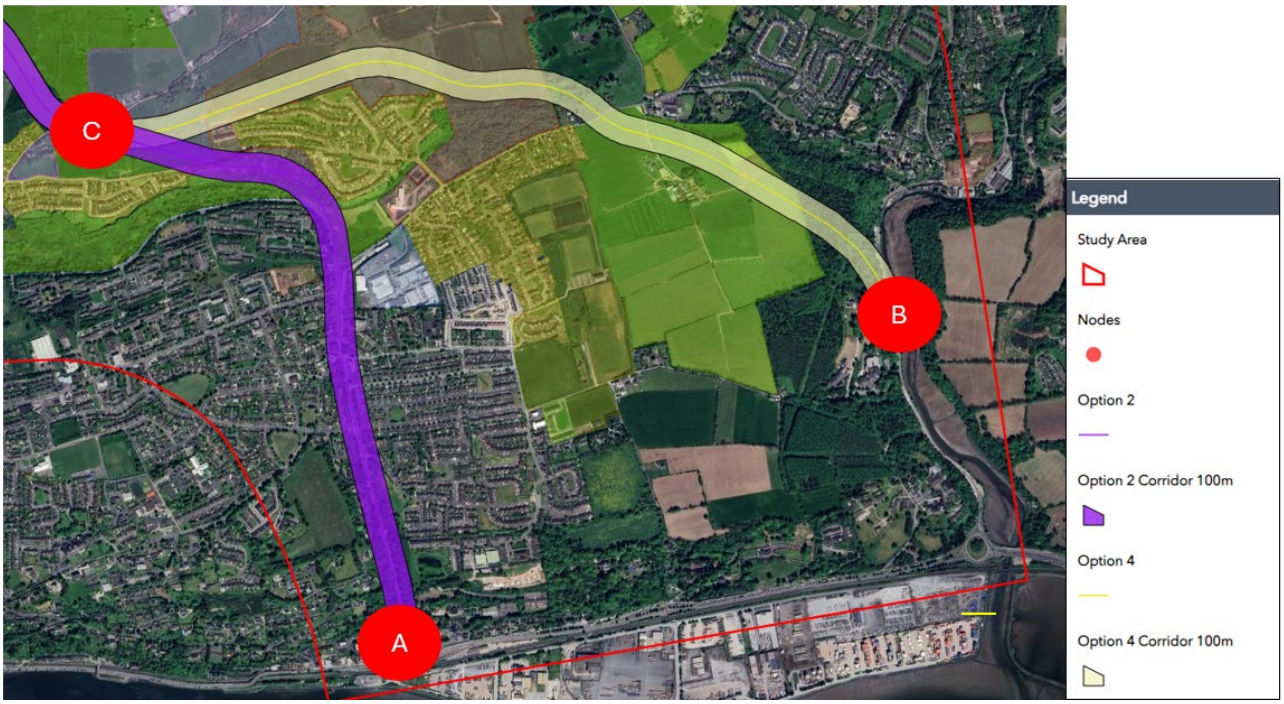


Figure 9-2: Option 2 & 4 - Node D to Node E [Sweeney's Hill to Nash's Boreen]

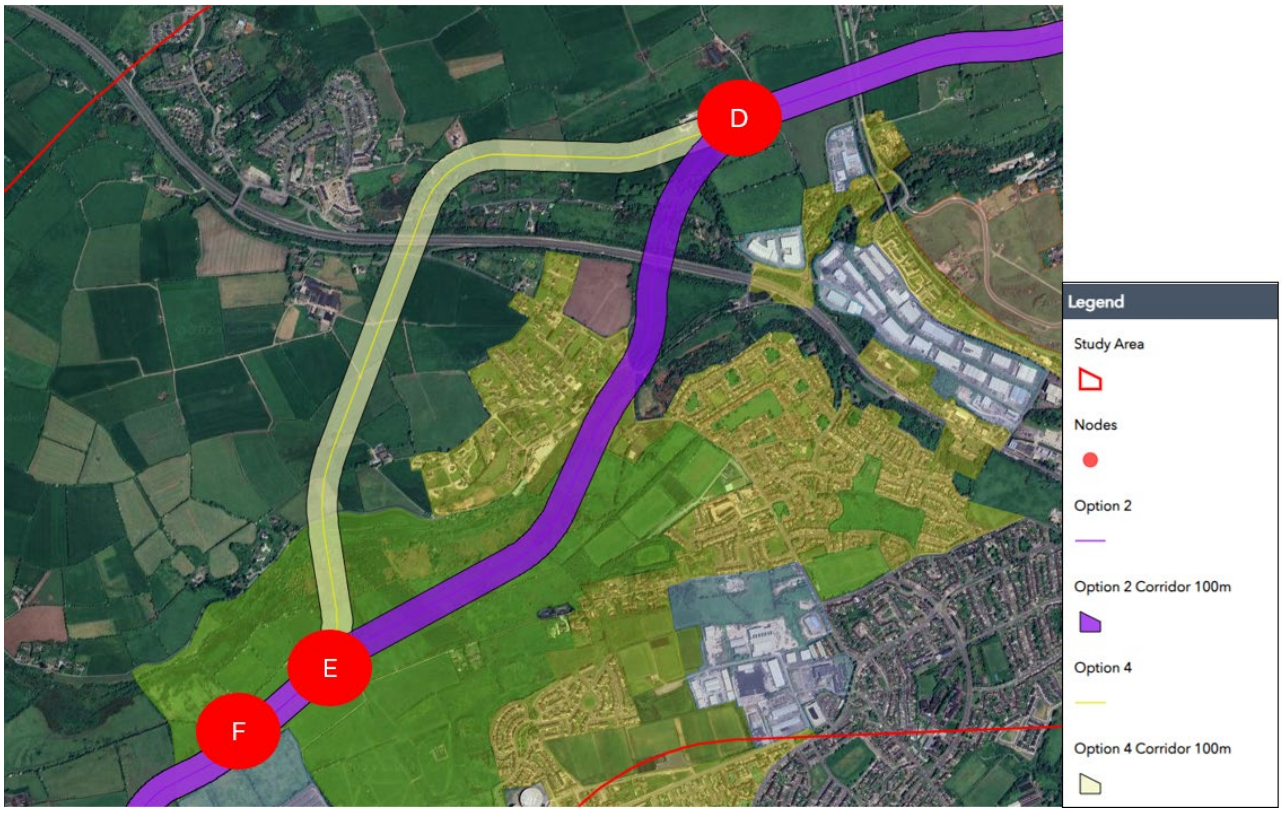
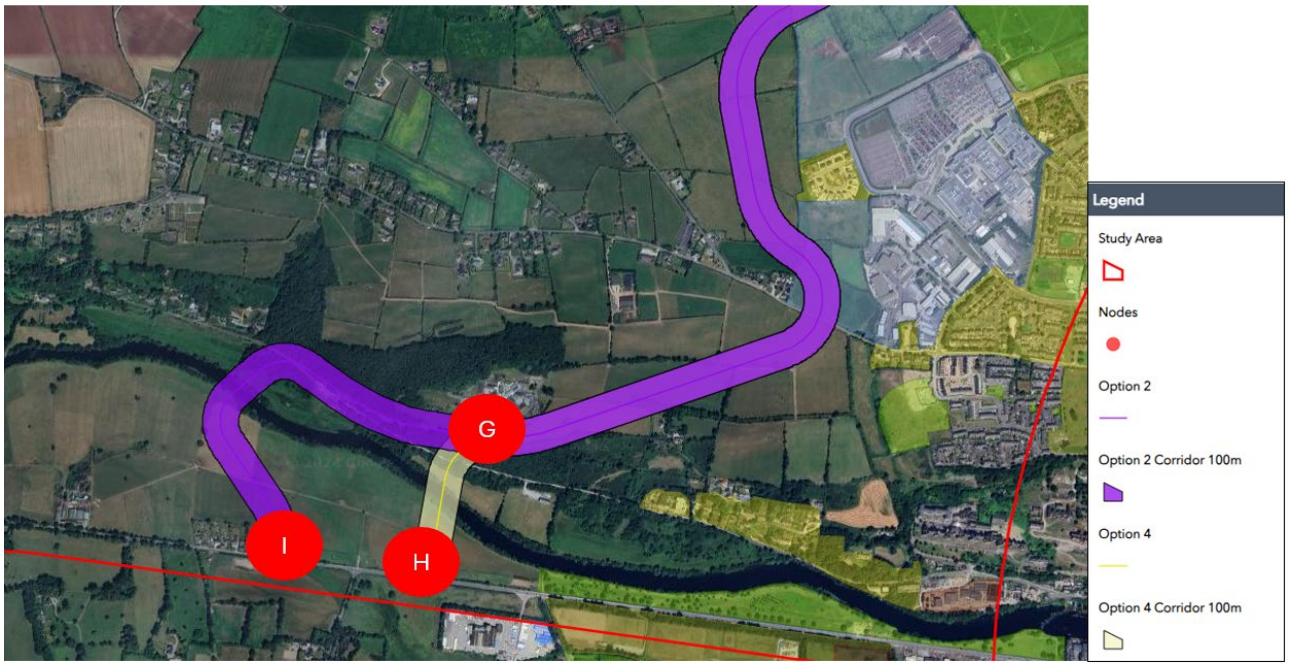


Figure 9-3: Option 2 & 4 - Node G to Western Tie-In [Lee Road to Carrigrohane Road]



9.2 Option 2 & 4 Comparative Assessment

Table 9-1 outlines the outcomes of the comparative assessment carried out for Option 2 and Option 4 under the 6 key TAA criteria and their sub-criteria. A more detailed version of this assessment is included in **Appendix I** to this report.

This comparative assessment concludes the following –

- Eastern Tie-In to Node C - Option 4 is Preferred under 4 of 6 key TAA Criteria headings. Given that it is also better under a majority of the sub-criteria headings compared to Option 2, **Option 4 is considered to be the Emerging Preferred Route for this section.**
- Node D to Node E - Option 2 is Preferred under 3 of 6 key TAA Criteria headings, and equal to Option 4 under 2 headings. Option 4 is marginally better than Option 2 under 1 heading. **Therefore Option 2 is considered to be the Emerging Preferred Route for this section.**
- Node G to Western Tie-In - Option 4 is Preferred under Local Environmental Impacts, and equal to Option 2 under all other criteria. **Option 4 is therefore considered to be the Emerging Preferred Route for this section.**

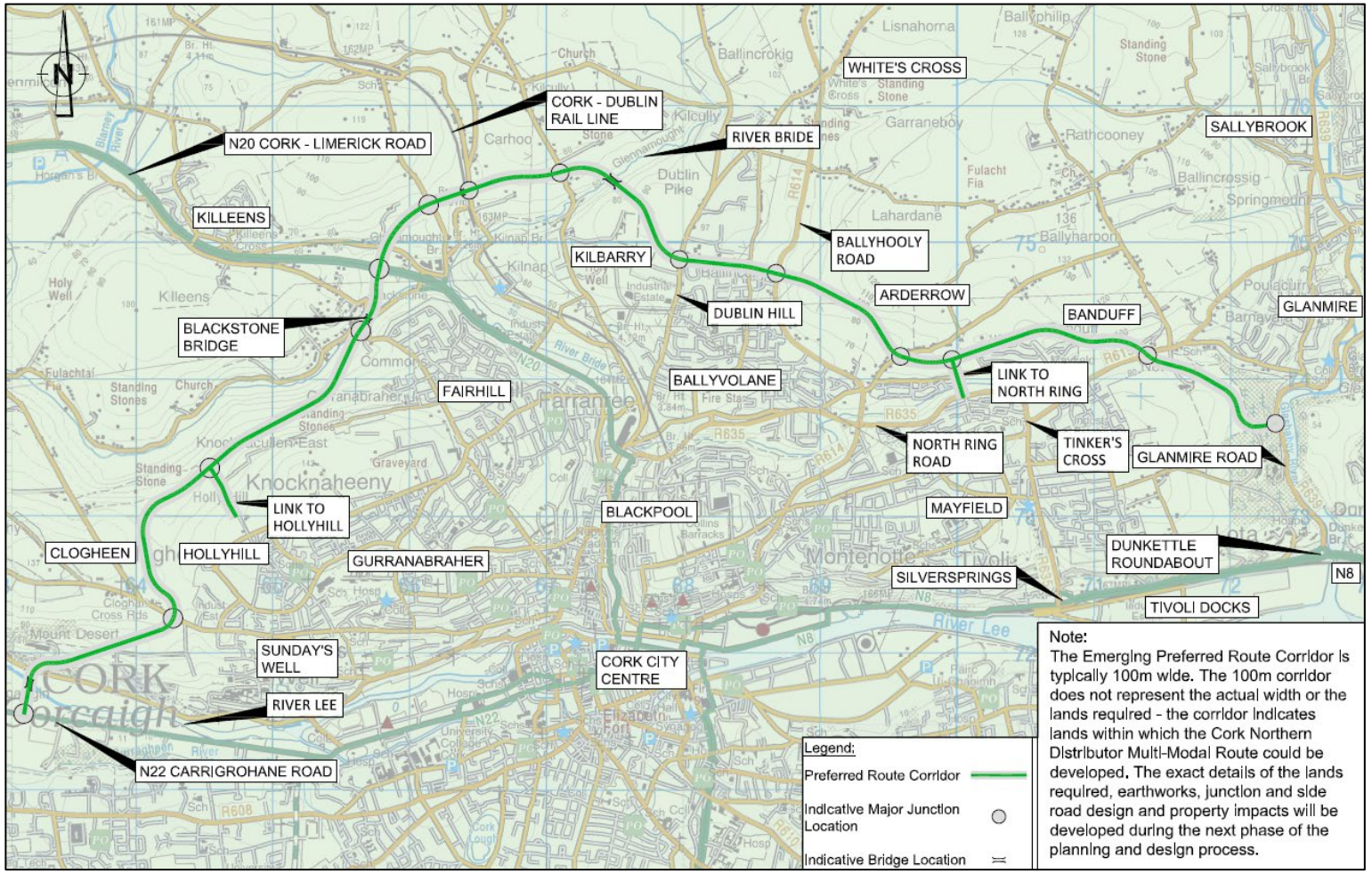
Table 9-1: Comparative Assessment of Option 2 & 4 under TAA criteria

Criteria	Sub-Criteria	Indicator to be measured	Eastern Tie-In (Nodes A & B) to Node C		Node D to Node E		Node G to Western Tie-In (Nodes H & I)	
			Option 2	Option 4	Option 2	Option 4	Option 2	Option 4
			Impact	Impact	Impact	Impact	Impact	Impact
Accessibility	Access to Services	Urban Centres	Slight Positive	High Positive	Positive	Neutral	Neutral	Neutral
		Schools and educational institutions	Slight Positive	Positive	Neutral	Neutral	Neutral	Neutral
		Hospitals and healthcare facilities	Slight Positive	High Positive	Slight Positive	Neutral	Positive	Positive
		Major land transport hubs and interchange facilities such as rail and bus stations	Slight Positive	Slight Positive	Slight Positive	Neutral	Slight Positive	Slight Positive
	Access to Recreational Facilities	Parks and playgrounds	Positive	Positive	Positive	Slight Positive	Neutral	Neutral
		Sports clubs and facilities	Neutral	Positive	Slight Positive	Neutral	Neutral	Neutral
	Access to jobs	Access to jobs	Positive	Positive	Positive	Positive	Positive	Positive
	Access to International Transport Gateways	Change in PT access	Slight Positive	Positive	Slight Positive	Neutral	Neutral	Neutral
		LGV access to urban centres	Neutral	Slight Positive	Slight Positive	Neutral	Neutral	Neutral
		Criteria Preference	Option 4 from Eastern Tie-In to Node C is preferred under Accessibility		Option 2 from Node D to Node E is preferred under Accessibility		No preference from Node G to Western Tie-In under Accessibility	
Social Impacts	Impact on deprived groups	Access to urban centres	Slight Positive	Neutral	Slight Positive	Neutral	Neutral	Neutral
		Access to schools						
		Access to healthcare facilities						
	Transport users with different mobility needs	Scheme facilities	Positive	Positive	Positive	Positive	Positive	Positive
	Gender Impacts	Scheme facilities	Positive	Slight Positive	Slight Positive	Neutral	Neutral	Neutral
		Criteria Preference	Option 2 from Eastern Tie-In to Node C is preferred under Social Impacts		Option 2 from Node D to Node E is preferred under Social Impacts		No preference from Node G to Western Tie-In under Social Impacts	
Land Use Impact	Public Realm	Scheme details	Slight Positive	Positive	Slight Positive	Neutral	Neutral	Neutral
	Connectivity with existing public transport facilities	Scheme details	Positive	High Positive	Positive	Positive	Positive	Positive
	Connection to zoned lands as part of national and regional planning.	Scheme details	Neutral	High Positive	Positive	Neutral	Neutral	Neutral
		Criteria Preference	Option 4 from Eastern Tie-In to Node C is preferred under Land Use Impacts		Option 2 from Node D to Node E is preferred under Land Use Impacts		No preference from Node G to Western Tie-In	
Safety Impact	Safety Impact	Safety assessment	Slight Positive	Positive	Positive	Positive	Positive	Positive
		Criteria Preference	Option 4 from Eastern Tie-In to Node C is preferred under Safety		No preference from Node D to Node E under Safety		No preference from Node G to Western Tie-In under Safety	
Climate Change	Climate Mitigation	Percentage change in mode share from private vehicles to public transport and active travel modes.	Slight Positive	Positive	Positive	Positive	Positive	Positive
		Percentage change in private car kilometres travelled.	Positive	Positive	Positive	Positive	Positive	Positive
		Percentage change in CO2 emissions	Positive	Positive	Positive	Positive	Positive	Positive
	Climate Adaptation	Climate hazard assessment	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
		Criteria Preference	Option 4 from Eastern Tie-In to Node C is preferred under Climate Change		No preference from Node D to Node E under Climate Change		No preference from Node G to Western Tie-In under Climate Change	
Local Environmental Impact	Air Quality	Air Quality Impact based on total score from Air Quality Scorecard Tab	Slight Negative	Positive	Slight Positive	Positive	Slight Positive	Slight Positive
	Noise and Vibration	Potential Impact Rating and number of receptors	Negative	Slight Negative	Negative	Slight Negative	Slight Negative	Neutral
	Biodiversity	Potential to affect sensitive habitats and proximity to designated sites.	Neutral	Negative	Negative	Negative	High Negative	Negative
	Water Resources	Proximity to flood zones and potential impact on aquifers.	Neutral	Slight Negative	Slight Negative	Negative	High Negative	Negative
	Landscape and Visual Quality	Potential for impacts on areas of high landscape value, scenic routes and visual amenity.	Slight Negative	Negative	Negative	Slight Negative	Neutral	Neutral
		Criteria Preference	Option 2 from Eastern Tie-In to Node C is preferred under Local Environmental Impact		Option 4 from Node D to Node E is marginally preferred under Local Environmental Impact		Option 4 from Node G to Western Tie-In is preferred under Local Environmental Impacts	
		Summary Outcome of Comparative Assessment	Option 4 is Preferred under 4 of 6 key TAA Criteria headings. Given that is also better under many more of the sub-criteria headings than Option 2, Option 4 from Eastern Tie-In to Node C is considered to be the Emerging Preferred Route.		Option 2 is Preferred under 3 of 6 key TAA Criteria headings, and equal to Option 4 under 2 headings. Option 4 is marginally better than Option 2 under 1 heading. Therefore Option 2 from Node D to Node E is considered to be the Emerging Preferred Route		Option 4 is Preferred under Local Environmental Impacts, and equal to Option 2 under all other criteria. Therefore Option 4 from Node G to Western Tie-In is considered to be the Emerging Preferred Route.	

9.3 The Emerging Preferred Route

Section 9.2 concludes that Option 4 remains the Emerging Preferred Route for the Eastern and Western tie-in's, however Option 2 is the verified Emerging Preferred route from Node C (Sweeney's Hill) to Node D (Nash's Boreen) based on comparative assessment to Option 4 along the same section. The Emerging Preferred Route in its entirety is shown in **Figure 9-4**.

Figure 9-4: CNDMR Emerging Preferred Route



The Emerging Preferred Route also shows key links to the North Ring Road and to Hollyhill, which are considered critical for connectivity to wider transport infrastructure and large employment centres.

10 PUBLIC CONSULTATIONS

Public consultation will be an important part of the process and will inform the final route within the proposed corridor.

A robust public consultation process clearly explaining the scheme and the statutory process will be developed.

Consultation has already taken place for the wider CMATS in which the CNDMR scheme has been presented, and therefore it is considered that the initial project specific consultation will be on the Emerging Preferred Option identified for the CNDMR scheme.

This initial public consultation process will clearly explain the scheme development and follow-on statutory process. A key element of this will be consultation with landowners, business owners etc. to identify specific constraints and identify the key issues and concerns relating to the Emerging Preferred Option.

Any amendments resulting from this initial scheme consultation will be addressed in order to finalise the Preferred Option for the CNDMR and in advance of commencement of Phase 3 Design & Environmental Evaluation.

11 CONCLUSION

The CNDMR is identified as a short-term objective of the Cork Metropolitan Area Transport Strategy (CMATS). The CNDMR is critical to the sustainable development of Cork City and is seen as a 'critical enabler' for the wider CMATS strategy.

The CNDMR will provide much needed active and sustainable transport infrastructure across the northern side of Cork City and provide a real alternative to private car-based transport. It will facilitate the sustainable compact development of zoned residential and employment lands in close proximity to Cork City Centre. It will facilitate the delivery of other sustainable transport initiatives on radial routes into the City Centre as well as initiatives within the City Centre.

National, Regional & Local policy identify the need for a multi-modal transport corridor for the northern side of Cork City, which can act as a key enabler for compact and sustainable growth in the area and support a shift to sustainable transport modes and is explicitly prioritised at all policy levels.

A range of alternatives were considered as part of the Strategic Assessment process, from which a Do-Something alternative was determined as the correct scheme intervention.

The Long List of Potential Options looked at 7 separate corridor options, which were shortlisted to 3 corridor options to be assessed as part of the Detailed Appraisal following the new TAA process set out in TAF.

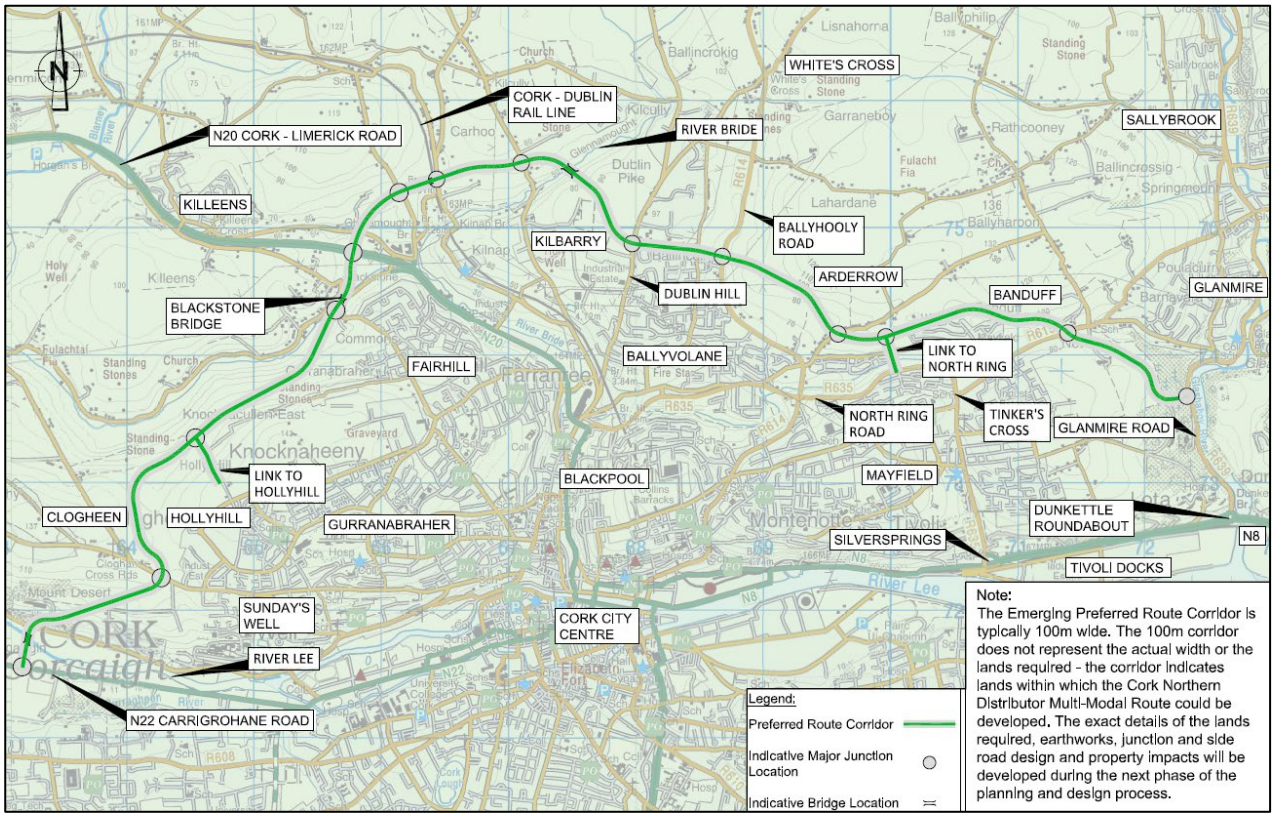
Taking account of the full range of assessments under the 6 TAA Criteria [Accessibility, Social Impacts, Land Use Impact, Safety Impact, Climate Change, and Local Environmental Impacts], a combination of Options 2 and 4 has been determined as the Emerging Preferred Route (as shown in Fig 11-1).

The Emerging Preferred Route achieves high value for money with a BCR >3.8, with a Total Scheme Budget of approximately €300m at present prices.

For future funding reasons a cost range within which the scheme is likely to fit, has been established with a Lower and Upper bound limit of €210m to €520m (incl. VAT). This range will likely shorten as more detailed costings are carried out at later scheme phases, and uncertainty around scheme risks reduce.

The Emerging Preferred Route can service a potential new population within 1km of its route of approximately 23,509.

Figure 11-1: CNDMR Emerging Preferred Route



As a road-based alternative, a cross section has been selected that best meets the needs of all users and modes. It is considered that the optimal cross-section for the CNDMR scheme should comprise the following elements -

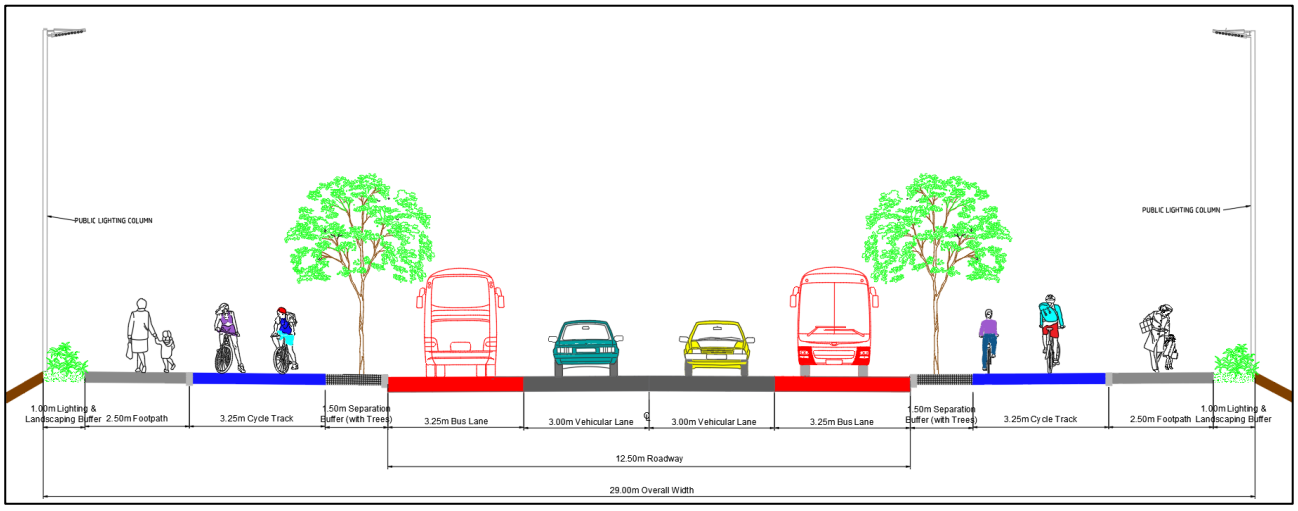
- 2no. 1.0m landscaped boundaries
- 2no. 2.5m footpaths
- 2no. 3.25m 2-way segregated cycle tracks
- 2no. 1.5m separation buffers/verges
- 2no. 3.25m bus lanes
- 2no. 3.0m vehicular lanes

This results in an optimal corridor width of 29m (excluding space for land forming, drainage, etc)

The provision of dedicated bus lanes, segregated cycle lanes and appropriately sized footpaths is a comparable cross section to that proposed by BusConnects. This will facilitate an expansion of the bus network and public transport services while also providing a safe and attractive active travel corridor to communities and facilities across the northern side of Cork City and beyond.

The optimal cross-section of the proposed CNDMR scheme is illustrated in **Figure 11-2**. It is noted that the provision of bus lanes along the entire route may need to correspond with the provision of bus services. Interim uses such as planting may be provided on sections of bus lanes not immediately required for bus services.

Figure 11-2: Proposed CNDMR Typical Cross-Section



A drawing of the Emerging Preferred Route is included in **Appendix J** to this report.

It is recommended that the Emerging Preferred Route as shown in **Figure 11-1** be brought forward for public consultation.

Option Selection Report - Appendices

Appendices

The following is a list of Appendices that form part of this Option Selection Report;

Appendix A Strategic Assessment Report

Appendix B Constraints Report

Appendix C Scheme Drawings

Appendix D Stage F Part 1 RSA

Appendix E Transport Modelling Report

Appendix F Cost Estimates

Appendix G Detailed Appraisal TAA Scoring

Appendix H Environmental Assessments

Appendix I Comparative Assessment of Option 2 and Option 4

Appendix J Emerging Preferred Route Corridor Drawing

These Appendices are available to download at the following link:

https://emeamft.tetratech.com/link/gmg21eV3ZDgpiDuderJnZa

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