Project

Royal Canal Urban Greenway

Report Title

Route Options Assessment

Main Report

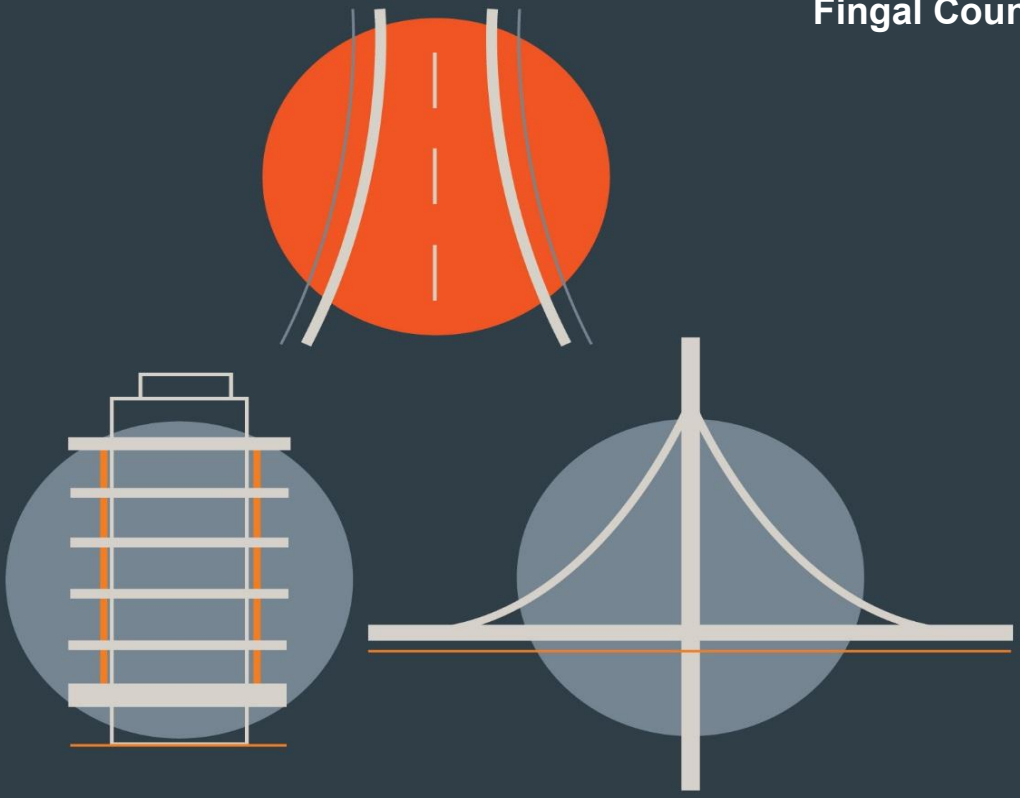
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EXECUTIVE SUMMARY

Introduction

The Royal Canal Urban Greenway (hereafter referred to as the 'proposed development') is a pedestrian and cycle route which is to be constructed along /adjacent to the Royal Canal as it heads eastwards from the Kildare County Boundary to the Old Navan Road (near 12th Lock) to connect with a previously constructed section of the Greenway. The proposed development is a joint scheme, Fingal County Council (the Client) is the scheme promoter in conjunction with the National Transport Authority (NTA) as the funding body and Waterways Ireland (WI) who are the principle property owner.

This report presents the findings of the route options assessment undertaken for the proposed development and recommends a Preferred Route for the scheme.

This route options assessment report describes the assessment of potentially viable route options within the study area identified for the proposed scheme against established assessment criteria.

Need for The Scheme

The proposed development is mainly located within the highly populated suburban area of Dublin 15 which is set for further growth and expansion in the future. The Royal Canal Urban Greenway is a key future transport linkage in the development of the area. The Royal Canal is used extensively as a recreational route and the popularity for greenway schemes have increased significantly & the appetite for outdoor recreation has grown since the Covid-19 pandemic. Its delivery is crucial to ensure this growth could be achieved sustainably by providing excellent sustainable travel alternatives to the use of the private vehicle whilst also enhancing public transport accessibility and interchange most notably at train stations along the route.

Study Area

The Study Area for the proposed development route option assessment begins to the west of the Royal Canal at the Kildare County Council boundary (Royal Canal Amenity Group premises) travelling north eastwards towards Clonsilla. The Study Area then continues along the canal to Coolmine and onto the 12th Lock where it ties into the Ashtown section of the Greenway at the Old Navan Road (Talbot Bridge). The study area follows the route of the Royal Canal corridor and extents north and south of the corridor for alternative route options.

The Study Area has been divided into three distinct sections based on their different geographical and physical characteristics to simplify the route options assessment process: -

- Section 1 – between the Kildare/Fingal County Council boundary line (Royal Canal Amenity Group) and Hansfield Railway Bridge (Ch. 0 – 3200).
- Section 2 – between Hansfield Railway Bridge and Kennan Bridge (Porterstown Road) (Ch. 3200 – 5325).
- Section 3 – between Kennan Bridge (Porterstown Road) and Talbot Bridge (Old Navan Road) (Ch. 5325 – 8100).

Route Options Assessment

A total of 31 route options were developed for the scheme from the Kildare County Council boundary (Royal Canal Amenity Group premises) to the Old Navan Road (Talbot Bridge). Each of the route options have been assessed individually with various design options discussed and appraised in order to determine the optimal layout for both greenway and canal users. These options include routes on the northern and southern embankments of the canal as well as parallel routes through adjacent residential estates, with varied engineering design solutions e.g. bound and unbound greenway surface, cantilevered boardwalk, raised boardwalk, on-road cycle tracks, shared street, pedestrian/cycle bridges etc. The

detailed assessment of the route options is outlined in the subsequent sections of this report.

In order to determine the preferred route option for the proposed development, it was necessary to undertake an options appraisal. This appraisal was based on the Multi-Criteria Assessment (MCA) set out by the Department of Transport, Tourism and Sport (DTTAS), aligning with the Common Appraisal Framework (CAF) criteria used for the MCA covering Economy, Integration, Safety and Environment. The route options for each Section were then compared against each other based on a five-point scale, ranging from having significant advantages to having significant disadvantages over other options. Further information on the assessment methodology is provided in **Chapter 7**.

The Route Options Assessment was undertaken between 2018 and 2022 in accordance with the Common Appraisal Framework (CAF), which was the applicable national transport appraisal guidance at the time. The MCA provided a structured and consistent basis for comparing reasonable alternatives across economy, integration, safety and environmental criteria. The assessment informed the Emerging Preferred Route and subsequently the Preferred Route, which was approved by the NTA in March 2023. Although the Transport Appraisal Framework superseded the CAF in June 2023, the NTA had confirmed that the original Route Options Assessment met its appraisal requirements and was fit for purpose, and the route selection and approval process had been completed in accordance with the national guidance at the time.

As part of the route options assessment process a number of desktop studies and site visits were undertaken to establish the constraints and develop a working knowledge of the issues along the proposed route.

A number of detailed surveys were also commissioned to gain an additional appreciation of the constraints and opportunities and to further understand potential construction methods required for particular route options, see **Chapter 4.3.**

Subsequent Assessment and Design Development

The Route Options Assessment was informed by a substantial body of desktop studies, site investigations and environmental and engineering surveys available at the time, together with the policies, standards and guidance applicable when the assessment was undertaken and approved. Following completion of the assessment and approval of the Preferred Route by the NTA, updated and additional surveys, engineering assessments, stakeholder consultation and design development were undertaken. This included updated or further habitat and species surveys, arboricultural surveys, landscape and visual assessment, archaeological, architectural and cultural heritage assessment, flood risk and Water Framework Directive assessment, road safety audit, and further consideration of construction methods and structural requirements.

The updated and additional information supplemented the evidence used for the Route Options Assessment and was used to review and refine the Preferred Route as the design progressed. Relevant policies, standards and guidance published or updated following approval of the Preferred Route were reviewed and, where applicable, informed the subsequent design refinement, environmental assessment and mitigation measures presented in the EIAR. The original Route Options Assessment has not been retrospectively updated to reflect those later documents, as it records the appraisal undertaken under the policy and guidance framework applicable at the time. This subsequent work did not replace or repeat the original route selection process but provided a substantially expanded and updated evidence base for the design and environmental assessment of the Proposed Development.

The results of this subsequent work are presented in the Environmental Impact Assessment Report (EIAR), its technical appendices and the supporting technical documents. These documents should be read alongside this Route Options Report as part of the complete record of the route selection and subsequent design development process.

Stakeholder Consultation

Extensive engagement has taken place since the project inception in 2018 and has continued to the current date. Consultation has been undertaken by the Project Team with the various departments in Fingal County Council (FCC), with the National Transport Authority (NTA) and Waterways Ireland (WI), in order to discuss the feasibility of particular route options.

Consultation with the general public, residential groups, elected representatives, other state bodies, such as An Garda Siochana, National Parks & Wildlife Service (NPWS), Inland Fisheries & Iarnród Éireann, as well as other interested parties have also been undertaken. There was a Non-Statutory Public Consultation on the emerging preferred route held in February 2019. As part of this consultation there were meetings with elected members and residential groups which also followed the public consultation.

Non-Statutory Public Consultation (2019)

The Emerging Preferred Route for the proposed development was presented during a Non-Statutory Public Consultation held from 25th February to 27th March 2019.

A total of 602 submissions were received. The majority of the submissions received (from the general public) as part of the public consultation process related to a 1km section of route between Kirkpatrick Bridge (Coolmine Road) and 400m west of Castleknock Train Station. The most common concerns mentioned were increased traffic, anti-social behaviour and crime and biodiversity impacts.

Many submissions were in favour of the Emerging Preferred Route, however, a greater number were in favour of the greenway to be specifically on the southern side of the Canal between Kirkpatrick Bridge and Granard Bridge at Castleknock Station.

The concerns raised have been thoroughly reviewed with reference to their alignment with local and national policy and the scheme project objectives and this has formed a core consideration in the progression of the Option

Development and Assessment process leading to the identification of the Preferred Route. Preliminary designs were prepared for both options on the north and south of the canal between Kirkpatrick and Granard Bridges as a result of the concerns raised in the 2019 consultation process. This included consideration of the anticipated constructability of the designs which was then incorporated into a refined options assessment process which is presented later in this report.

Second Non-Statutory Public Consultation (Preferred Route)

The second non-statutory public consultation was held from 25 May to 7 July 2021. Due to COVID-19 public health restrictions, consultation was primarily undertaken online through the Fingal County Council consultation portal, virtual consultation materials and public webinars. Postal submissions were also invited and promoted through a leaflet distribution to support participation by those without internet access.

A total of 1,143 submissions and 140 survey responses were received. The majority of submissions supported the delivery of the Royal Canal Urban Greenway, with fewer than ten submissions questioning the need for or opposing the scheme. The principal matters raised related to the preferred route, environmental effects, safety and anti-social behaviour, traffic and parking, access arrangements and elements of the scheme design.

A significant number of submissions supported locating the greenway on the southern bank of the Royal Canal between Kirkpatrick Bridge and Granard Bridge. These submissions were considered alongside additional design development, site investigations, specialist geotechnical assessment and a comparison of the northern and southern embankment options. The assessment confirmed the northern embankment as the preferred route, having regard to constructability, interfaces with the railway, environmental and heritage effects, access and connectivity, safety and comparative cost.

The consultation also informed changes to the preferred route and scheme design. These included a reduction in access points at Delwood and Brompton, revisions to the bridge access alignment and the Brompton access point, lowering

of the route adjacent to properties at Delwood Park, and additional fencing, planting and boundary treatments to address privacy and security concerns

Key Stakeholder Consultation

Ongoing consultation has been undertaken with a number of stakeholder groups in order to discuss strategic and specific elements of the scheme. This consultation has assisted in guiding technical and strategic elements of the scheme. On-going consultation and engagement have been undertaken with the National Transport Authority, the various departments of Fingal County Council, Waterways Ireland, An Garda Siochana, Iarnród Éireann and DART+West, Dublin Cycling Campaign, Royal Canal Amenity Group (RCAG) and Elected Representatives & Local Residential Groups throughout the route options assessment process. A summary of some of the feedback from the key stakeholders to-date are outlined in **Chapter 6.3**.

Supplementary Assessments

The approved Route Options Assessment included an assessment of the route options through the Hansfield subsection between Hansfield Railway Bridge and Hansfield Road. Following approval of the Preferred Route, a further localised assessment was undertaken to account for the completion of pedestrian and cycle facilities through Piper's Court and St. Joseph's, together with land availability and access constraints and the physical constraints along the Royal Canal towpath. Applying the same MCA methodology as the main Route Options Assessment, the supplementary assessment compared the reasonable local route alternatives and identified Option S2-D as providing the best overall balance of environmental effects, safety, route quality, integration, constructability and land requirements. The Supplementary Sub-section 2 Route Options Assessment is included in **Appendix K**.

Bridge structure options were assessed as part of the Route Options Report and were further developed through the subsequent design process. At the pre-application consultation meeting, An Coimisiún Pleanála advised that this assessment should also be presented in a standalone Bridge Structure Options Report to accompany the planning application. The report therefore documents

and consolidates the assessment already undertaken, setting out the feasible structural forms considered for the Landmark Bridge and Quarry Bridge with regard to technical suitability, appearance, construction and maintenance requirements. The assessment identified a curved steel box girder as the preferred solution for the Landmark Bridge and a single-span steel beam solution for the Quarry Bridge, as these provided the best balance of structural efficiency, buildability, appearance and environmental effects. The Bridge Structure Options Report is included in **Appendix L.**

The Preferred Route

Based on the findings of the route options assessment process, a preferred route for the proposed development has been identified, as presented in **Figure (i)** below. The preferred route drawings are included within the planning application documentation, and the route is described in the following paragraphs



Figure (i): Royal Canal Urban Greenway Preferred Route

Section 1

Length of Scheme Section: 3.2km

Indicative Infrastructure Capital Cost: €2.5 - 3.0 million

Indicative Land Acquisition Cost: €0 million

Total Indicative Capital Cost of Scheme Section: €2.5 – 3.0 million

The preferred route will follow the existing towpath along the northern side of the Royal Canal from the Kildare County Council boundary line to Hansfield Railway Bridge. The Greenway will be constructed as a 3-4m wide (where possible within existing embankment widths) unbound surface from the Kildare/Fingal County Council boundary line to Hansfield Bridge (Railway Bridge). The greenway will continue through the existing pedestrian underpass by Hansfield Railway Bridge.



Figure (ii): Photomontage of proposed greenway in Section 1

Section 2

Length of Scheme Section: 2.1km

Indicative Infrastructure Capital Cost: €5.8 – 6.5 million

Indicative Land Acquisition Cost: €6,200,000

Total Indicative Capital Cost of Scheme Section: €12.0 – 13.0 million

The greenway will proceed on the northern side of the Royal Canal from Hansfield to Kennan Bridge via Porterstown School House lands between Callaghan and Kennan bridges.

This involves widening of the existing trail to 4m along the northern side of the canal from Hansfield Railway bridge to Callaghan Bridge (Clonsilla Station).



Figure (iii): 3D image of the proposed bound greenway (4m wide) on approach to Callaghan Bridge from the west.

A cantilevered boardwalk structure is proposed from Callaghan Bridge along the towpath to the proposed ramp into the Porterstown Old School house lands (Ch. 4150-4560), to protect underlying ecological habitats along the canal.



Figure (iv): 3D image of the proposed 4m wide cantilevered boardwalk east of Callaghan Bridge.

The greenway will ramp up into the Porterstown Old School House lands (Ch. 4570), to the north of the existing towpath. A paved surface will be provided for the greenway route within the Old School House lands.

Section 3

Length of Scheme Section: 2.8km

Indicative Infrastructure Capital Cost: €7.2 – 8.5 million

Indicative Land Acquisition Cost: €0 million

Total Indicative Capital Cost of Scheme Section: €7.2 – 8.5 million

The Greenway will be provided on the northern side of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge via Sheepmoor Lane.

To minimise the impact on highly sensitive trees, the proposed route is located north of the wooded area along the northern embankment from Kennan Bridge to Sheepmoor Lane.

Greenway users will be directed onto the pedestrian/cycle facilities proposed as part of the Windmill Court Residential Development.

Through Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use).

The Greenway will be situated on the upper level of the northern embankment, from Coolmine Road (Kirkpatrick Bridge) to the Brompton green area (Ch. 6250-6850), to minimise tree removal and the visual impact of the scheme on the Canal.

To minimise the impact on highly sensitive trees (Oak-Ash-Hazel Woodland WN2) and habitats, the Preferred Route is proposed near the top of the northern embankment (adjacent to Delwood Park residential back gardens) and into the open space at Brompton. To prevent the greenway overlooking the back gardens of the residents of Delwood Park and for security reasons, the ground level of the greenway would be lowered. Also, security fencing and defensive planting will be provided between the greenway and the back gardens to increase security and any visual intrusion.



Figure (v): 3D Animation illustrating the fencing and landscaping proposed between the greenway and back gardens.

A bridge structure will be required to enable the proposed greenway to cross an historic quarry area on the northern embankment (Ch. +6500m).

A 4m paved greenway will be provided on the southern side of the Brompton green area (Ch. 6850-7100). Planting and railings will be provided along this section of the greenway. The scheme will provide opportunities for users to access Brompton & Roselawn estates.

The route switches from the northern side to the southern side of the Royal Canal at chainage 7100-7200 (before Roselawn Road). The Greenway will cross the Canal over an architecturally designed pedestrian and cycle bridge. The bridge will respect existing uses along the Canal and existing and future operations on the Dublin to Maynooth rail line.

The greenway will continue on the southern side of the Royal Canal, past Castleknock Station and under Castleknock Road through the proposed greenway underpass.



Figure (vi): Photomontage of the proposed greenway on approach to Castleknock Station.

A paved 4m wide greenway will be provided on the southern towpath from Granard Bridge to the 12th Lock Hotel. Due a pinch point between the hotel and the canal a 3m wide greenway is only feasible from the 12th Lock Hotel to Talbot

Bridge/Old Navan Road (150m). The greenway will tie into the current Ashtown section of the Royal Canal Greenway at Talbot Bridge providing continued linkage onwards to Dublin City.

Next Steps

The Preferred Route identified through the route options assessment has subsequently been developed through preliminary design, environmental assessment, further surveys, stakeholder consultation and the supplementary assessments described above. The Proposed Development is now being advanced for statutory approval under Section 51 of the Roads Act 1993, as amended.

This Route Options Report should be read in conjunction with the EIAR, the EIAR technical appendices and the supporting planning, environmental and technical documentation submitted with the application. Together, these documents set out the route selection process, subsequent design development, assessment of likely environmental effects, and the mitigation, monitoring and enhancement measures incorporated into the Proposed Development.

1.0 INTRODUCTION

1.1 Preamble

1.1.1 The Royal Canal Urban Greenway (hereafter referred to as the 'proposed development') is a pedestrian and cycle route which is to be constructed along /adjacent to the Royal Canal as it heads eastwards from the Kildare County Boundary to the Old Navan Road (near 12th Lock) to connect with a previously constructed section of the Greenway. The proposed development is a joint scheme, Fingal County Council (the Client) is the scheme promoter in conjunction with the National Transport Authority (NTA) as the funding body and Waterways Ireland (WI) who are the principle property owner.

1.1.2 This report presents the findings of the route options assessment undertaken for the proposed development and recommends a Preferred Route for the scheme.

1.1.3 This route options assessment report describes the assessment of potentially viable route options within the study area identified for the proposed scheme against established assessment criteria.

1.2 Report Structure

1.2.1 The route option assessment process and corresponding report structure are detailed below:

- Chapter 1 – Subsequent parts of this section provide an introduction and background to the proposed development.
- Chapter 2 – Provides a review of the relevant local and national transportation policies and guidance that will influence the design and appraisal of the prospective scheme.
- Chapter 3 – Outlines the Scheme Objectives.
- Chapter 4 – The proposed Study Area is described identifying key constraints and opportunities.
- Chapter 5 – This chapter of the Route Options Assessment Report assesses the feasibility of the 'Do-Nothing' and 'Do-Minimum' alternatives.

- Chapter 6 – Provides a summary of the submission received during Non-Statutory Public Consultation in February/March 2019 and outlines the Stakeholder Engagement undertaken to-date.
- Chapter 7 – The methodology for identifying and assessing the feasibility of the various route options is discussed in this section including:
    - the identification of study area sections where practical route options were considered;
    - the selection and determination of initial criteria for screening and assessing technically feasible route options, based on distinct, project-specific objectives; and
    - the definition of assessment criteria.
- Chapter 8 – Details the route option assessment for Section 1 on the western section of the Study Area.
- Chapter 9 – Details the route option assessment for Section 2 including sub-options at Hansfield.
- Chapter 10 – Details the route option assessment for Section 3 which is split up into three sub-sections due to the complexity of the 'deep sinking' section and to simplify the assessment process.
- Chapter 11 – Describes the preferred route design based on the preceding optioneering and assessment findings.

1.3 Proposed Development - Overall scheme

1.3.1 The Royal Canal Links the River Shannon in County Longford to the River Liffey in Dublin City's Docklands. On its way, it passes close to a number of towns, including Mullingar, Kilcock, Maynooth and Leixlip before entering Fingal where it passes through the built-up areas of Clonsilla, Coolmine, Castleknock and Blanchardstown on its way towards the north city.

1.3.2 Fingal County Council (the Client) as the Contracting Authority is responsible for the delivery of a pedestrian and cycle route which is to be constructed along /adjacent to the Royal Canal as it heads eastwards from the Kildare County Boundary to the Old Navan Road (near 12th Lock) to connect with a previously constructed section of the Greenway

1.3.3 Fingal County Council's overall objective is to deliver a safe combined pedestrian and cycle route, which meets the standards set out for a Greenway in the NTA's "National Cycle Manual" (published in 2011) and TII Publication "Rural Cycleway Design, DN-GEO-03047, April 2017", subject to detailed engineering design and the mitigation measures presented in the SEA and Natura Impact Statement accompanying the Greater Dublin Area Cycle Network Plan.

1.3.4 The scheme will provide a shared pedestrian/cycle route on/adjacent to the Royal Canal towpath over an approximate length of 8.1km which will tie in with the completed section of the Ashtown Greenway at Talbot Bridge (Old Navan Road) in the east and the Kildare County Council greenway section at the county boundary in the west. The extent of the scheme is illustrated in **Figure 1.1** below.

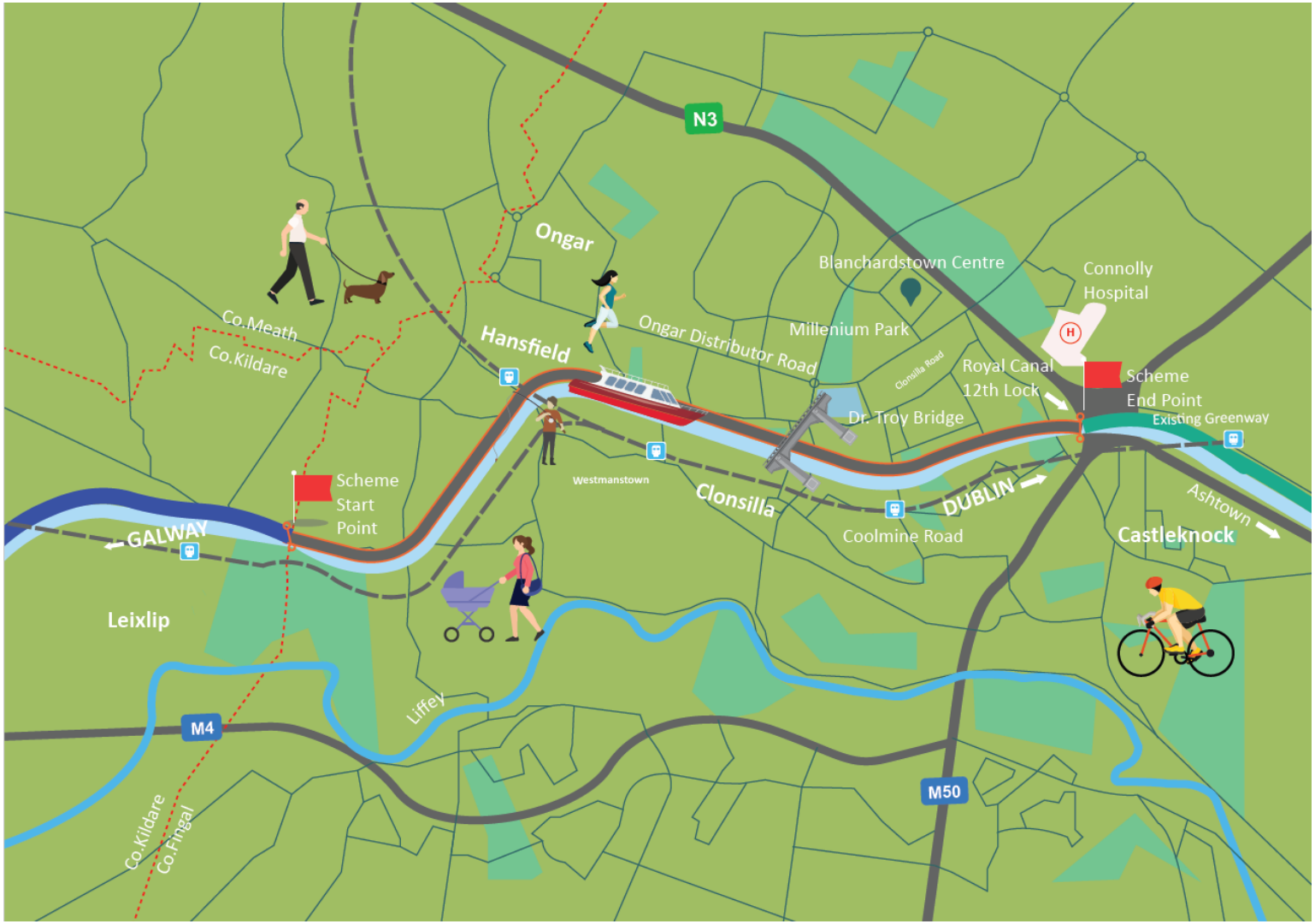


Figure 1.1: The Royal Canal Urban Greenway

1.3.5 The proposed development is a section of the major route corridor Dublin to Galway (266km) proposed in the National Cycle Network Scoping Study 2010. The proposed development is the start of the urban section of the route as it approaches Dublin Metropolitan area.

1.3.6 The study identifies thirteen potential route corridors between urban centres of a population of 10,000 and upwards that could make up a National Cycle Network. The potential Network identified in the scoping study is approximately 2,000km in length, illustrated in **Figure 1.2** below.



Figure 1.2: National Cycle Network – Route Lengths

1.3.7 NCN Route 8 is from Galway to Dublin and approaches Dublin along the Royal Canal through Maynooth.

1.3.8 In relation to the type of cycling facility to be provided on these routes, the NCN Scoping Study states the following:

1.3.9 "The length of the network that is off road or of greenway standard should be maximised with the aim of minimising the interaction with motorised vehicles. The network should use existing cycle routes if appropriate. Special attention should be given to the opportunities of using both the disused rail network and canal / river towpath networks as cycling / walking routes."

1.3.10 The NCN Route 8, is part of the longer distance trans-European EuroVelo Route 2, which extends eastwards across Europe to Moscow, shown in **Figure 1.3** below.



Figure 1.3: Trans-European EuroVelo Routes

1.3.11 One of the key objectives of the EuroVelo policy is to offer sustainable tourism development which means:

1.3.12 "Long-distance cycle route design should embrace the principles of sustainable tourism development; cycle tourism planners need to be aware of the need to conserve natural assets, to enhance community competences and capabilities and for the need for tourism providers to minimise use of resources and output of waste and pollution. Transport to a route can be one of the main negative environmental impacts and the route design has to be cognisant of this in terms of offering attractive near to home travel and integration of rail, coach and ferry transfers for longer distances".

1.3.13 The guiding principles for cycle route development are:

- Safety – avoid public roads with large motor traffic volumes and high speeds. Provide safe junctions. Consider social safety
- Attractiveness – include and connect cultural, historical and natural sights, culinary or other attractions, whilst avoiding unpleasant areas
- Coherence and directness – provide uninterrupted route infrastructure but link to attractions connected to the theme of the route and provide signing. Avoid unnecessary detours
- Comfort – minimise elevation. Provide good surfaces and sufficient good quality services (accommodation, food, bike repair etc).

Strategic importance of the scheme (GDA CNP)

1.3.14 The greenway between Maynooth in County Kildare and the Shannon in County Longford has been completed and was officially opened on the 24th March 2021. The full Greenway, when completed will offer a first-class multi-purpose off-road walking and cycling link running from the river Liffey in Dublin, through Counties Dublin, Kildare, Meath, Westmeath and Longford to Cloondara on the River Shannon.

1.3.15 This proposed development, from the Kildare County Boundary to the Ashtown Greenway at Talbot Bridge (Old Navan Road), is the final piece of Royal Canal greenway route yet to achieve planning approval. When complete, the proposed development will deliver a continuous greenway from Dublin City's Docklands to Kildare and westwards towards the Shannon and Galway. The scheme when complete will provide a high quality link for pedestrians and cyclists to commute to Maynooth and Dublin City Centre whilst also offering excellent recreational opportunities. The status of the other phases of the Royal Canal Greenway within the Greater Dublin Area are illustrated in **Figure 1.4**.

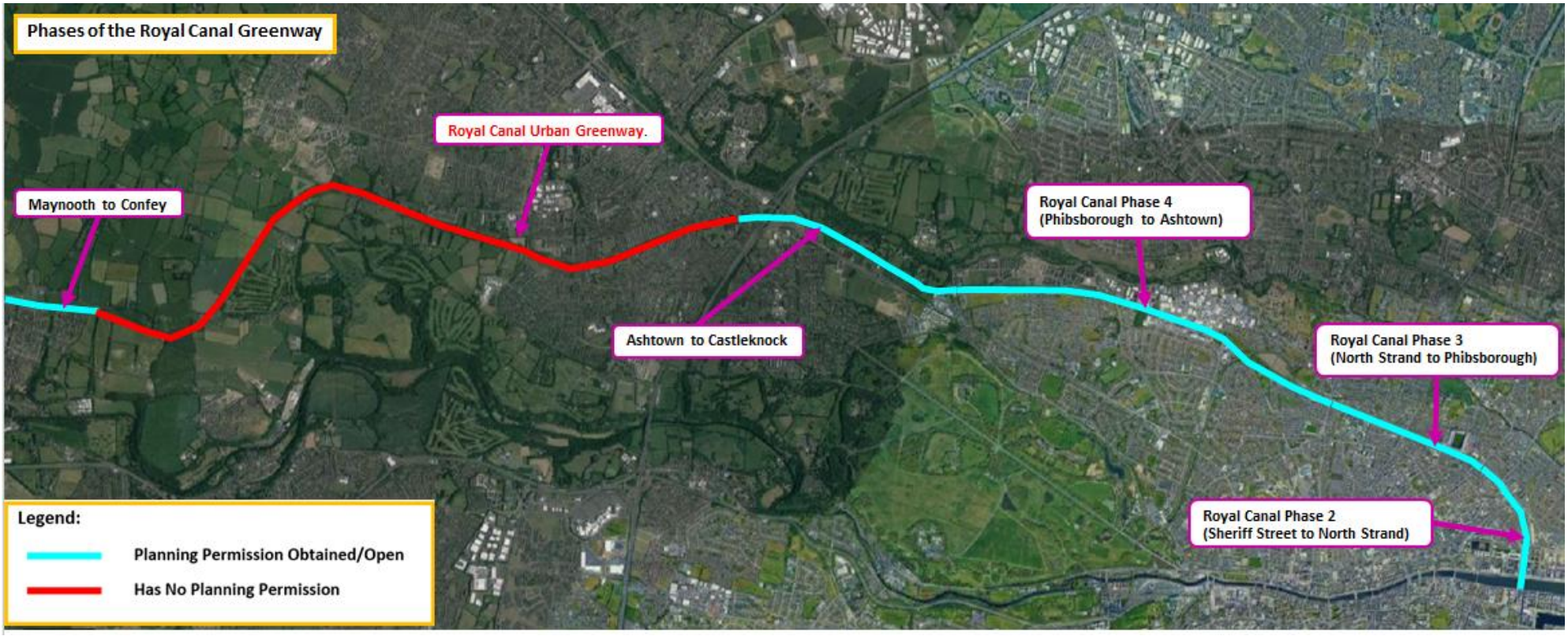


Figure 1.4: Status of the other phases of the Royal Canal Greenway

The NTA Project Approval Guidelines (Dec 2020)

1.3.16 The phases of the proposed development will align with the NTA '*Project Approval Guidelines(2020)'*, which have replaced the previous '*Project Management Guidelines for Projects Funded by the National Transport Authority (Up to €20 million in value)'* dated December 2011 and the '*Guidelines for the Management of Public Transport Investment Projects Delivered by Conventional Procurement'* dated July 2010.

1.3.17 These Guidelines divide the project into a seven Phase process (Phase 1 to Phase 7 inclusive) with seven Gateways (Gateway 1 to Gateway 7 inclusive), see **Figure 1.5**.

1.3.18 Due to the significant funding commitment required, NTA Approval Points, called Gateways, occur at key Approval milestones throughout these Guidelines.

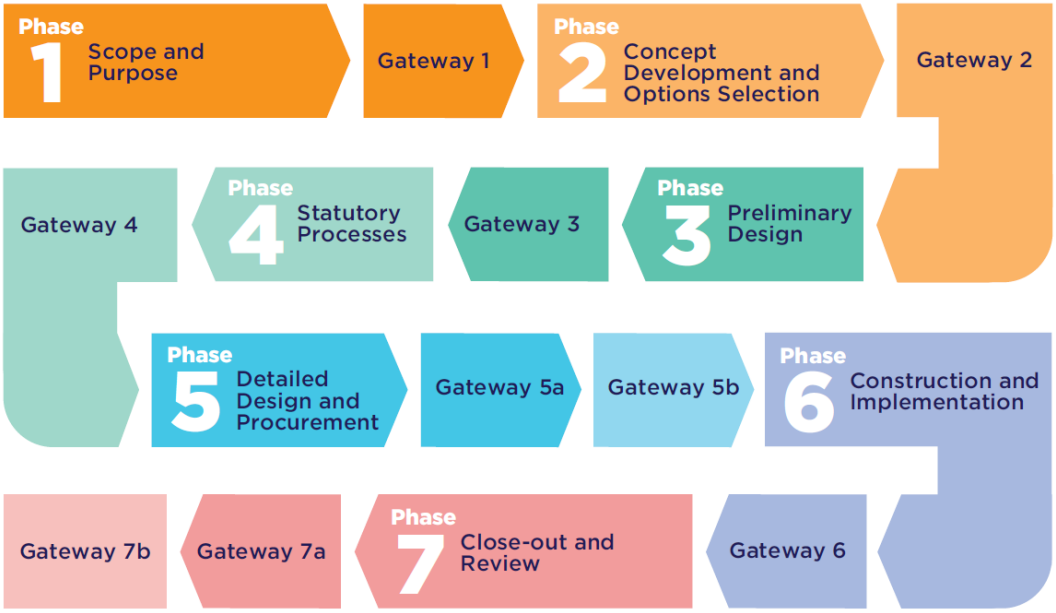


Figure 1.5: Phases of an NTA Project Life Cycle - Capital Investment

1.3.19 This proposed development is currently at Phase 2 (Concept Development and Options Selection).

1.3.20 The feedback obtained from the public on the Preferred Route Proposals will be incorporated into the preliminary design (Phase 3) of the proposed development, which will be subjected to screening for Environmental Impact Assessment and

Appropriate Assessment. The outcome of this screening will determine the statutory planning process for the scheme which will follow soon after (Phase 4).

1.4 Need for the Scheme

1.4.1 The proposed development is mainly located within the highly populated suburban area of Dublin 15 which is set for further growth and expansion in the future. The Royal Canal Urban Greenway is a key future transport linkage in the development of the area. The Royal Canal is used extensively as a recreational route and the popularity for greenway schemes have increased significantly & the appetite for outdoor recreation has grown since the Covid-19 pandemic. Its delivery is crucial to ensure this growth could be achieved sustainably by providing excellent sustainable travel alternatives to the use of the private vehicle whilst also enhancing public transport accessibility and interchange most notably at train stations along the route.

Economy

1.4.2 There is huge potential for the proposed development to increase economic activity within the local area generated by local coffee shops or bike repair shops or tourism offerings along the route.

1.4.3 The proposed development has the potential to have a significant and positive impact on local communicates, tourism and general economic activity in County Fingal.

1.4.4 The topic of the economic benefits of greenways in Ireland has been explored in several reports. Below is a series of examples:

- The Department of Transport Tourism and Sport's 'Strategy for the Future Development of Greenways' paper, greenways can act as significant economic drivers in the areas that they serve by attracting cycling visitors to the area. In 2010, 168,000 overseas tourists engaged in cycling while staying in Ireland spending approximately €180 million; this increased further to 175,000 in 2011 and an estimated €200 million spend. Notably,

these increases occurred at a time when overall visitor numbers were declining. In 2015, Fáilte Ireland estimated that this had increased to 355,000 representing 7% of the overall overseas market.

- The Fitzpatrick's report commissioned by Fáilte Ireland on the economic impact of the Mayo Greenway notes: "Estimates derived from the study suggest that all direct expenditure associated with the Greenway would contribute to a projected €7.2 million in spend in the local economy over a full year in 2011".
- Waterford City & County Council procured the undertaking of an intercept study of users of the Waterford Greenway. The study determined the following: "A majority of visitors from outside Waterford (80%) paid for accommodation while in Waterford and almost one in five visitors stayed four night or more".

1.4.5 With reference to the findings above from similar Irish greenways, the proposed development is well equipped to reap the rewards of tourism and provide stimulus into the local economy of the adjoining towns and businesses.

Environment

1.4.6 An absence of traffic free active travel routes within the Study Area results in most recreational and leisure-based cycling trips being undertaken on the regional and local road network.

1.4.7 This contributes to an impact on human beings in the form of harmful noise and emission pollutants, such as nitrogen dioxide, being breathed in by active travel patrons wishing to improve their physical wellbeing. Such pollutants are a contributing factor to health issues such as asthma, emphysema and other respiratory issues.

1.4.8 Whilst the proposed development will strongly facilitate leisure and recreational trip purposes, it is also intended that it will serve a dual function as a commuter route. As such it is considered that there is potential for a modal shift in key commuter trips between the adjoining towns of the proposed greenway. The

greenway would encourage walking and cycling to schools and train stations with opportunities for additional linkages in the future.

1.4.9 With reference to TII's Project Appraisal Guidelines it is possible that in reducing trips by motorised modes, particularly reducing private car travel, there likely be an improvement in air quality, noise reduction and overall positive impacts on climate change.

Safety

1.4.10 In general, along the Royal Canal, within the Study Area, particularly the 'Deep Sinking' section, between Clonsilla & Coolmine, facilities for pedestrians, cyclists and other users are poor.

1.4.1 Currently pedestrians and cyclists walk and cycle along the existing unsurfaced and narrow towpath (particularly within the 'Deep Sinking' section). The towpath along the 'Deep Sinking' section is very dangerous, typically consists of a 2-3m wide track, with local pinch points of approx. 1.3m, flanked by a deep cutting of 1.0-9.0m to the canal. This will be discussed in more detail in Chapter 4.

1.4.2 The proposed development will improve this significantly for leisure, recreational and commuter users by providing a safe and comfortable route that achieves the highest feasible level of service.

1.4.3 Throughout the process of developing and assessing the proposed routes, the safety & security of the greenway users (residents and landowners along the route) will be considered.

Accessibility and Social Inclusion

1.4.4 Within the Study Area there is a lack of accessible routes that link to key services and amenities that could be considered appropriate to encourage active travel for people with impairments and disabilities.

1.4.5 With 13% of the population of Fingal aged 60 or over and 11% of the population considered to have a disability, with those figures likely to rise, it is strategically important to ensure that our built environments are accessible and inclusive to a full range of people, including cyclists.

1.4.6 There is a lack of dedicated high quality recreational and leisure walking and cycling routes that facilitate users of all abilities which would encourage physical activity that could provide social benefits, such as increased social interaction that helps to build community networks, reduce isolation and exclusion and build social cohesion.

1.4.7 The Proposed development will improve this significantly for leisure, recreational and commuter users by providing a safe and comfortable route linking key services, facilities, amenities and attractions as much as possible without losing the vital proximity to the Royal Canal and its associated scenery.

1.4.8 The proposed development will also be designed for school children, providing them a safe facility that they can use without supervision.

Integration

1.4.9 The Proposed development will form part of a national greenway route along the Royal Canal that links the River Shannon in County Longford to the River Liffey in Dublin City's Docklands.

1.4.10 The Proposed development (approx. 8.1km) will tie in with the completed section of the Ashtown Greenway at Talbot Bridge (Old Navan Road) in the east and the Kildare County Council greenway section at the county boundary in the west.

1.4.11 In terms of a local integration perspective, the scheme will serve the towns of Clonsilla, Coolmine, Castleknock directly. The route will encompass large population catchment areas and rural areas which are currently more isolated, and in doing so, local schools, playing fields and other amenities will become more accessible. All of the urban centres have noteworthy populations with numerous services and amenities such as schools, shopping areas, community centres, parks, tourism attractions, playing pitches and train stations.

1.4.12 There is a significant lack of connectivity and integration between these services and amenities for active transport users at present. The possibility of connection of these amenities to nearby train stations and bus facilities is a significant benefit that the Proposed development could bring to the local area.

Physical Activity

1.4.13 According to The National Physical Activity Plan a large number of Irish people are not meeting the levels of physical activity recommended in the National Guidelines and this is evident from a range of surveys which have been conducted over the last number of years. On an international level, the European Charter on Counteracting Obesity includes the "promotion of cycling and walking by better design and transport policies", thereby improving public health and reducing the associated costs.

1.4.14 Research indicates that the percentage of people who are highly active in Ireland (2013 data) is just 31.3%. In relation to children, research undertaken as part of the Plan indicates that:

- Only 19% of primary and 12% of post-primary school children met the physical activity recommendations and these proportions have not improved since 2004
- Girls were less likely than boys to meet the physical activity recommendations
- The likelihood of meeting the physical activity recommendations decreased with increasing age
- One in four children was unfit, overweight or obese and had elevated blood pressure

1.4.15 Physical inactivity or sedentary behaviour is one of the leading risk factors for poor health and is now identified by the World Health Organization (WHO) as the fourth leading risk factor for global mortality.

1.4.16 With reference to TII's Project Appraisal Guidelines: for cyclists, an average increase in physical activity of 41.8 minutes per work day should equate to a risk of all-cause mortality of 0.79 times the normal figure (CAF 2016).

1.4.17 For new pedestrians, the risk of all-cause mortality should be 0.89 times the normal figure (so a smaller benefit than for cycling). This should correspond to physical activity levels of 38 minutes walking per weekday.

1.4.18 An increase in physical activity has been shown to have a beneficial effect on work absenteeism; this is an additional benefit to employers on top of the aforementioned health benefits. This reduction in short-term sick leave increases productivity in the economy.

Overall Need for the Scheme

1.4.19 The proposed Study Area is one of immense scenic beauty and amenity value rich with heritage and archaeological attractions.

1.4.20 There is huge potential to deliver a greenway, designed to high quality user safety and comfort standards, that can deliver a product with significant potential to attract local users and overseas visitors.

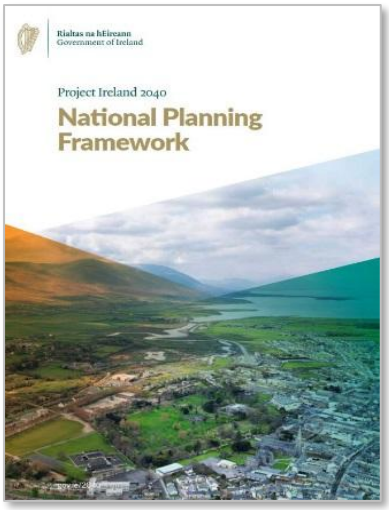
1.4.21 This would benefit the economy of the adjacent local communities, contribute significantly to health and wellbeing of all users as an amenity for physical activity and facilitate short to medium local commuter journeys thereby encouraging modal shift to active and sustainable transport alternatives.

2.0 POLICY CONTEXT

2.1 INTRODUCTION

2.1.1 It is important that a review of current national, regional and local policy is undertaken and used to inform the development of the options considered for the proposed development. The following relevant policy documents and design guidance have been reviewed as part of the scheme development.

2.2 NATIONAL PLANNING FRAMEWORK (2040)



2.2.1 The National Planning Framework 2040 (NPF) was published in February 2018 and now sets the strategic vision for the spatial development of Ireland for the period from 2018-2040. On foot of the completion of the NPF the Eastern and Midlands Regional Assembly has prepared their own strategy in accordance with the Framework set by the NPF. This was adopted in June 2019 and is known as a Regional Spatial and Economic Strategy.

2.2.2 According to the NPF, the National Strategic Outcomes (including Compact Growth and Sustainable Mobility) are supported by Strategic Investment Priorities where Housing and Sustainable Urban Development and National Road Networks are the first and second priorities (see **Figure 2.1** below). These concepts are central to the proposed scheme.



Figure 2.1: NPF Strategic Investment Priorities for Ireland (Source: www.NPF.ie)

2.2.3 Section 1.3 of the NPF describes these two **National Strategic Outcomes** as follows:

***Compact Growth**: 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*.

2.2.4 The NPF further explains **National Strategic Outcome 1** 'Compact Growth' at p. 139 of the document:

From an urban development perspective, we will need to deliver a greater proportion of residential development within existing built-up areas of our cities, towns and villages and ensuring that, when it comes to choosing a home, there are viable attractive alternatives available to people. Combined with a focus on infill development, integrated transport and promoting regeneration and revitalisation of urban areas, pursuing a compact growth policy at national,

regional and local level will secure a more sustainable future for our settlements and for our communities.

Sustainable Mobility: *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.*

2.2.5 The NPF further explains **National Strategic Outcome 4** 'Sustainable Mobility at p. 142 of the document:

The provision of a well-functioning, integrated public transport system, enhancing competitiveness, sustaining economic progress and enabling sustainable mobility choices for citizens, supports the overall Framework objectives. Dublin and other cities and major urban areas are too heavily dependent on road and private, mainly car-based, transport with the result that our roads are becoming more and more congested. The National Development Plan makes provision for investment in public transport and sustainable mobility solutions to progressively put in place a more sustainable alternative.

2.2.6 It is also pertinent to note the NSO for **Enhanced Amenities and Heritage** which seeks to *"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".*

2.2.7 Section 9.0 of the NPF highlights the commitment to **Environmental and Sustainability Goals. National Policy Objective 52** encapsulates this stating:

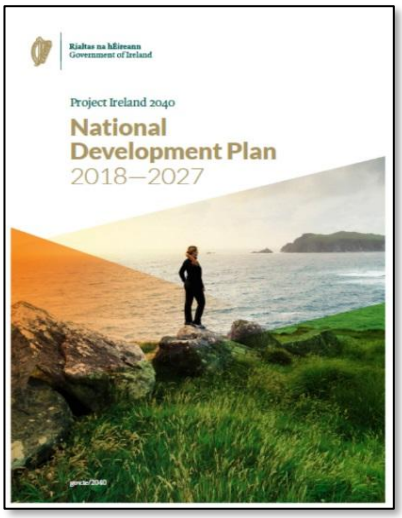
"The planning system will be responsive to our national environmental challenges and ensure that development occurs within environmental limits, having regard to the requirements of all relevant environmental legislation and the sustainable management of our natural capital".

2.2.8 **National Policy Objective 75** seeks to *"Ensure that all plans, projects and activities requiring consent arising from the National Planning Framework are subject to the relevant environmental assessment requirements including SEA, EIA and AA as appropriate"*.

2.2.9 The new NPF supports the creation of three new regional assemblies to replace the smaller eight regional authorities. This is seen as an effective measure of making the development of Ireland compact and sustainable. In relation to the development and creation of roads in the Eastern and Midlands region of the NPF, enhanced regional accessibility is of importance.

2.3 NATIONAL DEVELOPMENT PLAN (2018-2027)

2.3.1 The National Development Plan 2018-2027 (NDP) forms a key part of the initial development that the NPF aims to achieve over the next 20+ years. On foot of the completion of the NPF the Eastern and Midlands Regional Assembly has prepared their own strategy in accordance with the Framework set by the NPF. This was adopted in June 2019 and is known as a Regional Spatial and Economic Strategy. Metropolitan Area Strategic Plans will also be prepared.



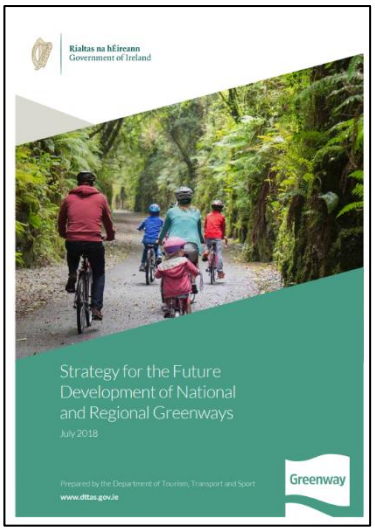
2.3.2 The NDP sets out a significant level of investment, almost €116 billion, which will underpin the NPF and drive its implementation over the next ten years. From reviewing the document there are a number of key points made about transport which relate to the proposed scheme. In section 2.3 *'Infrastructure Demand and Capacity Analysis'*, Transport was identified as a priority area for future public capital investment stating the following;

"'Transport: maintenance and upgrading of the road network and public transport to protect asset quality and value, meet demand forecast, ease congestion and to meet climate action objectives' (NDP, 2018)".

2.3.3 The NDP states that with over 50% of housing to be provided in our cities and 30% elsewhere to be provided within existing built up areas, this urban compact growth, '*will be supported through investment in high quality integrated public and sustainable transport systems*' (NDP, 2018).

2.3.4 The NDP also states that "*A step change is required under the NPF in putting in place environmentally sustainable public transport systems in order to secure Ireland's climate action goals*" and that "*the provision of safe alternative active travel options such as segregated cycling and walking facilities can also help alleviate congestion and meet climate action objectives by providing viable alternatives and connectivity with existing public transport provision*".

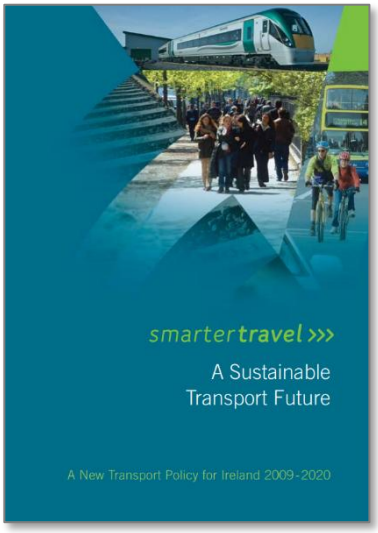
2.4 STRATEGY FOR THE FUTURE DEVELOPMENT OF NATIONAL AND REGIONAL GREENWAYS (2018)



2.4.1 The Strategy sets out how National and Regional Greenways in Ireland should be planned, suitable locations and constructed to an appropriate standard. It also aims to increase the number and geographical spread of Greenways and quality around the country.

2.4.2 The Strategy sets out the importance of early and widespread consultation with landowners and communities along and adjacent to proposed Greenway routes. The Strategy also emphasises the need to minimise the impact on landholdings by minimising severance as far as possible and providing accommodation works such as fencing and underpasses where required. The Strategy also sets out the importance of access to Scenery and things to See and Do in order to attract tourists.

2.5 SMARTER TRAVEL: A SUSTAINABLE TRANSPORT FUTURE (2009)



2.5.1 Smarter Travel: A Sustainable Transport Future, was published in February 2009, and represents a new transport policy for Ireland for the period 2009-2020. The policy recognises the vital importance of continued investment in transport to ensure an efficient economy and continued social development, but it also sets out the necessary steps to ensure that people choose more sustainable transport modes such as walking, cycling and public transport.

2.5.2 The policy is a direct response to the fact that continued growth in demand for road transport is not sustainable due to the resulting adverse impacts of increasing congestion levels, local air pollution, contribution to global warming,

and the additional negative impacts to health through promoting increasingly sedentary lifestyles. The following five key goals form the basis of the Smarter Travel policy document:

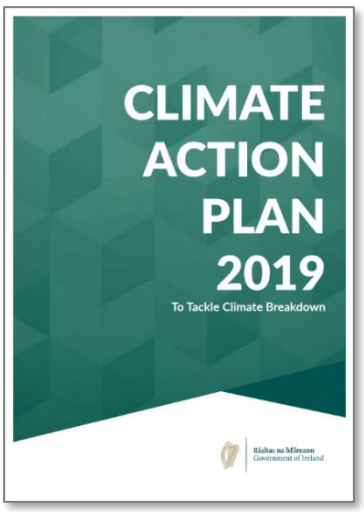
- ***Improve quality of life and accessibility*** to transport for all and, in particular, for people with reduced mobility and those who may experience isolation due to lack of transport.
- ***Improve economic competitiveness*** through maximising the efficiency of the transport system and alleviating congestion and infrastructural bottlenecks.
- ***Minimise the negative impacts of transport*** on the local and global environment through reducing localised air pollutants and greenhouse gas emissions.
- ***Reduce overall travel demand*** and commuting distances travelled by the private car.
- ***Improve security of energy supply*** by reducing dependency on imported fossil fuels.

2.5.3 These aims will be achieved through 49 specific actions listed within the Smarter Travel Policy, which can be broadly grouped into the following 4 key areas:

- Actions to reduce distance travelled by private car and encourage smarter travel;
- Actions aimed at ensuring that alternatives to the private car are more widely available;
- Actions aimed at improving the fuel efficiency of motorised transport through improved fleet structure, energy efficient driving and alternative technologies; and
- Actions aimed at strengthening institutional arrangements.

2.5.4 The Smarter Travel policy also includes for a comprehensive range of supporting 'actions' including mode specific (e.g. walking, cycling and public transport etc.) and behaviour change initiatives which both encourage and provide for sustainable travel practices for all journeys.

2.6 CLIMATE ACTION PLAN (2019)



2.6.1 The Climate Action Plan 2019 sets out a major programme for change in response to reducing Ireland's greenhouse gas emissions. The proposals outlined in the Plan are aimed at achieving a net zero carbon energy system within Ireland and it is envisaged that these proposals will also have associated positive economic and societal benefits, including cleaner air, warmer homes and a more sustainable economy in the longer term.

2.6.2 Irelands transport system plays a critical role in realising the ambitious targets of the Climate Action Plan. Consequently, to make growth less transport intensive a number of key policies are identified, including the expansion of walking, cycling and public transport to promote modal shift. The measures to deliver on the transport related targets set out in the Climate Action Plan cover the following:

- Modal Shift;
- Conversion of Public Fleets;
- Incentives and Regulation;
- EV Charging Network;
- Use of Biofuels;
- CNG Network; and
- Emerging Technologies.

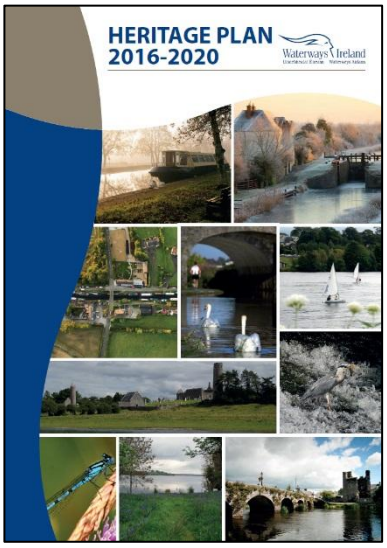
2.6.3 The Climate Action Plan makes a commitment to delivering an additional 500,000 public transport and active travel journeys daily by 2035. Of particular relevance to the Scheme are the identified actions, particularly in relation to building supporting infrastructure, specifically:

- "*Expand sustainable-travel measures, including a comprehensive cycling and walking network for metropolitan areas of Ireland's cities, with a*

particular emphasis on safety of cyclists. We shall also expand greenways and develop over 200km of new cycling network under BusConnects";

- "*Promote compact growth and greater integration of policies for land use and transport planning which will reduce the demand for commuter travel and support more efficient patterns inf development and travel*"; and
- "*Consider further opportunities to expand and better integrate existing mobility management initiatives for institutions and enterprises, such as Smarter Travel Workplaces, Smarter Travel Campus, Green School Travel and Workplace Travel Plans, including potential for increased participation by Local Authority-led structures*".

2.7 WATERWAYS IRELAND HERITAGE PLAN 2016-2020



2.7.1 The overarching aim of the Waterways Ireland Heritage Plan 2016-2020 is "to identify and protect the unique waterways heritage and promote its sustainable use for the enjoyment of this and future generations".

2.7.2 To achieve this, aim the Heritage Plan will deliver a series of actions that were developed through the consultation process. These actions have been categorised under four Strategic Objectives that cover partnership and collaboration, promoting awareness and community engagement, integrated management and developing heritage as a core value within Waterways Ireland. These objectives are listed below:

i. Objective 1: Fostering partnerships to continue building waterway heritage knowledge through storing information, undertaking research and developing best practice.

ii. Objective 2: Promoting awareness, appreciation and enjoyment of our waterway heritage with a focus on community engagement.

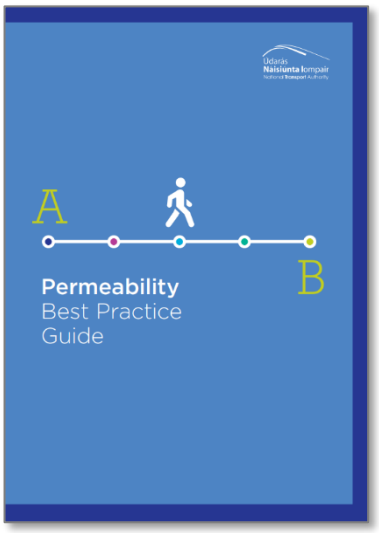
iii. Objective 3: Promoting the integrated management, conservation, protection and sustainable use of the inland navigable waterway asset.

iv. Objective 4: To develop Waterways Ireland as a heritage organisation committed to achieving the aim of this plan.

2.7.3 In the context of the proposed development the most relevant objectives include;

- *Ensure the ecological integrity of the waterways is maintained through continued involvement in Water Framework Directive (WFD), both at National Steering Group level and River Basin Management Groups.*
- *Work with local authorities to support the development and implementation of green infrastructure strategies and the achievement of green infrastructure objectives by local authorities, in recognition of the importance of the inland waterways as green corridors to local towns and villages as well as compliance under Article 10 of the Habitats Directive.*
- *Work in partnership with relevant agencies and local angling groups in order to maintain the inland waterways under our jurisdiction as sustainable fisheries.*
- *Raise awareness on light pollution and the impacts of artificial lighting on wildlife, built heritage and enjoyment of nature.*
- *Encourage appropriate re-use of historical buildings; including community asset transfers and leases to local service providers.*
- *Encourage an integrated, measured approach to heritage interpretation at all heritage sites that is sensitive to the special significance of the place (i.e. promote built, natural and cultural heritage aspects of all sites where possible).*
- *Support efforts to promote heritage-related sustainable tourism and eco-tourism, both domestically and abroad, and seek to meet the European Charter for Sustainable Tourism in Protected Areas standards.*

2.8 PERMEABILITY BEST PRACTICE GUIDE (2015)



2.8.1 In 2015 the National Transport Authority (NTA) published the Permeability Best Practice Guide. The guide provides the basis for delivering choice in existing built-up areas by promoting permeability for pedestrians and cyclists. A key element of this is addressing the legacy of severance built into the expansions of towns and cities over recent years.

2.8.2 The guide emphasises the importance of creating permeable neighbourhoods, where people can walk/cycle through areas safely and conveniently. This in turn confers a competitive advantage to active modes over the private car. The benefits of creating permeable networks are broadly categorised into the following four areas:

- ***Local Economic Well Being:*** Tangible economic benefits can be realised by creating neighbourhoods where people can easily access local shops and businesses by walking or cycling. By comparison, neighbourhoods which discourage or prevent short local walking/cycling trips, may result in people getting in their cars and going to out of town centres to avail of a larger range. This can result in a pattern whereby one longer car trip, which caters for a range of purchases, replaces several walking or cycling trips for each purchase.
- ***Public Transport:*** Relatively simple interventions which make it easier and quicker to access public transport can assist in achieving the NTA's objective of encouraging increased use of public transport. It may also result in reduced journey times and financial savings for users compared to private car travel.
- ***Health:*** Forms of urban and suburban development which 'design in' opportunities for walking and cycling result in supporting healthy activity and can instill healthy travel patterns into people's daily lives.

- ***Community Development & Social Capital:*** Creating connected, lively and useable spaces in the local community generate opportunities for day-to-day social interactions, which in turn contribute to a greater sense of community. This can help foster social cohesion, prevent crime and address anti-social behavioral problems. With higher numbers of people moving within residential areas, passive surveillance levels increase and thereby help to change the perception of a place in terms of safety.

2.8.3 The quality of service offered by a network will be influenced by how well the needs of pedestrians and cyclists are catered for, these needs being:

1. ***Safety:*** Is it safe to walk/cycle from someone's house to their destination?
2. ***Coherence:*** Is it obvious to the cyclist or pedestrian where to go? Is the route legible?
3. ***Directness:*** Is the route direct?
4. ***Attractiveness:*** Does the cycle or walking route attract or deter users by virtue of the impression it gives to passers-by and it is well maintained?
5. ***Comfort:*** It the route comfortable to walk and cycle on? Is the surface even and consistent?

2.8.4 The concept of filtered permeability is the common theme running throughout the guide. Whereby any trip in a built-up environment should be most direct by walking and cycling, not necessarily by private car. By minimising the distance and time it takes people to walk and cycle encourages travel by these modes relative to the private car.

2.9 NATIONAL PHYSICAL ACTIVITY PLAN (2016)



2.9.1 The National Physical Activity Plan was jointly prepared by the Department for Health and the Department for Transport, Tourism and Sport in 2016. The plan aims to increase physical activity levels across the whole population, whilst recognising that some groups of people face different barriers when it comes to accessing opportunities to be physically active.

2.9.2 The Plan sets out eight different areas for action, which are distinct yet complementary building blocks for encouraging greater participation in physical activity, these include:



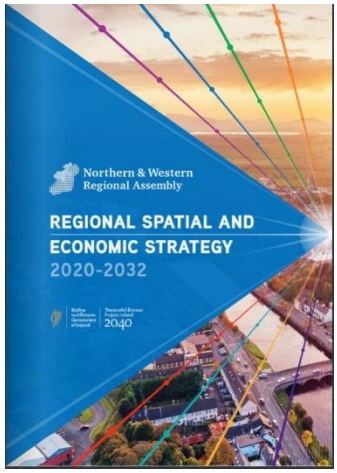
2.9.3 Get Ireland Active acknowledges the role that cycling and walking can play in achieving physical activity targets. The plan highlights the importance of good planning to promote the use of cycling and walking, stating that the layout of the

environment has a significant impact on the levels of physical activity undertaken across age groups. "The built environment is an important determinant of physical activity behaviour. The way the built environment is designed, planned and built can also act as a barrier to being active and can reinforce sedentary behaviour and car dependence.

2.9.4 Walking or cycling for transport or leisure is a form of physical activity that can easily be incorporated into the daily activities for many people. Supportive environments for walking, cycling and recreational and outdoor physical activity have many benefits beyond the immediate physical activity gains"

2.9.5 The proposed development is a positive example of how the built environment can be developed to promote physical activity, improving the health and wellbeing of those that choose to travel by bike or on foot. The proposed development will be used for a variety of journey purposes including travelling to work, travelling to work on foot or bike is an ideal opportunity to increase physical activity through everyday journeys

2.10 REGIONAL SPATIAL AND ECONOMIC STRATEGY (RSES) 2020-2032 & METROPOLITAN AREA STRATEGIC PLAN (MASP) (2019)



2.10.1 The new regional strategy for the region sets out a long-term strategic planning and investment strategy for the Dublin area and surrounding counties and Midlands area to 2032. Chapter 6 'Economy and Employment' and specifically sub-section 'Natural and Cultural Tourism Assets' recognises the Region's varied and rich tourism offering from its cultural assets of the capital city to the natural landscapes and amenities. Failte Ireland has identified that landscape and heritage are the key drivers for the promotion of Ireland's tourism. In this regard, the regional strategy seeks to increase access to the countryside in collaboration with relevant stakeholders whilst having regard

to the environmental sensitivities of the surrounding area. Chapter 7 'Environment & Climate' of the strategy promotes the development of a network of strategic greenways as a unique alternative for tourists and visitors to access and enjoy the natural and built heritage assets of the Region whilst having regard to the environmental sensitivities of the area. The strategy promotes a number of flagship greenways in the Region.

- RPO7.23 seeks to, Promote the development of a sustainable Strategic Greenway Network of national and regional routes, with a number of high capacity flagship routes that can be extended and/or linked with local Greenways and other cycling and walking infrastructure, notwithstanding that capacity of a greenway is limited to what is ecologically sustainable.
- RPO 7.24 seeks to, Support Local Authorities and state agencies in the delivery of sustainable strategic greenways, blueways and peatway projects in the Region under the Strategy for the Future Development of National and Regional Greenways.
- Chapter 8 'Connectivity' of the strategy promotes the importance of the integration of land use and transport which prioritises the development of lands which are, or will be, most accessible by walking, cycling and public transport, including infill and brownfield sites. Furthermore, the strategy promotes a shift to more efficient modes, i.e. active travel modes and public transport, including walking and cycling to reduce car dependency. In this regard, the following cycling and walking objectives are promoted:
- Delivery of the cycle network set out in the Greater Dublin Area Cycle Network Plan inclusive of key commute routes and urban greenways on the canal, river and coastal corridors.
- Delivery of the National Cycle Plan within the Region inclusive of the Greenway and Blueway Projects.
- Provide safe cycling routes in towns and villages across the Region.
- Enhance pedestrian facilities in all urban areas in the Region.

2.10.2 Section 5.6 of the MASP identifies cycling and walking as a key element in promoting and creating healthier places, mitigating climate change and facilitating tourism and metropolitan scaled amenities such as strategic cycling networks having regard to the NTA Greater Dublin Area Cycle Network Plan. Specifically, the MASP promotes the development of a Metropolitan Greenway Network, a strategic network of connected greenways for cycling and walking to enable access to key environmental assets within the Metropolitan area, while having regard to the environmental sensitivities of the area. Specifically, the strategy promotes a number of greenways of strategic value that will form part of a connected Strategic Metropolitan Greenway Network.

- RPO 5.3 seeks, Future development in the Dublin Metropolitan area shall be planned and designed in a manner that facilitates sustainable travel patterns, with a particular focus on increasing the share of active modes (walking and cycling) and public transport use and creating a safe and attractive street environment for pedestrians and cyclists.
- RPO 5.8 seeks to, Support the promotion and development of greenway infrastructure and facilities in the Dublin metropolitan area and to support the expansion and connections between key strategic cycle routes and greenways as set out in the NTA Greater Dublin Area Cycle Network Plan.

RURAL CYCLEWAY DESIGN, TII PUBLICATIONS DN-GEO-03047 (2017)

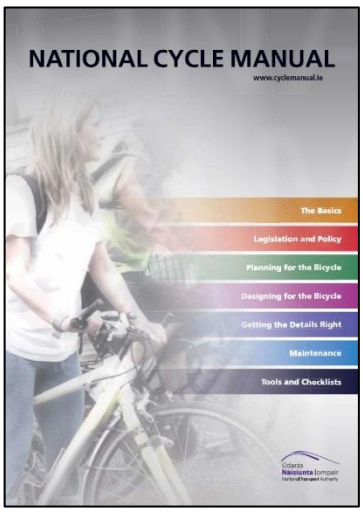
2.10.3 The National Cycle Policy Framework 2009-2020 (NCPF) identified the requirement to develop and implement the National Cycle Network to promote cycling as a transport mode, leisure activity and tourist activity in Ireland. Transport Infrastructure Ireland published the National Cycle Network Scoping Study in August 2010, which identified a core network of corridors between the larger towns and cities, and through the regions of greatest



interest for tourist and recreational cycling. This Design Standard will assist in the delivery of the National Cycle Network and will ensure a consistent approach is applied to the design of cycle schemes in rural areas.

2.10.4 In order to develop appropriate design standards for rural cycling facilities, there are a number of core design principles that need to be implemented. The principles include Coherence, Convenience, Directness, Safety, Comfort, Attractiveness and Access.

2.11 NATIONAL CYCLE MANUAL (2011)



2.11.1 The National Cycle Manual is a national guidance document that details the principles of sustainable safety that offers a safe traffic environment for all road users including cyclists. The manual provides guidance on integrating the bicycle into the design of urban areas. The manual sets out five principles of Sustainable Safety:

- ***Functionality:*** The principle of functionality is that the design which is fit for purpose is safer. Urban streets, roads and spaces are always multi – functional.
- ***Homogeneity:*** The principle of Homogeneity is that reducing the relative speed, mass and directional differences of different road users sharing the same space increases safety.
- ***Legibility:*** The principle of Legibility is that a road environment that all road users can read and understand is safer. A legible design will be self-evident, self-explanatory and self-enforcing.
- ***Forgivingness:*** The principle of Forgivingness (Passive Safety) is that environments that contribute to benign outcomes of accidents are safer.

- ***Self-Awareness:*** The principle of Self-Awareness is that where road users are aware of their own abilities and limitations to negotiate a road environment, the environment is safer.

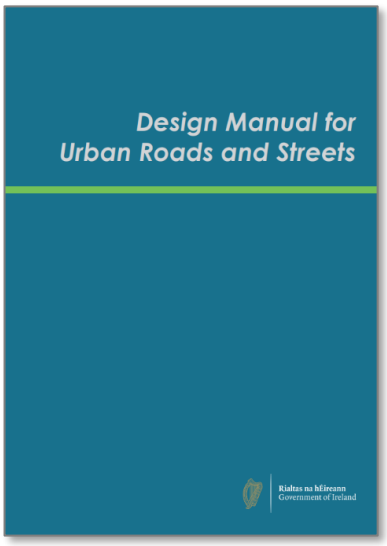
2.11.2 The Manual also highlights the five needs of cyclists, which correspond with those previously identified in the Permeability Best Practice Guide, including:

1. Road Safety
2. Coherence
3. Directness
4. Attractiveness
5. Comfort

2.11.3 Clearly all needs should be taken in to account when developing and designing route options, but of key consideration to the subject scheme is the potential benefits in terms of directness. The manual highlights the benefits of filtered permeability as a means of giving cycling a positive advantage by providing short-cuts and minimising delays for cyclists. By providing shorter average distances, or journey times, this gives cycling a competitive advantage over other modes.

2.11.4 In terms of creating attractive routes, there is a need to provide facilities which are well maintained and adequately lit so as not to deter evening and night-time use. Furthermore, appropriate widths and gradients are essential to deliver infrastructure which is designed and built for ease of use and comfort.

2.12 DESIGN MANUAL FOR URBAN ROADS AND STREETS (2019)



2.12.1 The Design Manual for Urban Roads and Streets (DMURS) (Version1.1,2019) provides guidance relating to the design of urban roads and streets. It presents a series of principles, approaches and standards that are necessary to achieve balanced, best practice design outcomes with regard to street networks and individual streets.

2.12.2 The manual places a significant emphasis on car dominance in Ireland and the implications this has had regarding the pedestrian and cycle environment.

2.12.3 The four key design principles of DMURS include:

Design Principle 1: *Support the creation of integrated street networks which promote higher levels of permeability and legibility for all road users, and in particular more sustainable forms of transport*

Design Principle 2: *The promotion of multi-cultural, place-based streets that balance the needs of all users within a self-regulating environment*

Design Principle 3: *The quality of the street is measured by the quality of the pedestrian environment*

Design Principle 4: *Greater communication and co-operation between design professionals through the promotion of a plan-led, multidisciplinary approach to design*

2.12.4 The document encourages more sustainable travel patterns and safer streets by proposing a hierarchy for user priorities. This hierarchy places pedestrians at the top, indicating that walking is the most sustainable form of transport and that by prioritising pedestrians first, the number of short car journeys can be reduced, and public transport made more accessible.

2.12.5 Second in the hierarchy are cyclists with public transport third in the hierarchy and private motor vehicles at the bottom. By placing private vehicles at the

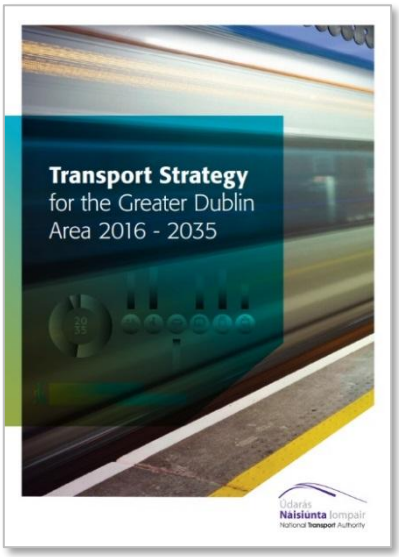
bottom of the hierarchy, the document indicates that there should be a balance on street networks and cars should no longer take priority over the needs of other users.

2.12.6 DMURS acknowledges the challenges in retrofitting permeability to existing built up areas, whereby the dendritic nature of some street patterns makes it difficult to retrofit as there are very little connection opportunities. A number of processes and design principles are suggested by DMURS to assist in successfully retrofitting permeability to existing built up areas, including:

- Rather than seeking to retrofit a fully permeable network, focus on key desire lines where maximum gain can be achieved throughout the minimum amount of intervention;
- Ensure any plan highlights reductions in journey times, walking distances etc.;
- Identify potential reduction in private vehicle use or increases in cycling and walking;
- Ensure links are short, overlooked, have clear sight lines and are well lit to mitigate anti-social behaviour. Longer links should be limited to those which go through areas of open space;
- Implement a package of landscape improvements that will directly add to the attractiveness of an area; and
- Where possible focus on formalising routes which are currently used by more able pedestrians but due to barriers are not suitable for use by the mobility impaired and disabled.

2.12.7 The focus of the manual is to promote an integrated approach towards creating and designing street networks which are simpler in structure, with higher levels of connectivity to reduce travel distances on foot or by bike, but which also incorporate elements of urban design and landscaping to help manage behaviours and provide high quality street environments.

2.13 TRANSPORT STRATEGY FOR THE GREATER DUBLIN AREA (2016-2035)



2.13.1 The purpose of this strategy is '*to contribute to the economic, social and cultural progress of the Greater Dublin Area by providing for the efficient, effective and sustainable movement of people and goods.*' This transport strategy provides a framework for the planning and delivery of transport infrastructure and services in the Greater Dublin Area (GDA).

2.13.2 There is an onus on the National Transport Authority to take full account of current prevailing policies and plans made at central government level, in transport, planning and in other sectors as well as other regional level plans. On review of these policies, the following key messages have emerged:

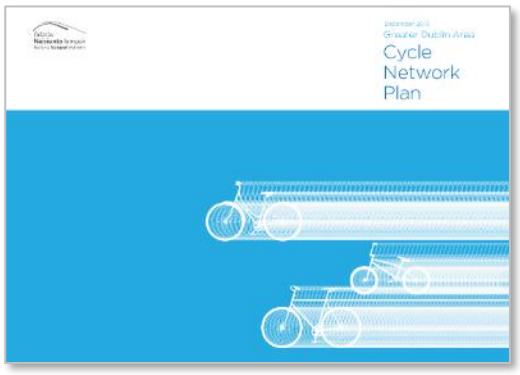
- Transport must be a key consideration in land use planning;
- In the short term, funding for large scale transport projects will be limited;
- Addressing urban congestion is a priority;
- The capacity of the strategic road network must be protected;
- A significant reduction in the share of trips undertaken by car is required, particularly in relation to short trips and commuter trips;
- An associated increase in walking, cycling and public transport is also required;
- A safe cycling network, with extensive coverage in metropolitan Dublin and in other towns, is needed to cater for the increased use of cycling that is already occurring and to reduce the dominance of the private car in meeting travel needs;
- The enhancement of the pedestrian environment, including measures to overcome severance and to increase permeability, is a priority.

2.13.3 In terms of cycle infrastructure, the GDA cycle network plan proposes to expand the urban cycle network to over 1,485km in length and will provide over 1,300km of new connections between towns in the rural areas of the GDA. Recognising the need for a safe cycling network, it is intended that many of the key cycling route will be developed as segregated facilities, with cyclists separated from vehicular traffic through the use of kerb separators or by having the cycleway at a higher level than the road carriageway.

2.13.4 In terms of walking and issues raised relating to provision for pedestrians, it is intended to:

- Provide a safer, more comfortable and more convenient walking environment for those with mobility, visual and hearing impairments, and for those using buggies and prams;
- Enhance pedestrian movement along the strategic pedestrian routes by widening footpaths where appropriate, providing better surfacing and by removing unnecessary poles, signs, street cabinets, advertising and other street clutter;
- Revise road junction layouts, where appropriate, to provide dedicated pedestrian crossings, reduce pedestrian crossing distances, provide more direct pedestrian route and reduce the speed of turning traffic;
- Cooperate with other agencies in the enforcement of laws in relation to parking on footpaths;
- Ensure that permeability and accessibility of public transport stops and stations for local communities is maintained and enhanced.

2.14 GREATER DUBLIN AREA CYCLE NETWORK PLAN (2013)



2.14.1 The GDA Cycle Network Plan is a document, prepared on behalf of the NTA, that identifies and determines a consistent, clear and logical cycle network within the Greater Dublin Area.

2.14.2 The plan aims to ensure that cycling as a transport mode is supported, enhanced and exploited in order to achieve strategic objectives and reach national goals. In line with the National Cycle Manual methods for designing a Cycle Network, the plan followed seven key steps, including:

1. Collating existing and planned network information;
2. Undertaking quality of service review;
3. Identifying gaps in existing network;
4. Cycle travel demand assessment;
5. Developing cycle network plan;
6. Targeting quality of service for routes; and

2.14.3 The GDA Cycle Network map, shown in **Figure 2.1**, outlines the proposals Royal Canal Greenway within our Study Area along with a number of Primary and Secondary cycle routes which form a series of interconnected linkages including the following:

- ***Royal Canal Greenway (N2)*** from the city centre via Cabra, Ashtown, Castleknock, Coolmine and Clonsilla. Some or all of this greenway will form part of the National Cycle Route 2 between Dublin and Galway;
- ***Primary Route 5*** Liffey Quays and Phoenix Park to Blanchardstown.
- ***Primary Route 5A*** from Phoenix Park to Carpenterstown, Coolmine and Blanchardstown.
- ***Secondary Route N05*** Finglas West to Blanchardstown via Ratoath Road, Cappagh Road, Ballycoolin Road, and Snugborough Road.
- ***Secondary Route 4A*** Ashtown along the Navan Road

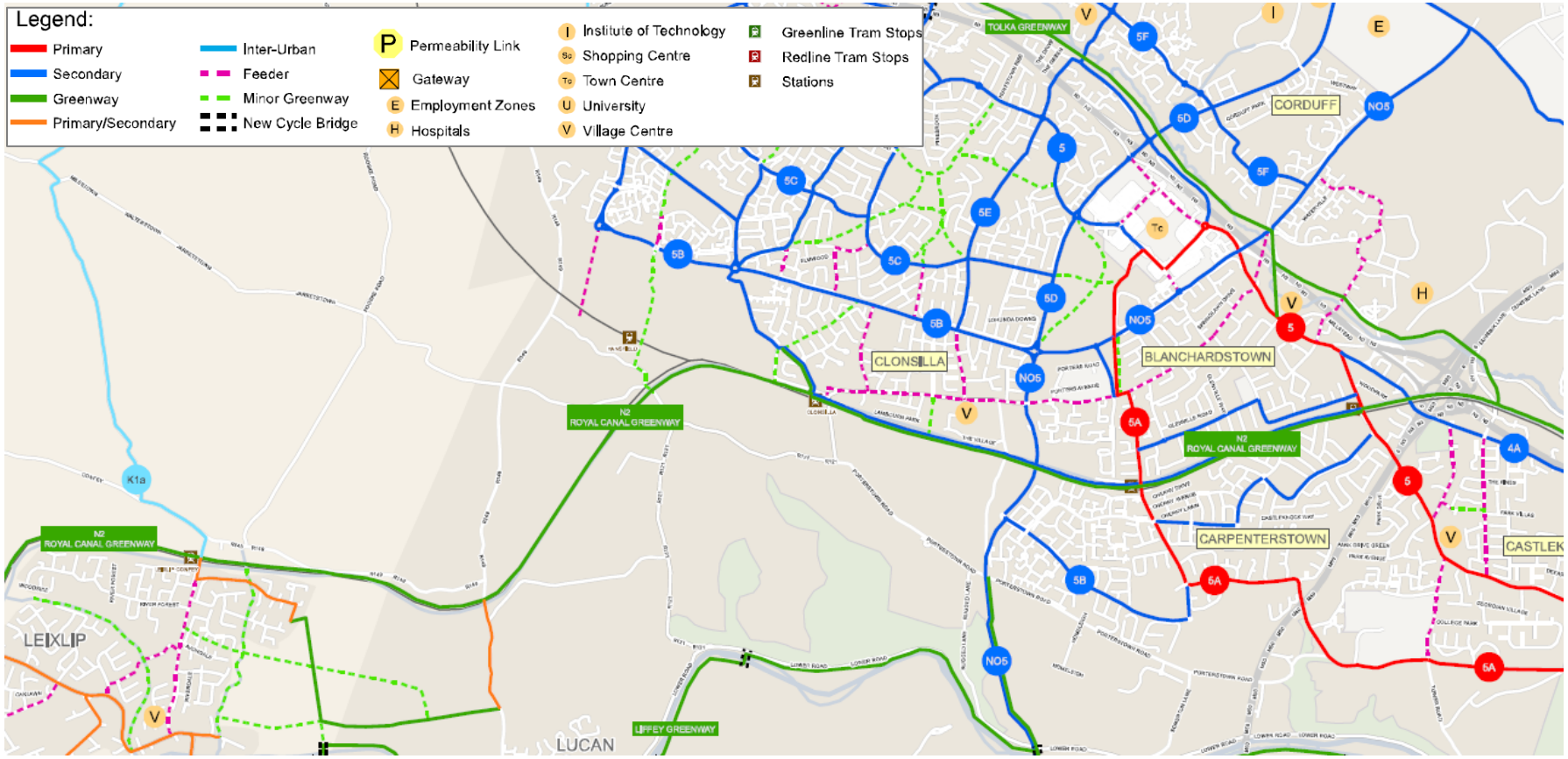


Figure 2.1: Proposed Cycle Network - Dublin North West Sheet N4

2.15 FINGAL DEVELOPMENT PLAN 2017-2023



2.15.1 The Fingal Development Plan 2017-2023 sets out the policies and objectives for sustainable development in the County up to 2023. It has been prepared in accordance with the requirements and various provisions of the Planning and Development Act, 2000 (as amended).

2.15.2 The greenway will link up with the indicated Cycle/Pedestrian route outlined on Sheet 13 of Fingal Development Plan Maps at:

- Clonsilla Train station.
- Porterstown Road
- Under Dr. Troy Bridge.
- Coolmine Train Station.

2.15.3 In the context of the proposed development the most relevant policies and objectives include;

2.15.4 The Council will work in cooperation with the NTA and adjoining Local Authorities to implement the Greater Dublin Area Cycle Network Plan subject to detailed engineering design and the mitigation measures presented in the SEA and Natura Impact Statement accompanying the NTA Plan.

2.15.5 The Royal Canal is a Protected Structure (RPS 944a, 10th Lock 944b, 11th Lock 944c and 12th Lock 944d), a Proposed Natural Heritage Area, Water Framework Directive Register of Protected Areas Site and an Annex 1 Habitat. These are designated under the Birds Directive (79/409/EEC) and the Habitats Directive (93/43/EEC).

2.15.6 The whole extent of the man-made structure of the Royal Canal within Fingal is a Protected Structure and that in addition individual elements over it or within it

are also protected structures (i.e. historic bridges and locks). The table below lists all elements of the Royal Canal that are Protected Structures.

RPS No.	Structure Name
696	Granard Bridge
697	Kirkpatrick Bridge
698	Kennan Bridge
706	Callaghan Bridge
711	Packenham Bridge
713	Collins Bridge
944a	Royal Canal (from Ashtown to St. Catherine's Park)

2.15.7 In addition to the above there are a number of Protected Structures that are in close proximity to the Royal Canal and within the route options for the proposed cycleway.

RPS No.	Structure Name
699	Keeper's Cottage, Porterstown
700	Former Clonsilla School, Porterstown Road, Kellystown
705	St. Mary's Church of Ireland Church, Clonsilla
707	Clonsilla Station Signal Box and Overbridge
709	The Courtyard, Beechpark House, Clonsilla
710	Beechpark House, Clonsilla

2.15.8 Promote and facilitate the development of the Royal Canal Greenway taking full account of the need to protect the natural and cultural heritage of the canal route and the need to avoid significant adverse impacts on European site(s) and species protected by law and ensure the integration of the Royal Canal Greenway with other strategic trails in Fingal and in adjoining Local Authorities.

2.15.9 Under the Wildlife (Amendment) Act, 2000 Natural Heritage Areas (NHAs) are being designated to conserve species and habitats of national importance. This includes the Liffey Valley, Royal Canal and wetland sites such as the Sluice River Marsh and the Bog of the Ring. There are also a number of Statutory Nature Reserves and Refuges for Fauna in Fingal. These areas, established under the

Wildlife Acts 1976 to 2012, are areas where nature conservation is the primary objective and takes precedence over all other activities. The Council will normally only grant permission where it is clearly demonstrated that a proposal will have no significant adverse impact on the habitats and species of interest in the designated area and its ecological integrity.

2.15.10 *Protect and enhance the built and natural heritage of the Royal Canal and ensure that development within its vicinity is sensitively designed and does not have a detrimental effect on the character of the Canal, its built elements and its natural heritage values and that it adheres to the Waterways Irelands Heritage Plan 2016-2020.*

2.15.11 *Protect the ecological integrity of proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna, and Habitat Directive Annex I sites.*

2.15.12 *Provide for public understanding of and public access to rivers, waterway corridors and wetlands, where feasible and appropriate, in partnership with the National Parks and Wildlife Service, Waterways Ireland and other relevant stakeholders, while maintaining them free from inappropriate development and subject to Ecological Impact Assessment and screening for Appropriate Assessment as appropriate.*

2.15.13 *Ensure that development does not have a significant adverse impact on proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna, Habitat Directive Annex I sites and Annex II species contained therein, and on rare and threatened species including those protected by law and their habitats.*

2.15.14 *Secure lands adjacent to the Royal Canal for environmentally friendly and sustainable public access and public open space.*

2.15.15 *Create a network of pedestrian and cycle routes between Clonsilla, the Royal Canal and the adjacent railway stations; and a connection from the 'Windmill' residential development to Dr. Troy Bridge and a new Light Rail Corridor stop.*

2.15.16 Have regard to the joint Department of Transport, Tourism and Sport and the Department of Environment, Community and Local Government's Design Manual for Urban Streets and Roads (DMURS), (2013) and the National Transport Authority's Permeability Best Practice Guide (2015), in the provision of good urban design.

2.15.17 Ensure permeability and connections between public open spaces including connections between new and existing spaces, in consultation to include residents.

2.15.18 Encourage the sympathetic and appropriate reuse, rehabilitation and retention of Protected Structures and their grounds including public access seeking that the Protected Structure is conserved to a high standard, and the special interest, character and setting of the building preserved. In certain cases the relaxation of site zoning restrictions may be considered in order to secure the preservation and conservation of the Protected Structure where the use proposed is compatible with the existing structure and this will only be permitted where the development is consistent with conservation policies and the proper planning and sustainable development of the area.

2.16 FINGAL TOURISM STRATEGY



2.16.1 The Fingal Tourism Strategy 2015 – 2018 was developed to provide the "definitive pathway to tourism development in Fingal". The objective moving forward for tourism in Fingal was to develop a comprehensive strategy for the development of tourism with support and buy-in of relevant public, private and community tourism stakeholders. A work programme has been developed up to 2022 to ensure that the overall aim of the tourism strategy is delivered. The vision for Fingal tourism is:

"An attractive, vibrant and sustainable tourism destination delivering a distinctive experience for local residents, domestic and international visitors".

2.16.2 As outlined within the county tourism strategy, tourism is returning to strong growth and continues to play a hugely influential role in Fingal's economic success. Appropriately one of the three core objectives of the Fingal County Council Corporate Plan 2015-2019 are to strengthen the proposition and marketing of tourism in Fingal through its tourism plan and ensure regular engagement with key stakeholders

2.16.3 The core objectives of the Fingal Tourism Strategy are:

- Optimise and expand existing visitor experience – The primary appeals and motivations to visit the County are embedded in its built heritage and its urban/rural balance of living culture and festival experiences.
- Adopt a new place marketing strategy aligned with, and leveraging, the Grow Dublin Tourism Alliance.
- Develop new ways of working in partnership with stakeholders.

2.16.4 The proposed development is a showcase example of promoting and utilising the natural environment to deliver high quality sustainable tourism. The Greenway will provide Fingal with a new tourism offering allowing visitors to experience the unique characteristics of the area. It will be imperative that the scheme is developed in partnership with local stakeholder, providing opportunities for closer working relationships moving forward.

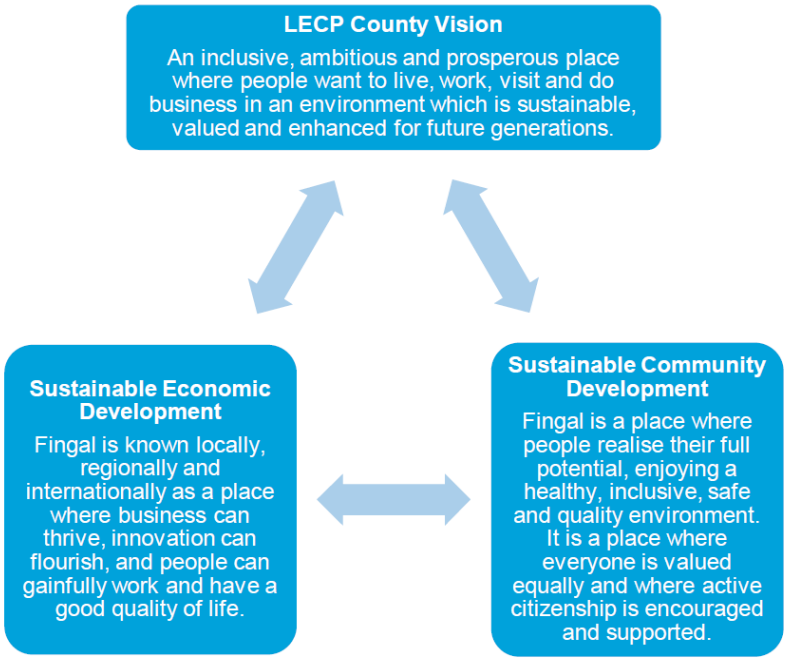
2.17 FINGAL LOCAL ECONOMIC AND COMMUNITY PLAN

2.17.1 The Fingal Local Economic and Community Plan (LECP) is the first policy document to integrate economic and community development within the county. Sustainable development is at the heart of the first LECP.



> *"The plan is built upon the understanding that economic, local and community development are mutually supportive in building sustainable communities with strong local economies. The plan promotes a collaborative leadership approach across a broad range of publicly funded agencies and civil society stakeholders to achieve improved outcomes and impacts for citizens, businesses and communities."*

2.17.2 The Fingal LECP is based on a county vision as well as sustainable economic and community development statements as presented below.



2.17.3 The LCEP acknowledges the role of transport (particularly sustainable transport) in delivering the overall county vision and supporting economic and community development. A range of key strategic goals have been identified with those aligned to the greenway presented below:

- Maximise job creation opportunities by activating the potential within local communities. This will provide for an enhanced equality of access to job opportunities for hard to reach communities;
- Increase participation in social cultural and economic activities to improve, well-being and quality of life.
- Increased community participation levels in health, social, cultural and economic activities will act as a vehicle for improving the quality of life for all;
- More coherent services that connect people and places, more active and empowered communities of place and interest;
- Protect and enhance the environment and heritage of Fingal. This goal recognises that the effective sustainable management of the environment and heritage will be enhanced by increased community awareness;
- Create distinct visitor attractions by sensitively optimising the natural assets of the county, and building an enterprise and community infrastructure to drive and expand the visitor potential;
- Re-generate towns and villages, and increase the resilience of the local economy; and
- Support the sustainability of rural communities through the development of a resilient economy

2.17.4 A key objective relating to 'Increase participation in social cultural and economic activities to improve, well-being and quality of life' is to provide facilities and support services that enable a healthier lifestyle. An action to improve facilities to enable such health styles is the creation of cycling and walking trails within the county.

"Develop linked walking and cycling trails, marked by clear directional signage and branding; investigate the potential for natural, cultural and historical information signs, community participation and employment and enterprise opportunities such as low-level guiding"

2.17.5 The proposed development has the potential to a best practice example of how to create distinct visitor attractions by maximising the local environment through sustainable growth, creating job opportunities, connecting people and places and developing more active and empowered communities.

2.18 HANSFIELD SDZ PLANNING SCHEME APRIL 2006

2.18.1 Hansfield has been designated for the establishment of a strategic development zone to address the deficiency in the supply of housing nationally and the Greater Dublin Area particularly.

2.18.2 The Hansfield Strategic Development Zone comprises approximately 80.74 hectares of land in South West Blanchardstown close to the county boundary with County Meath.

2.18.3 The lands are bounded by the recently constructed Ongar Road to the North, the Hansfield Road to the East, the Royal Canal Towpath and the disused Navan Railway Line to the South and the Barnhill / Lucan Road to the West.

2.18.4 The following sections from the SDZ outline importance of cycle/pedestrian movement within the SDZ and its surrounds.

2.18.5 Accordingly, this Planning Scheme makes provision for a bus route through the development lands to serve the station, and in tandem with this, provides for pedestrian and cycle access towards Clonsilla.

2.18.6 It is an objective of the Council to secure the provision of pedestrian and cycle access to the Canal Walkway, as detailed in Section 8.5.2.

2.18.7 This will ensure the potential future availability of pedestrian and cycle access via the Royal Canal to Clonsilla rail station and the possibility of shorter direct routes.

2.18.8 A pedestrian and cycle path connection will be provided through Zone 6 connecting the rest of the SDZ lands with the Clonsilla Station Improvements.

2.18.9 The SDZ will maximise the provision of pedestrian and cyclist routes and design these routes to encourage movement within and into the SDZ. The design and layout of the building form will be required to include this as a central design element. The SDZ will provide safe and attractive routes that feature good passive surveillance, lighting, cycle parking facilities and which relate well to desire lines to/from local facilities. In particular boundary walls between differing residential estates will not be permitted where they would reduce pedestrian movement to local facilities. Emphasis will be on the creation of pedestrian/cyclist linkages to:

- *local amenities such as shops and leisure facilities.*
- *Public Transportation facilities such as bus stops and train stations.*
- *Educational establishments.*
- *Amenity areas – The Royal Canal, Tolka Valley Park, Liffey Valley SAAO*
- *Employment areas such as Blanchardstown, Damastown, Ballycoolin, Cruiserath and Cappagh.*

Policy Conclusion

2.18.10 The various studies discussed in the preceding sub-sections set out the transport planning policy context, the need to enhance permeability and to promote the sustainable development of walking, cycling, and other more sustainable forms of transport as an alternative to the private car and to facilitate the provision of the necessary transport infrastructure to fully accommodate existing and future population needs as well as the demand for economic development in an environmentally sustainable manner.

3.0 SCHEME OBJECTIVES

3.1 Royal Canal Pedestrian & Cycle Route Scheme Objectives

3.1.1 Having regard to the findings of the transport context for the proposed Royal Canal, the following objectives have been established for the proposed development:

- To deliver a premium quality combined pedestrian and cycle route which will serve projected recreational and commuter demand.
- To improve the canal corridor as a recreational pedestrian and cycle route
- To improve connectivity between the canal and adjacent residential neighbourhoods.
- To deliver enhanced permeability via sustainable modes of walking and cycling in a manner that balances the security of the greenway user and respects potentially affected landowners & residents in accordance with best practice urban design.
- To encourage use of a sustainable modes of transport, and interlink with existing public transport (with links to Train Stations) and proposed public transport schemes such as DART + West;
- To deliver a greenway which respects the environmental, conservation and heritage sensitivities within the Study Area.
- To create a first-class cycling facility and tourist attraction which can contribute to the economic development of County Fingal;
- Connect to the completed phase of the Greenway at Ashtown and tie in with the section to be completed by Kildare County Council.
- Raise the profile of cycling and inspire people to cycle;
- Increased cyclist and pedestrian safety;
- Tackle obesity and promote activity and create a better quality of life;
- Reduce congestion and the number of motorised vehicle trips;
- To deliver the scheme in compliance with DMURS, NCM and the latest design standards.

- To meet the requirements of Fingal County Council Departments, the NTA, Iarnród Éireann, National Parks & Wildlife Services and other key stakeholders.
- To consult with the statutory and non-statutory stakeholders at all stages during the project.
- To meet planning and statutory requirements.
- To meet the environmental requirements including mitigation measures outlined.
- To protect the current uses of the canal/scheme and to respect the access requirements of Waterways Ireland, as primary landowner within the Study Area, and other users such as anglers, walkers and barges.
- To protect the Royal Canal or ensure that its historical context is protected in the delivery of this greenway.
- To deliver a safe combined pedestrian and cycle route, which meets the standards set out for a Greenway in the NTA's "National Cycle Manual" (published in 2011) and TII Publication "Rural Cycleway Design, DN-GEO-03047, April 2017", subject to detailed engineering design and the mitigation measures presented in the SEA and Natura Impact Statement accompanying the Greater Dublin Area Cycle Network Plan.

3.2 Physical Character of the Greenway

3.2.1 By its nature a greenway is a low-key and low impact feature. It will consist of 3-4 metre wide pathway (where possible within existing embankment widths) and will follow the natural topography as much as possible with little earthworks for cuttings and embankments. Suitable curvature for cyclists is only 25m radius for a maximum speed of 30km/h or lower where appropriate, with a minimum radius of 4m at 10km/h. The gradients will preferably not exceed 3% but may be relaxed to 5%, or an absolute maximum of 10%.

3.2.2 The Greenway will be constructed as a 3-4m wide (where possible within existing embankment widths) from the Kildare/Fingal County Council boundary line to Hansfield Bridge (Railway Bridge). For the remainder of the route, from Hansfield

Bridge (Railway Bridge) to the end of the scheme at Talbot Bridge (Ashtown Greenway), where increased usage is projected, the greenway will be constructed as a 4m wide path (where possible within existing embankment widths and terrain) made from a bituminous surface to provide a high quality and durable finish for cyclists and pedestrians. This is based on the route being of National/Regional and Local importance (as outlined in Chapter 1) that is expected to attract significant demand for commuter and leisure use. By way of context, the Baldoyle to Portmarnock greenway, which was officially opened in June 2020, has experienced considerable usage levels as can be seen from the user counts from January 1st to February 28th, 2021 **(Table 3.1)**, the popularity for greenway schemes has increased significantly & the appetite for outdoor recreation has grown following the construction of quality infrastructure. It is anticipated that sections of the proposed development will provide greater levels of usage and as such the 4m width of the facility between Hansfield and Castleknock is fully justified.

Greenway	Daily Average (Week)	Daily Average (Weekend)
Baldoyle Greenway	1296	1681

Table 3.1: Baldoyle Greenway user counts January-February 2021

3.2.3 Ancillary elements of the greenway facility will be sensitively designed in phases 3 and 5 (Preliminary Design and Detailed Design) of the project. These elements may include such items as signage, lighting, CCTV, access control info boards and seating.

4.0 STUDY AREA

4.1 Introduction

4.1.1 This Chapter of the report focusses on the Study Area for the proposed development and the characteristics of this area in terms of physical features, opportunities and constraints as well as identifying potential for integration with other travel modes.

4.1.2 . The Study Area begins to the west of the Royal Canal at the Kildare County Council boundary (Royal Canal Amenity Group premises) travelling north eastwards towards Clonsilla. The Study Area then continues along the canal to Coolmine and onto the 12th Lock where it ties into the Ashtown section of the Greenway at the Old Navan Road (Talbot Bridge). The Study Area for the proposed development route option assessment is as identified by the area within the red boundary line in **Figure 4.1** below. The study area follows the route of the Royal Canal corridor and extents north and south of the corridor for alternative route options.

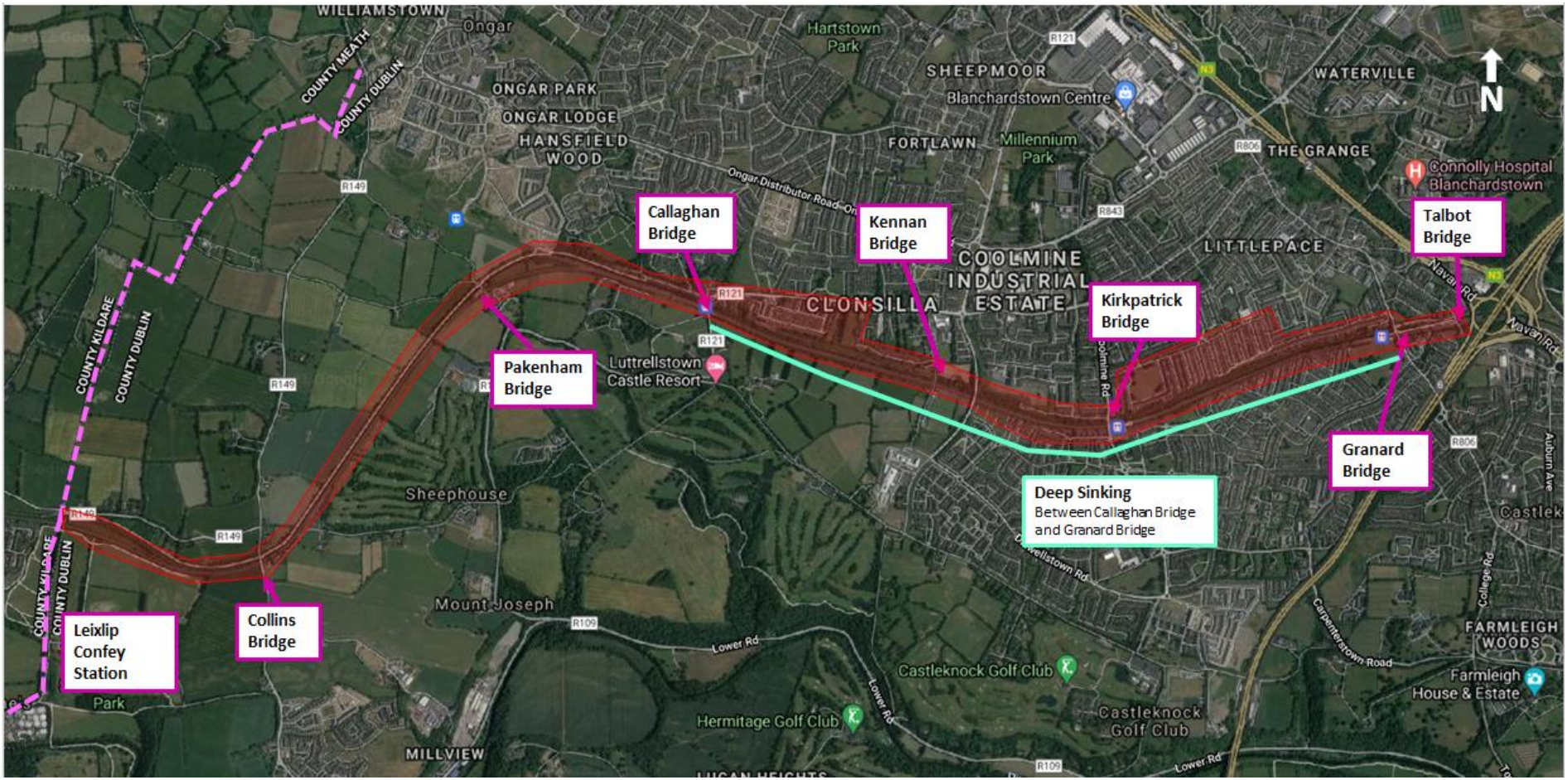


Figure 4.1: Proposed Study Area

4.2 Study Area Sections

4.2.1 The Study Area has been divided into three distinct sections based on their different geographical and physical characteristics to simplify the assessment process as illustrated below in **Figure 4.2**: -

- **Section 1** – between the Kildare/Fingal County Council boundary line (Royal Canal Amenity Group) and Hansfield Railway Bridge (Ch. 0 – 3200).
- **Section 2** – between Hansfield Railway Bridge and Kennan Bridge (Porterstown Road) (Ch. 3200 – 5325).
- **Section 3** – between Kennan Bridge (Porterstown Road) and Talbot Bridge (Old Navan Road) (Ch. 5325 – 8100).



Figure 4.2: Study Area Sections

4.3 Characteristics and Constraints

4.3.1 There are a number of constraints, both natural (i.e. existing natural environment) and physical (the built environment), which constrain route options for the proposed scheme within the defined Study Area.

4.3.2 The Royal Canal is a protected area of national importance and is designated as a proposed Natural Heritage Area (pNHA) with the objective of conserving species and habitats of national importance.

4.3.3 Under the Wildlife Amendment Act, 2000 the entire Royal Canal is formally designated as a pNHA under the site code 002103 (National Parks and Wildlife Service (NPWS)) including the central channel and adjoining banks, hedgerows, towpath, grassland, open water, related scrub and woodland features. The pNHA designation indicates that the site has a B rating and is of national importance. According to the report accompanying the pNHA designation, the ecological value of the canal lies in the diversity of species along its linear habitats.

4.3.4 The Royal Canal is also a Water Framework Directive Register of Protected Areas site (WFDRPA). The protected areas are identified as those requiring special protection under existing national or European legislation, either to protect their surface water or groundwater, or to conserve habitats or species that directly depend on those waters.

4.3.5 The Royal Canal itself is the main Protected Structure (RPS 944a, 10th Lock 944b, 11th Lock 944c and 12th Lock 944d) along the scheme extent. The Royal Canal is a manmade channel cut into the landscape in the 18th century as a navigation route and has earthen banks and a towpath running alongside. The bridges along the canal are also protected structures, single-arch limestone humpback road bridges.

4.3.6 The Royal Canal is a Natural Heritage Area, Water Framework Directive Register of Protected Areas Site and an Annex 1 Habitat. These are designated under the Birds Directive (79/409/EEC) and the Habitats Directive (93/43/EEC). These are areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection.

4.3.7 The conservation of biodiversity in Ireland is a legislative imperative. Species of national and international importance identified within the Royal Canal corridor includes the Otter & bats such as common pipistrelle, soprano pipistrelle and Leisler's bat. Under the Wildlife Acts (1976 – 2000) it is illegal to disturb or harm Protected Species and their habitats.

4.3.8 Another general characteristic of the Study Area is the proximity of the Canal to the Dublin – Maynooth Rail Line which generally follows the route of the Canal. This is a key public transport corridor for the region but also nationally serving commuters and also connecting Dublin to Galway. As part of the proposed DART + West scheme, the railway line is due to be electrified to provide enhanced capacity to serve future connectivity to the west of Dublin. As part of these proposals, it is proposed that a number of existing level crossings of the rail line will be closed, overhead electrification infrastructure will be provided, new pedestrian and cycle bridges will be provided over the rail at the existing crossings and there will also be more onerous requirements in terms of clearances required above and adjacent to the rail line.

4.3.9 As part of the route options assessment process a number of desktop studies were undertaken and previous studies were reviewed and new surveys were undertaken since 2018. The following surveys were undertaken/reviewed to gain a more detailed understanding of the potential constraints along the Study Area.

Field Surveys

2013 Ecological Field survey (BEC)

4.3.10 In 2013 BEC Consultants Ltd. was contracted by the National Transport Authority (NTA) to undertake a comprehensive ecological survey of the Royal Canal between Talbot Bridge (12th Lock), Blanchardstown, Co. Dublin and Maynooth Train Station, Maynooth, Co. Kildare (Brophy & Devaney 2013). It thus covered the entire length of the proposed development in Fingal County as well as sections further west in Co. Kildare. The aim of this survey was to collect data on the flora, fauna and habitats that exist within these sections of the Royal Canal in order to help inform any future plans for development along the canal. The

field surveys mapped and classified the habitats, recorded plants (including bryophytes), bird and mammal species, while highlighting habitats and species of particular importance (e.g. rare or protected habitats and species) within the Study Area. The surveys included both the waterbody itself and the terrestrial habitats marginal to the canal.

4.3.11 Given the fact that very little change in management of the canal and towpath has occurred since 2013 it is considered that these findings are still valid. There has also been very little development within the Study Area along the Royal Canal, which would not add a significant impact. Thus, additional surveys undertaken in 2018 were designed to supplement this information and to give more precision to the results. It should be noted that sections 1 to 8 of the 15 sections included in the BEC study are included in the route proposed by Fingal County Council.

Field surveys during 2018 & 2019

4.3.12 In order to supplement the 2013 surveys by BEC Consultants some more detailed surveys were conducted in 2018 & 2019 by Natura Environmental Consultants. These included:

i. Habitat surveys of the woodland in the Deep Sinking (2018).

ii. Habitat surveys of grassland in the western sections of the Study Area.

iii. Breeding waterbird surveys along the full length of the Study Area.

iv. Bat surveys of the bridges in the Study Area including bat activity.

v. Bat activity surveys of the section between Ashtown station and the M50 for comparison with an earlier bat survey to examine the effects of lighting.

vi. Survey of terrestrial molluscs on the full length of the Study Area.

vii. Tree Survey along the full length of the Study Area.

viii. A survey of the woodland on the north side of the Royal Canal east of Kirkpatrick Bridge for badger setts (Aug 2019).

4.3.13 The methodologies for these surveys are described in the 'Royal Canal Urban Greenway, Biodiversity Assessment Report (2018)' in **Appendix H**.

Ground Investigation Surveys (2020)

Ground Investigations were undertaken along the entire length of the scheme from the Kildare/Fingal County Council boundary line (Royal Canal Amenity Group) to Talbot Bridge (Old Navan Road). Along the 'Deep Sinking' section between Clonsilla Station and Granard Bridge ground investigations were undertaken on both the northern and southern embankment. The purpose of the site investigation was to investigate subsurface conditions (particularly in the 'Deep Sinking' section) and to further understand the structural infrastructure/construction method required for particular route options. The scope/extent of the ground investigations undertaken are as follows:

- Slit trenches to a maximum depth of 1.5m below ground level (BGL)
- Rotary Core Boreholes to a maximum depth of 23.20m BGL
- Hand diamond drilled Cores to a maximum depth of 0.5m BGL
- Angled Rotary Core Boreholes from a barge on the Canal to a maximum depth of 5.5m.
- Plate load and TRL probe testing at slit trench locations to determine CBR value
- Geotechnical & Environmental Laboratory testing

4.4 Study Area Characteristics

4.4.1 The following sections will address the characteristics & constraints specific to each of the Study Areas identified above.

SECTION 1

4.4.2 Section 1 extends from Kildare County Council boundary line (Royal Canal Amenity Group premises) to Hansfield Railway Bridge. This section is rural/peri-urban in nature, predominately farmlands, however, it also adjoins local amenities such Westmanstown Golf Club and Westmanstown Sports Centre. The existing towpath is present along the northern embankment. There is sufficient available width along the northern towpath to provide a 3-4m wide greenway within existing embankment widths.



Figure 4.3: Existing Towpath between Collins & Packenham Bridges

(i) Natural Environment

Topography & Landscaping

4.4.3 The overall topography for Section 1 and its surrounding landscape is generally flat, therefore topography will not constitute a significant constraint for this route selection. This type of topography does aid itself to the placement of a greenway in the area as limited re-grading of lands would be required to achieve the desirable longitudinal gradients.

Ecology

4.4.4 The studies undertaken to date indicate that there are areas of ecological interest contained within the Section 1, as shown in Sheet 1 of **Appendix G**. The lands surrounding the canal are predominately agricultural land.

4.4.5 Two types of habitat were identified within the Study Area in the National Survey of Native Woodland Habitats in 2010 by the National Parks and Wildlife Service:

i. Oak-Ash-Hazel Woodland (WN2) – High Value; and

ii. Dry Meadows & Grassy verges (GS2) – Low Value;

4.4.6 The survey undertaken in 2018 indicates that some of the grasslands (GS2) along both sides of the canal for Section 1 are of high conservation value, especially those pockets containing the Annex 1 habitat 'Lowland hay meadows'. This habitat type is now rare in Ireland and especially in Fingal where the majority have been converted to improved agricultural grasslands. Where the proposed route is located in these sections of the canal towpath it will be set back at least 1m from the water's edge and no disturbance should be permitted to the grassland habitat on the canal bank during construction. Following construction of the Greenway, much of this marginal habitat could be converted to a species-rich grassland using the methods proposed above. For additional information on the Annex 1 habitat 'Lowland hay meadows' please refer to the 'Royal Canal Urban Greenway, Biodiversity Assessment Report (2018)' in **Appendix H**.

Fauna

4.4.7 There are several species of fauna that are of national and international significance.

The following Fauna surveys were undertaken in 2018 as part of the assessment:

- Molluscan Survey (Snail Survey) of the potential Vertigo habitats;
- Waterbird Survey; and
- Bat survey.

4.4.8 No Vertigo species (of snails) were found in the survey, and no habitats with potential to support the damp and gentle transition needed for them were found.

4.4.9 A total of one water bird species was recorded along Section 1 of the canal over two surveys. Mallard were recorded in Section 1 and most abundant species along the complete scheme. Mallards occur frequently and generally nest in areas with reed fringe. In the 'Royal Canal Urban Greenway, Biodiversity Assessment 2018' report, **Appendix H**, Table 3 outlines the number of registrations for each species and Figure 5 illustrates a map of the survey area and the distribution of waterbird registrations.

4.4.10 The waterbird species recorded breeding on this stretch of the canal are largely confined to the waterbody itself and are habituated to human disturbance. It is not expected that the development of a pedestrian path and cycleway parallel to the canal would have any significant impacts on them provided that the vegetation in the canal water is not disturbed.

4.4.11 A full bat survey of this section of the Royal Canal was undertaken in 2013 (Aughney 2013). This included a survey of bat activity along the waterway. The results are summarised in Table 4 in the Biodiversity Report, **Appendix H**. Four species were found with Soprano Pippistrelle being most widespread. The entire canal forms a significant foraging and commuting corridor for bats and this is likely to continue in the future.

4.4.12 The old stone bridges were examined in 2013 for potential bat roosts. This survey was repeated between 13th and 18th July 2018 in order to update the

assessment carried out in 2013 and to confirm if bats were present in any of the old bridge structures along the route.

4.4.13 Collins Bridge in Section 1 has suitable crevices, however, it was not recorded as a bat roost.

Invasive Species

4.4.14 Non-native invasive species, both invertebrate and plants, are threatening many of Ireland's inland waterways, roadsides and riparian zones. A number of species that are considered invasive, both terrestrial and aquatic, were recorded within the Study Area for the complete scheme in 2013. These included Japanese Knotweed (Fallopia japonica), cotoneasters (Cotoneaster spp.), Snowberry (Symphoricarpos albus), Winter Heliotrope (Petasites fragrans), Cherry Laurel (Prunus laurocerasus), Buddleja (Buddleja davidii), Wilson's Honeysuckle (Lonicera nitida), Sycamore (Acer pseudoplatanus), Canadian Waterweed (Elodea canadensis) and Nuttall's Waterweed (Elodea nuttallii). Due to the widespread distribution of Sycamore throughout the Study Area, no specific locations were recorded for this species.

4.4.15 Of these invasive species only the following two are listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011. This places certain restrictions on the spread of plants, seeds or soil from these areas. If site clearance is required, then a licence is required to disturb the site and this material needs to be sent to licenced landfill for deep burial.

- Rhododendron ponticum (Rhododendron)
- Fallopia japonica (Japanese Knotweed)

4.4.16 Japanese Knotweed was recorded by BEC near Pakenham Bridge however, our 2018 ecological survey confirmed that it does not occur in this area presently.

4.4.17 Therefore, there is no presence of any non-native invasive species in Section 1 according to survey conducted.

(ii) The Built Environment

Architectural Heritage

4.4.18 There are a number of Protected Structures in Section 1 of the Study Area. The Record of Protected Structures is compiled and maintained by Fingal County Council. The Royal Canal itself is the main protected structure in Section 1 along with Collins Bridge and Pakenham Bridge. Within this section the Royal Canal is a manmade channel cut into the landscape in the 18th century as a navigation route and has earthen banks and a towpath running alongside. Collins Bridge is a single-arch limestone road bridge over canal, built 1904, with oval limestone name and date plaque above arch. The towpath splits at Collins Bridge and provides an option to proceed under the bridge, although the footpath width is limited to 2.0m minimum. Pakenham Bridge is a single-arch limestone humpback road bridge over Royal Canal, c.1820, with ashlar parapet walls. The towpath also splits at Pakenham Bridge to offer an alternative route under the bridge, although the footpath width is limited to 2.0m minimum. Physical alterations to the fabric of the canal and the bridge structures, along with impacts on their setting are to be avoided.



Figure 4.4: Collins Bridge (left) and Pakenham Bridge (right).

The distribution of protected structures in the present Study Area, is shown in **Sheet 1 of Appendix G**. Also, locations of a number of cottages etc were added (not protected) in terms of the receiving environment but none of them are considered of major significance.

Rail Network

4.4.19 The Dublin – Maynooth Rail Line follows the south/eastern side of the Royal Canal for Section 1. As mentioned previously, as part of the DART + West scheme, the railway line is due to be electrified to provide enhanced capacity to serve future connectivity to the west of Dublin As part of these proposals, it is proposed that a number of existing level crossings of the rail line will be closed, overhead electrification infrastructure will be provided, new pedestrian and cycle bridges will be provided over the rail at the existing crossings and there will also be more onerous requirements in terms of clearances required above and adjacent to the rail line. Measures will need to be undertaken to minimise any effects on the live rail system (e.g. settlement/slope slips).

The Hansfield Railway Bridge connects the Dublin – Maynooth Rail Line to Hansfield Station. The railway bridge was constructed in 2010 and it is a steel girder bridge which is clad in stone, see **Figure 4.5** below.



Figure 4.5: Hansfield Railway Bridge

4.4.20 Connected to the Hansfield Railway Bridge is a pedestrian/cyclist underpass that aligns with the existing towpath. However, the underpass has a fixed width of

3.5m, therefore it will act as a localised pinch point for the required 4m wide greenway.



Figure 4.6: Hansfield Railway underpass

Road Network

4.4.21 The future Kellystown Road scheme proposes to provide a link from the Diswellstown Road at Porterstown in the East to Barnhill in the West, allowing for enhanced road safety, improved cycle and pedestrian connectivity and the development of a new urban neighbourhood in the Kellystown LAP Lands. A Non-Statutory Public Consultation was undertaken in during the last quarter of 2020. As part of the scheme, a bridge with pedestrian and cycle facilities is proposed south of Pakenham Bridge, as shown in **Figure 4.7** below. The interaction between the proposed bridge Kellystown Road bridge/infrastructure and the proposed development will have to be considered.

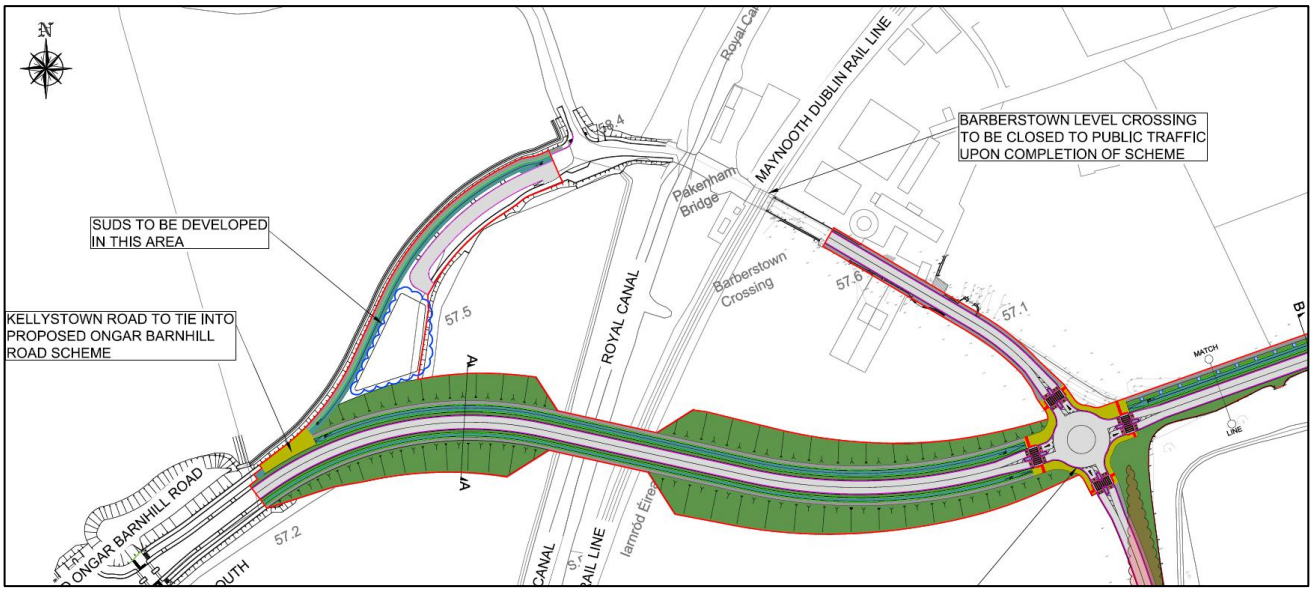


Figure 4.7: Kellystown Road Bridge (Source: Non-Statutory Public Consultation Drawing No. 18_015-CSE-GEN-ZZ-DR-C-1071)

Drainage

4.4.22 Between Kildare County Council boundary line (Royal Canal Amenity Group) and Collins Bridge there is a large ditch on northern side of the towpath, which could pose a risk to greenway users (1km length), see **Figure 4.8** below.



Figure 4.8: Ditch on the northern side of the towpath

SECTION 2

4.4.23 Section 2 extends from Hansfield Railway Bridge to Kennan Bridge (Porterstown Road). The character of the Study Area changes from rural to predominantly suburban in nature. This section is predominately residential on the northern side of the canal with farmlands on the southern side. There is significant development ongoing within Hansfield Strategic Development Zone (SDZ) with further plans for development on the southern side of the canal, east of Clonsilla Train Station, see land zoning map below for the FCC Development Plan (brown hatching).

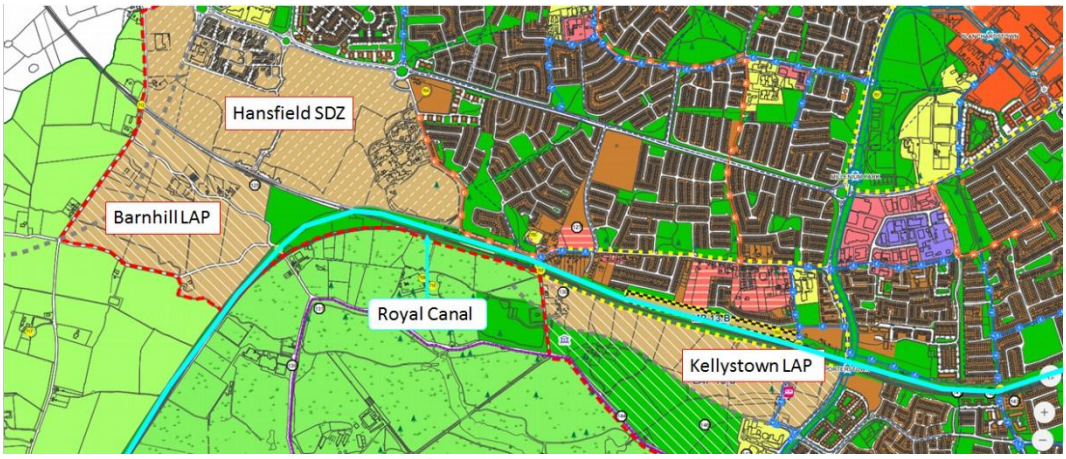


Figure 4.9: FCC Development Plan Land Zoning map, Blanchardstown South

4.4.24 Currently, there are three different surface finishes along the existing towpath which is on the northern side of the Royal Canal for Section 2. From Hansfield Railway Bridge to Hansfield Road service access there is no surfacing provided, from Hansfield Road service access to Callaghan Bridge there is asphalt surfacing provided and from Callaghan Bridge to Kennan Bridge quarry dust surfacing has been provided, photographs of the existing surfaces are illustrated below in **Figure 4.10**.



Figure 4.10: Existing surfacing along the northern towpath of Section 2

(i) Natural Environment

Topography & Landscaping

4.4.25 The overall topography for Section 2 is generally flat along the existing towpath to the north/eastern side of the canal.

4.4.26 The 'Deep Sinking' section of the Royal Canal is between Clonsilla Road and Castleknock Road. For Section 2, the 'Deep Sinking' section is from the eastern side of Callaghan Bridge from Clonsilla Road to Porterstown Road. It presents significant challenges to the provision of a continuous 4m greenway route. The

topography and layout of the existing towpath typically consists of a 2-3m wide track flanked by a deep cutting of 1.0 – 5.0m to the canal on one side and a varying height embankment supporting the Dublin – Maynooth Railway on the other side of the canal.



Figure 4.11: Deep cutting along the 'Deep Sinking'

4.4.27 On the northern side of the towpath, there is a large embankment, to widen the existing pedestrian route (to 4m), retaining structures or soil nailing into the embankment are likely to be required along the majority of this section.

4.4.28 On the south/eastern side of the Royal Canal, there are steep banks with inadequate width. If the greenway is proposed on this side of the canal a cantilevered boardwalk design would be required due to the inadequate width along this section. This section has steep banks and is in close proximity to the railway line.

Ecology

4.4.29 There are regions of ecological interest contained within Section 2 of the Study Area. The lands are predominately agricultural land on the southern side of the canal and residential on the northern side of the canal, shown in **Sheet 2 of Appendix G**.

4.4.30 Three types of habitat identified within the Study Area in a National Survey of Native Woodland Habitats in 2010 by the National Parks and Wildlife Service:

Oak-Ash-Hazel Woodland (WN2) – High Value; and

Marsh (GM1) – Moderate Value; and

Dry Meadows & Grassy verges (GS2) – Low Value;

4.4.31 The survey undertaken in 2018 indicates that some of the grasslands (GS2) along both sides of the canal for Section 2 are of high conservation value, especially those pockets containing the Annex 1 habitat 'Lowland hay meadows'. This habitat type is now rare in Ireland and especially in Fingal where the majority have been converted to improved agricultural grasslands. Where the proposed route is located in these sections of the canal towpath it should be set back at least 1m from the water's edge and no disturbance should be permitted to the grassland habitat on the canal bank during construction. Following construction of the Greenway, much of this marginal habitat could be converted to a species-rich grassland using the methods proposed above. For additional information on the Annex 1 habitat 'Lowland hay meadows' please refer to the Biodiversity Report in **Appendix H**.

Fauna

4.4.32 There are several species of fauna that are of national and international significance.

The following Fauna surveys were undertaken as part of the assessment:

- Molluscan Survey (Snail Survey) of the potential Vertigo habitats;
- Waterbird Survey; and
- Bat survey.

4.4.33 No Vertigo species (of snails) were found in the survey, and no habitats with potential to support the damp and gentle transition needed for them were found.

4.4.34 A total of two water bird species were recorded along section 2 of the canal over two surveys. Mallard and Moorhens were recorded in section 2. Mallards occur

frequently and generally nest in areas with reed fringe. Moorhens select dense emergent vegetation or tree branches in the water for nesting In the 'Royal Canal Urban Greenway, Biodiversity Assessment 2018' report, **Appendix H**, Table 3 outlines the number of registrations for each species and Figure 5 illustrates a map of the survey area and the distribution of waterbird registrations.

4.4.35 The waterbird species recorded breeding on this stretch of the canal are largely confined to the waterbody itself and are habituated to human disturbance. It is not expected that the development of a pedestrian path and cycleway parallel to the canal would have any significant impacts on them provided that the vegetation in the canal water is not disturbed.

4.4.36 A full bat survey of this section of the Royal Canal was undertaken in 2013 (Aughney 2013). This included a survey of bat activity along the waterway. The results are summarised in Table 4 in the 'Royal Canal Urban Greenway, Biodiversity Assessment 2018' report, **Appendix H**. Four species were found with Soprano Pippistrelle being most widespread. The entire canal forms a significant foraging and commuting corridor for bats and this is likely to continue in 2018.

4.4.37 The old stone bridges were examined in 2013 for potential bat roosts. This survey was repeated between 13th and 18th July 2018 in order to update the assessment carried out in 2013 and to confirm if bats were present in any of the old bridge structures along the route.

4.4.38 Callaghan bridge in Section 2 has suitable crevices, however, it was not recorded as a bat roost.

Invasive Species:

4.4.39 Non-native invasive species, both invertebrate and plants, are threatening many of Ireland's inland waterways, roadsides and riparian zones. A number of species that are considered invasive, both terrestrial and aquatic, were recorded within the Study Area for the complete scheme in 2013. These included Japanese Knotweed (Fallopia japonica), cotoneasters (Cotoneaster spp.), Snowberry (Symphoricarpos albus), Winter Heliotrope (Petasites fragrans), Cherry Laurel

(Prunus laurocerasus), Buddleja (Buddleja davidii), Wilson's Honeysuckle (Lonicera nitida), Sycamore (Acer pseudoplatanus), Canadian Waterweed (Elodea canadensis) and Nuttall's Waterweed (Elodea nuttallii). Due to the widespread distribution of Sycamore throughout the Study Area, no specific locations were recorded for this species.

4.4.40 Of these invasive species only the following two are listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011. This places certain restrictions on the spread of plants, seeds or soil from these areas. If site clearance is required, then a licence is required to disturb the site and this material needs to be sent to licenced landfill for deep burial.

- Rhododendron ponticum (Rhododendron)
- Fallopia japonica (Japanese Knotweed)

4.4.41 There is no presence of any non-native invasive species in Section 2 according to the ecological survey.

(ii) The Built Environment

Architectural Heritage

4.4.42 There are a number of Protected Structures in Section 2 of the Study Area. The Record of Protected Structures is compiled and maintained by Fingal County Council. The Royal Canal itself is the main protected structure in Section 2 along with Callaghan Bridge and Kennan Bridge. Within this Section the Royal Canal is a man-made channel cut into the landscape in the 18th century as a navigation route and has earthen banks and a towpath running alongside.

4.4.43 Callaghan Bridge is a single-arch limestone humpback road bridge over Royal Canal, c.1820. It has a towpath on the northern side of the bridge, 1.8m wide. There is also a steel pedestrian bridge on the western side of Callaghan bridge, linking directly from Clonsilla Road to the Clonsilla Station, see **Figure 4.12** below.

4.4.44 Kennan Bridge is a single-arch limestone bridge over canal, c.1800, with plaque over arch, it has no towpath. Physical alternations to the fabric of the canal and the bridge structures, along with impacts on their setting are to be avoided.



Figure 4.12: Callaghan Bridge (left) and Kennan Bridge (right).

The distribution of protected structures in the present Study Area, is shown in **Sheet 2 of Appendix G**. Also, see below information on the other protected structures within the Section 2 Study Area.

Porterstown School House

Detached gable-fronted three-bay two-storey over basement former school with attic accommodation, built 1854, with gabled central projecting bay flanked by entrance porches. Now vacant.

Clonsilla Signal Box

Detached single-bay two-storey signal box, c.1850, with timber superstructure on red brick ground floor plinth. Cast-iron pedestrian bridge, c.1850, spanning railway track.



Figure 4.13: Porterstown School House (left) and Clonsilla Signal Box Station (right).

Porterstown Crossing Keeper's House (former)

Detached three-bay single-storey former railway keeper's house, c.1850, with central gable-fronted projecting porch located at the railway crossing. Now derelict.



Figure 4.14: Porterstown Crossing Keeper's House.

The distribution of protected structures in the present Study Area, is shown in **Sheet 2 of Appendix G**.

Also, the are a small number of additional protected structures are within section 2, such as, (i) St. Mary's Church of Ireland Clonsilla and (ii) The Courtyard Beechpark House, Clonsilla and (iii) Beechpark House, Clonsilla (iv) Overbridge of Clonsilla Train Station. However, they are a significant distance from the Royal

Canal and the proposed route options. Therefore, the potential impact on these protected structures is highly unlikely.

Rail Network

4.4.45 The Dublin – Maynooth Rail Line follows the south/eastern side of the Royal Canal for Section 2. As mentioned previously, as part of the proposed DART + West scheme, the railway line is due to be electrified to provide enhanced capacity to serve future connectivity to the west of Dublin. As part of these proposals, it is proposed that a number of existing level crossings of the rail line will be closed, overhead electrification infrastructure will be provided, new pedestrian and cycle bridges will be provided over the rail at the existing crossings and there will also be more onerous requirements in terms of clearances required above and adjacent to the rail line. Measures will need to be undertaken to minimise any effects on the live rail system (e.g. settlement/slope slips).

Surface water main

4.4.46 The required greenway width of 4m is not achievable at the surface water main, located between Hansfield Railway Bridge and Callaghan bridge, at the north abutment (2.5m width).



Figure 4.15: Clonsilla surface water main (north abutment)

SECTION 3

4.4.47 Section 3 extends from Kennan Bridge (Porterstown Road) to Talbot Bridge (Old Navan Road). This section is predominately urban with extensive residential catchments on both sides of the Canal. There is employment and retail at Coolmine Industrial Estate such as Power City, Ford Motors etc and many educational sites such as Luttrellstown Community School, St. Mochta's National School and St Brigid's Girl School in Section 3.

4.4.48 The existing towpath for Section 3 from Kennan Bridge to Granard Bridge is on the southern side of the Royal Canal directly adjacent to the railway line/stations. For the majority of this section, there is no surface finish along the existing towpath, see **Figure 4.16** below.



Figure 4.16: Existing surfacing along the towpath for Section 3

(i) Natural Environment

Topography & Landscaping

4.4.49 The 'Deep Sinking' section is between Clonsilla Road and Castleknock Road. The 'Deep Sinking' section therefore continues through Section 3 from Porterstown Road to Castleknock Road. It presents significant challenges to the provision of a continuous 4m greenway route. The layout of the existing towpath typically consists of a 2-3m wide track flanked by a deep cutting of 1.0 – 9.0m to the canal on a varying height embankment adjacent to the Dublin – Maynooth Railway (see **Figure 4.16** above).

4.4.50 From Kennan Bridge to Kirkpatrick, the towpath on the southern side (adjacent to the railway line) is typical of the Deep Sinking where a narrow towpath width is provided with steep embankments. The width of the path through this section is typically 2.0 to 2.5m with the adjacent embankments falling within the railway's zone of influence.



Figure 4.17: Existing towpath on the southern side of the canal between Kennan Bridge and Kirkpatrick Bridge (adjacent to the railway line)

4.4.51 From Kirkpatrick bridge to Granard bridge, the typical towpath width is 2m, however along the section there are localised pinch points, such as the approach to Kirkpatrick Bridge and 400m west of Castleknock Station, there is a pinch point of 1.5 – 1.7m, between the towpaths edge and masonry retaining wall structure for the rail line.



Figure 4.18: Pinch point Kirkpatrick Bridge Chainage 6250 (left) and Pinch between the towpaths edge and the masonry retaining wall (Right).

4.4.52 The topography on the northern bank of the Royal Canal varies along the section, with steep banks, filling and re-grading of lands would be required to achieve acceptable longitudinal gradients (as per the National Cycle Manual (NCM), TII Rural Cycle Design (DN-GEO-03047) and Universal Access), see **Figure 4.19** below.



Figure 4.18: Northern bank in Section 3

4.4.53 As mentioned above, along the existing towpath on the southern side of the Royal Canal, there are steep banks with inadequate width (as per the National Cycle Manual (NCM), TII Rural Cycle Design (DN-GEO-03047) and Universal Access).

Ground conditions (between Kirkpatrick Bridge and Granard Bridge)

Field Survey

4.4.54 The ground conditions beneath the existing towpath appears to vary across the site. Between the approximate chainages Ch.6250 and Ch.6850, the towpath appeared to be founded on a shallow depth of glacial till overlying competent rock. Rock outcrops were observed along the northern bank (**Figure 4.20**) between these chainages. The southern bank was also observed to have an exposed rock face typically at the base of the canal slope beneath the towpath (**Figure 4.21** and **Figure 4.22**). The exposed rock face was observed to be higher along the southern bank than the adjacent northern bank, suggesting that the rock dips in a northerly direction.



Figure 4.20: Northern bank adjacent to Kirkpatrick bridge



Figure 4.21: Southern bank adjacent to Kirkpatrick bridge (Ch.6275)



Figure 4.22: Exposed rock face along the southern bank (approximately Ch.6450)

4.4.55 A stone masonry wall was exposed intermittently between vegetation along Ch.6300 to Ch.6400 as shown in **Figure 4.23**. At the time of writing, it was unknown when this wall was constructed, how far rock is located to the rear of this wall, or whether similar walls exist further down chainage. This wall appears to support overburden material beneath the existing towpath.



Figure 4.23: Stone masonry wall facing along the southern bank between Ch.6300 and Ch.6400

4.4.56 Above the rock and stone wall, a shallow depth of heavily vegetated glacial till was noted along both the northern and southern banks of the canal. The inclination of the glacial till slopes appeared to be in excess of 45°. Mature trees were observed along both banks of the canal as shown in **Figure 4.24**.



Figure 4.24: Presence of heavily vegetated overburden along the southern embankment

4.4.57 An apparent overburden slip failure was observed along the northern bank at an approximate chainage of Ch.6515 as shown in **Figure 4.25**. Vegetation was observed to be growing over the face of the slip plane and no material was noted to be accumulated at the base of the slip. These indicators suggest the slip did not occur recently. There was no evidence of large slip failures along the southern embankment from the towpath.



Figure 4.25: Apparent slip failure in the northern embankment

Ground Investigation

4.4.58 Ground Investigations were undertaken by GII along the entire length of the scheme from the Kildare/Fingal County Council boundary line (Royal Canal Amenity Group) to Talbot Bridge (Old Navan Road). Along the 'Deep Sinking' section between Clonsilla Station and Granard Bridge ground investigations were undertaken on both the northern and southern embankment. The purpose of the site investigation was to investigate subsurface conditions (particularly in the 'Deep Sinking' section) and to further understand the structural infrastructure/construction method required for particular route options. The following is a summary of the ground investigation findings:

Soil and rock descriptions

4.4.59 Soils at the site location can generally be described as Topsoil/Surfacing overlying Made Ground overlying Cohesive Glacial Till. Granular deposits were encountered underlying the Cohesive Glacial Till. Bedrock was encountered during rotary coring between Coolmine and Castleknock Station on the northern and southern

banks of the canal. The bedrock was recovered from the angled rotary cored boreholes typically as weak to strong LIMESTONE.

Topsoil/Surfacing

4.4.60 The ground conditions at the existing ground level along the subject section of greenway consisted of either Topsoil or Gavel Surfacing. Topsoil was generally described as dark brown/brown slightly sandy gravelly CLAY with the depth varying from 0.1m to 0.2m BGL. Gravel surfacing was described as angular to subangular fine to course sandy Gravel with depths between 0.1m and 0.19m BGL placed on top of a geotextile separator layer.

Made Ground

4.4.61 Made Ground deposits were encountered beneath the Topsoil/Surfacing in the majority of the slit trenches. Made Ground was typically present between 0.2m BGL and 0.6m BGL with a maximum depth of 1.4 m BGL. These deposits were described as dark brown/brown slightly sandy gravelly CLAY or occasionally as a grey sandy angular fine to coarse GRAVEL. Occasional cobble and boulder content was noted on the exploratory hole logs. In several slit trenches, the made ground contained waste materials including fragments of concrete, red brick, glass, ceramic, wood and plastic.

4.4.62 According to geophysical investigation prepared by Apex Geophysics in 2020, the Made Ground has low to medium strength. These deposits might require reinforcement to install a working platform where required.

Cohesive Glacial Till

4.4.63 Cohesive Glacial Tills were encountered beneath Made Ground and were generally described as brown/greyish slightly sandy gravelly CLAY. The gravel was described as angular to subrounded fine to coarse. Deposits occasionally contain angular to subrounded cobbles and boulders. The Cohesive Glacial Tills were present at depths ranging between 1.5m and 17.2 m BGL. Based on Standard Penetration Test (SPT) N values which vary from 8 to 29 and a maximum 50, the Cohesive Glacial Tills are anticipated to have medium strength

increasing to high strength with depth. The strength of the deposit should be sufficient for a working platform installation.

Granular deposits

4.4.64 Granular deposits were encountered within rotary borehole RC24 only underlying the Cohesive Glacial Tills and were described as grey brown clayey gravelly fine to coarse SAND or sandy fine to coarse GRAVEL. There was limited recovery of these materials from the rotary cored holes between depths of 8.2m and 23.2m BGL. Based on the SPT N values from RC24 which various from 25 to 50 the deposits are typically dense to very dense.

Rock

4.4.65 Rock was generally recovered in the angled rotary cored boreholes as weak to strong grey/dark grey fine to medium grained LIMESTONE with calcite veins. According to a geophysical survey, along the Coolmine and Castleknock Stations the depth to rock is generally shallow but varies at depths of between 0.5 and 3.5m BGL with an average of 1.0m BGL.

Ecology

4.4.66 There are regions of ecological interest contained within Section 3.

4.4.67 The main woodland habitats in the Study Area are in the Deep Sinking area (Section 3), mainly located on the north side of the canal where they vary from a narrow line of trees to a band up to 50m in width. The main categories of woodland found are Oak-Ash-Hazel Woodland (WN2), Mixed Broadleaved/Conifer Woodland (WD2) with small areas of Scrub (WS1) and Scattered Trees and Parkland (WD5). These have been mapped accurately by the BEC survey (Brophy & Devaney 2013). While the Oak-Ash-Hazel Woodland is classified as semi-natural with native trees dominant, it does contain some non-natives such as Sycamore, Sweet Chestnut, Beech and a few conifer species.

4.4.68 The woodland on the northern bank of the Royal Canal in the Deep Sinking area is mainly classified as semi-natural although it contains a mixture of native and

non-native tree species. The woodland is extensive in some areas and has a typical associated ground flora. It also provides a valuable corridor of semi-natural vegetation through essentially urban areas for the movement of animal species including mammals, birds and insects. The areas of Oak-Ash-Hazel Woodland (WN2) are of high conservation value and should be avoided by the proposed development, where possible, see **Sheet 3 Appendix G**.

4.4.69 At the top of the woodland on the northern side of the canal, residential back gardens have been extended over time and there has been removal of trees, see **Figure 4.26**.



Figure 4.26: Extension of residential back gardens into woodland

Fauna

4.4.70 There are several species of fauna that are of national and international significance.

The following Fauna surveys were undertaken as part of the assessment:

- Molluscan Survey (Snail Survey) of the potential Vertigo habitats;
- Waterbird Survey;
- Badger Survey; and
- Bat survey.

4.4.71 No Vertigo species (of snails) were found in the survey, and no habitats with potential to support the damp and gentle transition needed for them were found.

4.4.72 A total of three water bird species were recorded along Section 3 of the canal over two surveys. Mallards, Moorhens and a Grey Wagtail were recorded in section 3. Mallards occur frequently and generally nest in areas with reed fringe. Moorhens select dense emergent vegetation or tree branches in the water for nesting. Grey Wagtails tend to nest in crevices in stonework or among tree roots or ivy invariably close to the water (Ferguson-Lees et al. 2011). The Grey Wagtail found in this survey was present at the 12th Lock on 22nd May 2018 and was likely to be nesting in the stonework around the canal close to this location Mute Swans and Grey Heron were present on the western section of the route during the preliminary survey in March 2018 but there was no evidence of either species breeding here in May. Grey Wagtail is of high conservation concern in Ireland because its population is estimated to have declined by at least 50% over the period 1998-2011 (Colhoun & Cummins 2013). In the Biodiversity Assessment report, **Appendix H**, Table 3 outlines the number of registrations for each species and Figure 5 illustrates a map of the survey area and the distribution of waterbird registrations.

4.4.73 A badger survey of the woodland on the north side of the Royal Canal east of Kirkpatrick Bridge was undertaken in August 2019. This section is very steep, heavily overgrown and inaccessible in a few places. At the western end there is

considerable disturbance from children using the woodland and evidence of household dumping and waste at the top of the embankment.



Figure 4.27: Household dumping and waste at the top of the embankment behind Delwood Park.

4.4.74 A disused badger sett located about half-way down the slope between the flat area behind the gardens and the canal bank (between Ch.6550 - 6570). This is very close to the location outlined in *'The Mammal Fauna of the Royal Canal, Waterways Ireland & Fingal County Council Parks Division, Dec 2004'*. The single hole was heavily covered in ivy and could easily be missed in a survey. There were no badger tracks leading to or from it and it appeared to have been disused for some years. None of the other typical signs of active use such as droppings, feeding signs or hair were noted.

4.4.75 Badger setts are usually classified into four types. This sett would fit the category of an outlier sett. These usually have only one or two holes, often with little spoil outside the hole and have no obvious path connecting to another sett. They are used only sporadically and, when not in use by badgers, they may be taken over by foxes or rabbits. This sett had not been used by any mammal species for a considerable time.

4.4.76 Badger setts in urban areas are common and they can occur in private gardens, parks and cemeteries and occasionally under buildings (Roper, T.J. 2010. Badger. London. Harper-Collins; Sleeman D.P. et al. 2006. Bull. Ir. Biogeog. Soc. 30:3-6). A national survey in Ireland recorded 66 badger setts in man-made features and 9 in roadside verges (Smal, C. 1995. The Badger and Habitat Survey of Ireland. Dublin. Stationery Office). Hence active badger setts can be located in very close proximity to people and they are not necessarily disturbed if vegetation is not removed in the immediate area of the sett.

4.4.77 In summary, the sett reported in the 2004 survey is now inactive and does not hold any badgers. There was no sign of current badger activity in this area.

4.4.78 A full bat survey of this section of the Royal Canal was undertaken in 2013 (Aughney 2013). This included a survey of bat activity along the waterway. The results are summarised in Table 4 in the Biodiversity Report, **Appendix H**. Four species were found with Soprano Pippistrelle being most widespread. The entire canal forms a significant foraging and commuting corridor for bats and this is likely to continue in 2020.

4.4.79 The old stone bridges were examined in 2013 for potential bat roosts. This survey was repeated between 13th and 18th July 2018 in order to update the assessment carried out in 2013 and to confirm if bats were present in any of the old bridge structures along the route.

4.4.80 The Kirkpatrick bridge in Section 3 has suitable crevices and it was recorded as a bat roost.

Invasive Species:

4.4.81 Non-native invasive species, both invertebrate and plants, are threatening many of Ireland's inland waterways, roadsides and riparian zones. A number of species that are considered invasive, both terrestrial and aquatic, were recorded within the Study Area for the complete scheme in 2013. These included Japanese Knotweed (Fallopia japonica), cotoneasters (Cotoneaster spp.), Snowberry (Symphoricarpos albus), Winter Heliotrope (Petasites fragrans), Cherry Laurel

(Prunus laurocerasus), Buddleja (Buddleja davidii), Wilson's Honeysuckle (Lonicera nitida), Sycamore (Acer pseudoplatanus), Canadian Waterweed (Elodea canadensis) and Nuttall's Waterweed (Elodea nuttallii). Due to the widespread distribution of Sycamore throughout the study area, no specific locations were recorded for this species.

4.4.82 Of these invasive species only the following two are listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011. This places certain restrictions on the spread of plants, seeds or soil from these areas. If site clearance is required, then a licence is required to disturb the site and this material needs to be sent to licenced landfill for deep burial.

- Rhododendron ponticum (Rhododendron)
- Fallopia japonica (Japanese Knotweed)

4.4.83 There is no presence of any non-native invasive species in section 3 according to our independent survey by Natura Environmental Consultants .

(ii) Built Environment

Architectural Heritage

4.4.1 There are a number of Protected Structures in Section 3 of the Study Area. The Record of Protected Structures is compiled and maintained by Fingal County Council. The Royal Canal itself is the main protected structure in Section 3. Within this section the Royal Canal is a manmade channel cut into the landscape in the 18th century as a navigation route and has earthen banks and a towpath running alongside.

4.4.2 There are three protected bridges in Section 3, they are Kirkpatrick Bridge, Granard Bridge and Talbot Bridge. Kirkpatrick Bridge is a single-arch stone bridge, built 1795, with ashlar parapet walls, cut stone keystones and voussoirs, having stone date and name plaques.

4.4.3 Kirkpatrick Bridge has suitable crevice's which have been recorded as a bat roost, impact on this bridge should be minimised and crevices retained. Where crevices cannot be retained, then bat tubes should be erected in vicinity of the bridge. There is also a steel pedestrian bridge on the eastern side of Kirkpatrick bridge, linking to Cloomine Station, see **Figure 4.28** below.

4.4.4 Granard Bridge is a single-arch ashlar granite humpback road bridge over the canal, c.1810, it has a towpath under the bridge which is 2m width.



Figure 4.28: Kirkpatrick Bridge (left) and Granard Bridge (Right).

4.4.5 Talbot Bridge is a single-arch ashlar granite and limestone humpback road bridge over canal, built 1819.

4.4.6 The distribution of protected structures in the present Study Area, is shown on **Sheet 3, Appendix G**. Also, see below information on two of the none bridge protected structures in Section 3 study Area.

Rail Network

4.4.7 The Dublin – Maynooth Rail Line follows the southern side of the Royal Canal for section 3. As mentioned previously, as part of the DART + West scheme, the railway line is due to be electrified to provide enhanced capacity to serve future connectivity to the west of Dublin. As part of these proposals, it is expected that a number of existing level crossings of the rail line will be closed, new pedestrian and cycle bridges over the rail at the existing crossings and there will also be more onerous requirements in terms of clearances required above and adjacent to the rail line. Measures will need to be undertaken to minimise any effects on the live rail system (e.g. settlement/slope slips).

4.4.8 The railway and canal towpath tend to merge between Dr. Troy Bridge and Kirkpatrick Bridge, to create a local 1.9m wide pinch point on the towpath for a length of approximately 50m. A retaining wall is provided between the towpath and the railway signal, see **Figure 4.29** below.



Figure 4.29: Pinch point between towpath and the railway signal

4.4.9 Approaching Kirkpatrick Bridge (from the east) there is approximately 1.2m width between the retaining wall (Irish Rail) and the pedestrian bridge pier. To provide a 4m greenway on approach to Kirkpatrick bridge (pinch point between the pedestrian bridge and the retaining wall) would require land acquisition from Irish Rail at the pedestrian entrance to the eastbound platform of Coolmine Station. However, Irish Rail have stated that this access would likely be retained and enhanced as part of the DART + West works. As such the suggested land acquisition would not be feasible. Widening to the north, would impact on the existing pedestrian bridge piers which would likely result in the retrofitting or removal of the existing pedestrian bridge.



Figure 4.30: Pinch point between the pedestrian bridge and Coolmine Station pedestrian access (facing eastwards)

4.4.10 Along the southern towpath from Coolmine Station to Castleknock Station the railway track level is between 0.5m and 3.75m higher than the towpath, with the greatest level difference observed along near Coolmine Station. The increase in level between the towpath and the railway track is due to an apparent man-made embankment. Evidence of a historic stone masonry wall in the lower half of the embankment was observed at various locations along the initial 200m extending from the Kirkpatrick bridge as shown in **Figure 4.31** and **Figure 4.32**. This wall was inclined at approximately 60° to the horizontal. The stone wall was in a poor condition, as the blocks appeared to be loosened with soil between the blocks in place of mortar. The wall was also heavily overgrown by vegetation, and the roots from this vegetation were observed to intrude the gaps between stone blocks. From site observations, it is likely that this wall is acting less like a retaining wall and is more likely contributing dead weight at the base of the slope to maintain the stability of the slope alongside the mature vegetation.



Figure 4.31: Apparent masonry retaining wall supporting Coolmine Train Station Platform 1



Figure 4.32: Apparent masonry retaining wall supporting Dublin-Sligo railway line

4.4.11 Between Chainage 7000-7200, another stone masonry wall (**Figure 4.33**) was noted to retain the railway track embankment, however, this wall had a near vertical orientation. The stone retaining wall was noted to be in better condition than the wall adjacent to the Coolmine Train Station. The mortar between rock blocks was present and the facing was relatively even. However, the wall was observed to be overturning in the direction of the towpath and previous efforts including retrofitted concrete buttresses to rectify this instability were evident in the area.



Figure 4.33: Retrofitted buttresses to support stone masonry retaining wall support railway line

4.4.12 This retaining wall also creates a pinch point of 1.5 – 1.7m, between the towpaths edge and masonry retaining wall structure for Iarnród Éireann (**Figure 4.34**). Along a particularly narrow stretch of this section of towpath, a steel rail covered in vegetation was noted with the apex of the rail approximately 0.1m above the path. The original purpose of this rail is unknown. It is assumed that this rail was installed to either act as an edge warning system, or to retain the edge of the path as the ground appeared to be eroding beneath the rail.



Figure 4.34: Pinch between the towpaths edge and the masonry retaining wall (left) and Metal rail along a narrow stretch of towpath (Right).

Road Network

4.4.13 Diswellstown Road crosses the canal via Dr. Troy Bridge. Dr. Troy Bridge is a multi-span precast concrete road bridge. The towpath along the southern embankment widens at the bridge piers. Available width between the bridge pier and the edge of the existing towpath is approx. 3m.



Figure 4.35: Dr. Troy Bridge (left) and Dr. Troy bridge piers adjacent to the southern towpath (Right).

5.0 Do Nothing and Do Minimum Alternatives

5.1.1 This chapter of the Route Options Assessment Report assesses the feasibility of the 'Do-Nothing' and 'Do-Minimum' alternatives.

5.2 Do Minimum Consideration

5.2.1 With reference to TII PAG Unit 4.0 Consideration of Alternatives and Options, it is necessary to consider a Do Minimum Option in order to provide a baseline for establishing the economic, integration, safety, environmental and accessibility impacts of all options.

5.2.2 The Do Minimum is essentially maintaining the existing infrastructure and constructing any projects that are committed.

5.2.3 If there are no committed projects, then Do Minimum is essentially Do Nothing.

5.3 Royal Canal Urban Greenway 'Do Nothing Scenario'

5.3.1 The 'do nothing' scenario for the proposed development is that pedestrians and cyclists will continue to walk and cycle along the existing narrow and unsurfaced towpath. The towpath along the 'Deep Sinking' section is very dangerous. As mentioned in Chapter 4, this section typically consists of a 2-3m wide track, with local pinch points of approx. 1.3m, flanked by a deep cutting of 1.0-9.0m to the canal.



Figure 5.1: Existing towpath on the southern side of the canal between Kennan Bridge and Kirkpatrick Bridge (adjacent to the railway line)

5.3.2 Also, mature tree roots cross the towpath, creating trip hazards.



Figure 5.2: Mature tree roots crossing the towpath

5.3.3 Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Kirkpatrick Bridge (approx. 900m) and between Kirkpatrick Bridge and Granard Bridge (approx. 1.5km) due to the railway line on the southern side of the towpath, thereby preventing permeability and linkages from residential catchments, resulting in less passive surveillance and security for users.

5.3.4 The existing towpath results in an environment that is not safe, not comfortable and not attractive for pedestrians and cyclists. The latent commuter and recreational user demand will continue to be supressed by the existing poor walking and cycling environment along the towpath (particularly within the 'Deep Sinking' section.

5.3.5 In the context of human health, the benefits of walking and cycling are well documented and include improved cardiovascular fitness, chronic disease prevention, improved mental health wellbeing, strengthened immune system and a reduced risk of cancer, obesity and coronary heart disease. These benefits to Fingal County and its people will not be realised in the 'do nothing' scenario.

5.3.6 If the proposed greenway is not constructed, the additional economic benefit which could be derived from the project will not be realised. This benefit can be estimated in basic terms by reference to the Department of Public Expenditure

and Reforms 'Public Capital Programme 2016 to 2021: Labour Intensity of Public Investment' report which estimates that approximately 12 construction jobs will be created for every €1 million of capital investment and that the tourism sector supports 29 jobs for every €1 million of capital investment.

5.3.7 In the 'do nothing' scenario, the long-standing objectives of the Fingal Development Plan to deliver the proposed development will not be realised.

5.3.8 Based on the reasons outline above, the 'do nothing' scenario will essentially result in a lost opportunity.

6.0 STAKEHOLDER CONSULTATION

6.1 Introduction

6.1.1 As part of the general consultation associated with the scheme, extensive consultation has been undertaken with the various departments in Fingal County Council (FCC), with the National Transport Authority (NTA) and Waterways Ireland (WI), in order to discuss the feasibility of particular route options. Consultation with the general public, residential groups, elected representatives, other state bodies, such as An Garda Siochana, National Parks & Wildlife Service (NPWS), Inland Fisheries & Iarnród Éireann, as well as other interested parties have also been undertaken. There was a Non-Statutory Public Consultation on the emerging preferred route in February 2019. As part of the consultation there was meetings with elected members and residential groups.

6.2 Non-Statutory Public Consultation

6.2.1 The Emerging Preferred Route was presented during the Non-Statutory Public Consultation from 25th February to 27th March 2019. Any interested parties were invited to:

i. Visit the public display at Fingal County Council Office in Blanchardstown;

ii. Visit FCCs Public Consultation website;

iii. Meet the project team at the FCC Office in Blanchardstown on the 5th of March; and

iv. Make a submission online or by post.

6.2.2 A total of 602 submissions were received either in favour, against or with recommendations relating to the design. These submissions came from areas around the proposed scheme as well as areas which are not in direct proximity, but which residents feel they would be affected by such a scheme being implemented. The submissions consisted of several recurring concerns which were noted.

6.2.3 The majority of the submissions received (from the general public) as part of the public consultation process were based on a 1km section of route between Kirkpatrick Bridge (Coolmine Road) and 400m west of Castleknock Station. The vast majority of these residents brought up concerns relating to crime, traffic and biodiversity impacts. Many of the submissions related to the potential side effects with providing access from existing cul-de sacs to the greenway, would have on the area. The main side effects listed were increased traffic, anti-social behaviour and crime, three of the most common issues mentioned throughout the submissions. One of the most common concerns among the submissions, was that the Emerging Preferred Route could potentially destroy the wildlife belt along the northern side of the canal.

6.2.4 Many submissions were in favour of the Emerging Preferred Route, however, a greater number were in favour of the greenway to be specifically on the southern side of the Canal, located between Kirkpatrick Bridge and Granard Bridge at Castleknock Station.

6.2.5 The concerns raised have been thoroughly reviewed with reference to their alignment with local and national policy and the scheme project objectives and this has formed a core consideration in the progression of the Option Development and Assessment process leading to the identification of the Preferred Route. Preliminary designs were prepared for both options on the north and south of the canal between Kirkpatrick and Granard Bridges as a result of the concerns raised in the 2019 consultation process. This included consideration of the anticipated constructability of the designs which was then incorporated into a refined options assessment process which is presented later in this report.

6.2.6 These preliminary designs were also informed by site investigations undertaken by Ground Investigations Ireland 'Ground Investigation Report (Rev B)' as well as consultation with stakeholders such as Waterways Ireland, Iarnród Eireann, the NTA, An Garda Siochana & FCC officials. Design options developed for the southern embankment were also subjected to independent expert peer review by Gavin & Doherty Geosolutions Ltd (GDG).

6.3 Key Stakeholder Consultation

6.3.1 Ongoing consultation has been undertaken with a number of stakeholder groups in order to discuss strategic and specific elements of the scheme. This consultation has assisted in guiding particular technical and strategic elements of the scheme. On-going consultation and engagement has been undertaken with the National Transport Authority and the various departments of Fingal County Council throughout the route options assessment and design process. The following summarises some of the main recommendations from the key stakeholders to-date:

Fingal County Council (FCC)

6.3.2 On-going engagement with the various departments in FCC has been undertaken, which included consultation with the Area Planner, Biodiversity Officer, Conservation Officer, Heritage Officer and others. The following are some of the recommendations/comments provided by FCC:

i. The fabric of the canal itself is a protected structure, significant structural infrastructure proposed along the canal may directly impact upon the canal's protected status and its existing landscape.

ii. The rural character of the greenway section from the Kildare boundary to Hansfield should be preserved as much as possible.

iii. The single-arch limestone humpback road bridges along the scheme are all protected structures. Minimal impact upon these bridges is desirable.

iv. Loss of trees and habitats should be minimised.

Waterways Ireland (WI)

6.3.3 Consultation with Waterways Ireland, being the principal landowner within the study area, has been on-going throughout the progression of the scheme. The following are some of the recommendations/comments provided by WI:

i. The rural character of the greenway section from the Kildare boundary to Hansfield should be preserved as much as possible. Unbound paving materials should be used in the westernmost section of the scheme

(Section 1) while the width of the facility should not extend beyond the footprint of the existing embankments.

ii. All users of the canal are to be taken into consideration including anglers, particularly in the western Section 1 where there are numbered angler posts.

iii. The continual operation of barges along the canal must be maintained. Cantilevered boardwalks may impact on the use of the canal by barges, depending on the canal width at locations.

iv. The towpath must be maintained to enable the towing of barges and for maintenance purposes.

v. 3.5 - 4m height clearance required above the canal at bridge locations to allow barges to pass under.

vi. 3m height clearance required along the towpath under bridge sections for maintenance machinery.

National Transport Authority (NTA)

6.3.4 On-going engagement with the National Transport Authority has been undertaken throughout the scheme feasibility/design stages. The following are some of the recommendations/comments provided by NTA:

i. 4m wide greenway is the NTA's target as the scheme is predicted to have high levels of usage. A slightly lesser width section may be acceptable between the county boundary and Hansfield due to lower number of users.

ii. A bound bituminous surface is the NTA's preference for the greenway due to the predicted high level of usage.

iii. NTA emphasised the need to provide enhanced permeability/connectivity to the greenway route, in accordance with *DMURS* and the *Permeability Best Practice Guide*.

Department of Culture, Heritage and the Gaeltacht

6.3.5 Written consultations have been undertaken with the Department of Culture, Heritage and the Gaeltacht. A scoping response dated 20th June 2018 was received from the Department. This outlined the value of the Royal Canal pNHA corridor for biodiversity. It also recommended a series of items that should be included in an ecological survey and impact assessment. Some further issues including alien invasive species, hedgerows and protected species, rivers and wetlands and water quality were highlighted. These issues have been addressed in the 'Royal Canal Urban Greenway, Biodiversity Assessment Report (2018)'.

Inland Fisheries (IF)

6.3.6 Written consultations have been undertaken with the Inland Fisheries. Inland Fisheries outlined that the entire canal is a significant year-round angling amenity. According to IF, the observations below are without prejudice to the requirements of Waterways Ireland who are the body responsible for the management, maintenance and development of the canal.

i. Where possible existing pathways should be used, widened and upgraded if required. Where new pathways are to be constructed detail should be provided on the width and depth, fill materials to be used, management, storage and disposal of excavated material.

ii. Drainage arrangement cognisant of the Greater Dublin Strategic Drainage Strategy (GDSDS) recommendations and Sustainable Drainage Systems (SuDS) technologies should be incorporated within the design.

iii. A plan for the identification, management, treatment and disposal of alien species is required. Any new planting must be with native species (in accordance with the All Ireland Pollinator Plan). The protection of habitats and their biodiversity from increasing invasion by alien species is key.

iv. Maintenance and development of suitable riparian habitat throughout should be planned.

v. All construction works should be in line with a Construction Environmental Management Plan (CEMP). The CEMP should identify potential impacts and mitigating measures, it should provide a mechanism for ensuring compliance with environmental legislation and statutory consents. The CEMP should detail and ensure best construction practices including measures to prevent and control the introduction of pollutants and deleterious matter and measures to minimise the generation of sediment and silt.

vi. Detailed design is required on all infrastructure particularly the new Canal Bridge.

vii. IFI have fish data for the project section undertaken in 2013, this is available from Waterways Ireland.

An Garda Siochana (AGS) – Crime Prevention Office and Blanchardstown Station

6.3.7 A number of meetings and joint site visit was undertaken with AGS representatives from the Crime Prevention Office and Blanchardstown Station. The following are some of the recommendations/comments provided by AGS:

i. AGS acknowledged the benefits of enhanced permeability and passive surveillance and this should be a key feature of the scheme.

ii. AGS outlined that the greenway width of 4m would facilitate comfortable passing by users and add to feeling of personal security.

iii. AGS mentioned that a maximum height of at least 1.9m for the boundary treatment at private properties to the greenway would be desirable. Anything in excess of 2.5m would compromise greenway user safety. AGS welcomed the use of defensive planting between the greenway and proposed boundary treatments but suggested that welded mesh anti-climb fencing should be used instead of timber fencing. Timber fencing could be used to the rear of the welded fencing to limit visual intrusion.

iv. AGS advised that security fencing should be provided under any bridge proposals where people could congregate before it spans the canal.

v. AGS suggested consideration of increased barrier heights at the proposed bridge crossing of the canal.

vi. AGS offered to review the preferred route drawings, lighting proposals, boundary treatments etc and provide feedback.

Iarnród Éireann and DART+West

6.3.8 A number of meetings have been undertaken with Iarnród Éireann to discuss, in particular, the route option along the southern towpath from Coolmine Station to Castleknock Station and the interaction between the DART+West proposals and the proposed development.

6.3.9 In terms of the greenway option along the southern towpath adjacent to the railway line, Iarnród Éireann outlined the following:

i. Impact on slope stability between the railway embankment and the greenway will need to be preserved. Monitoring for settlement would be required in accordance with IÉ specification CCE-TRK-SPN-010.

ii. Security of the rail line will need to preserved either by retaining existing fencing or replacement fencing.

iii. If existing vegetation is to be cut back at all it should be to the boundary/fence only.

iv. Greenway works should not be impinging on IE existing boundary and IE existing embankment above tow path level. New fence should be installed at the existing boundary/bottom of the existing slope and work outside that fence

v. Minimum 2.04m lateral clearance from the railway line to the proposed greenway infrastructure required.

vi. Any infrastructure such as anchors below the retained ground level (railway embankment) could possibly be severed during the installation of future overhead infrastructure required for the Dart + West scheme. Permanent anchors under the railway are a poor idea. IE cannot guarantee that these anchors are not going to be severed at some stage in the future including by piling for overhead stanchions.

vii. In locations of tight clearances at present it is unlikely that undertaking these works during the normal running of trains will be allowed and they will therefore have to happen during possessions at night.

viii. Impact of possible train derailment to be considered and risk assessed.

Dublin Cycling Campaign

6.3.10 A meeting with the Dublin Cycling Campaign was undertaken in March 2021. The Dublin Cycling Campaign agreed with the benefits of enhanced permeability to the greenway route. Dublin Cycling Campaign outlined the following:

i. Concerns at road crossing due to:
   a. Poor visibility issues due to existing hump backed bridges and road alignments.
   b. Heavy traffic levels, particularly at Castleknock Road.
ii. Requested details of the proposed access gates on the greenway route.
iii. They are happy to see potential access points from nearby roads and housing estates on the north bank of the Royal Canal.
iv. Loss of trees and habitats should be minimised.

Royal Canal Amenity Group (RCAG)

6.3.11 A meeting with the Royal Canal Amenity Group was undertaken in April 2021. RCAG considered it a very positive meeting and are in full agreement with the proposed plans as outlined at the meeting. The proposed direction for upgrading and developing the Greenway in the Fingal area is very much in line with the

group's aspirations. Consultation with RCAG will be ongoing and FCC propose to coordinate with RCAG to develop a Signage Strategy.

Elected representatives & Local Residents' Groups

6.3.12 Consultation has also been undertaken with the elected representatives and local residential groups throughout the design process providing an update on the scheme progress and incorporating the feedback into the Option Development and Assessment process and scheme design. Meetings and correspondence have been undertaken with residents' groups, in particular with the Delwood and Brompton residents' groups.

6.3.13 All commentary received throughout the ongoing stakeholder engagement was considered by the project team in assessing the route options for the scheme as well as the scheme design.

7.0 ROUTE OPTION ASSESSMENT METHODOLOGY

7.1 Assessment Process

7.1.3 This Chapter of the report presents the structure & methodology used for the assessment of route options within the Study Area. In order to determine the preferable route option for each section, it is necessary to undertake an options appraisal. This appraisal is based on a number of criteria as set out in the Department of Transport, Tourism and Sport (DTTAS). A detailed Multi Criteria Analysis Assessment (MCA) was adopted.

7.2 Route Option Assessment Methodology

7.2.1 This route option assessment comprised a detailed qualitative and quantitative assessment, using criteria established to compare route options.

7.2.2 The 'Guidelines on a Common Appraisal Framework for Transport Projects and Programmes' published by the Department of Transport, Tourism, and Sport (DTTAS), March 2016 (updated October 2020), requires schemes to undergo a 'Multi-Criteria Analysis' (MCA) under the following criteria: -

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

7.2.3 An appreciation of constraints and opportunities within the Study Area as well as the defined project objectives, led to the establishment of project-specific route options assessment criteria. These were tailored to have commonality to the Common Appraisal Framework guidelines where practical.

7.2.4 The physical activity criterion, added recently to the Common Appraisal Framework, relates to the health benefits derived from using different transport

modes. The subject scheme options under consideration relate to the same modes of travel (walking & cycling). As such, this criterion will not produce any relative differences between the options. Therefore, this criterion will not be applied in the multi – criteria assessment for the subject scheme.

7.2.5 The physical benefits associated with the scheme will be quantified as part of a future Cost – Benefit Analysis at the end of Phase 3 (Preliminary Design).

7.2.6 The Accessibility and Social Inclusion criterion, embraces the notion that some priority should be given to benefits that accrue to those suffering from social deprivation, geographic isolation and mobility and sensory deprivation. A review of the Pobal Deprivation Index Map indicated that the majority of areas within the Study Area along the Royal Canal had similar affluence. As such, this criterion will not produce any relative differences between the options. Therefore, this criterion will not be applied in the multi – criteria assessment for the subject scheme.

7.2.7 **Table 7.1** presents a summary of the assessment criteria and sub criteria used as part of the detailed route options assessment process.

Assessment Criteria	Assessment Sub-Criteria
1. Economy	1a. Capital Cost
	1b. Constructability
	1c. Quality of Service
2. Integration	2a. Cycling Integration
	2b. Traffic Network Integration
	2c. Potential Impact on Rail Network
	2d. Potential Impact on Canal Users
	2e. Potential Impact on Communities/Residents
3. Safety	3a. Road Safety
	3b. Pedestrian Safety
4. Environment	4a. Archaeology and Cultural Heritage
	4b. Architectural Heritage
	4c. Flora & Fauna
	4d. Soils, Geology & Hydrology
	4e. Landscape & Visual
	4f. Land Use Character

Table 7.1: Assessment Criteria

7.2.8 Each of the assessment criteria are described in further detail as follows:

1. Economy

a. Capital Cost

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

i. Indicative Infrastructure Cost Estimate

7.2.10 This sub-criterion is established to assess route options for their likely capital infrastructure cost. Each route option has been assessed relative to the nature and extent of infrastructure requirements to deliver the scheme objectives. In order to evaluate route options, a degree of initial outline design has been undertaken for some routes to inform infrastructure requirements.

7.2.11 For the purposes of the route options assessment, a high-level cost estimate has been prepared for each type of construction i.e. widening of the existing pedestrian route along the towpath of the Royal Canal, where retaining structures or soil nailing into the embankment may be required along particular sections of the route.

ii. Land Acquisition Cost Estimate

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

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

7.2.13 For the purposes of route options comparison and assessment, the extent of land acquisition required for each route option is calculated by developing an outline design for each option based on topographical survey mapping available.

7.2.14 Outline designs prepared for some route options also considered any specific constraints and tailored the route design where appropriate to practically minimise land-take without compromising on the overall scheme objectives to provide a quality greenway.

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

7.2.16 For the purposes of this assessment, no cost has been assumed for public land acquisition. The Waterways Ireland (WI) lands along the Royal Canal would be used under licence agreement between FCC and WI.

b. Constructability

7.2.17 This criterion assesses the ease at which the proposed scheme option can be constructed. This assessment was undertaken based on professional judgement and an understanding of the various construction methods available. This is predominantly concerned with the available working widths and whether structural infrastructure is required. A number of different structural infrastructure types may be provided where existing towpath widths are less than 4m e.g. cantilevered boardwalk, retaining walls, soiling nailing etc. Complex underpasses or new pedestrian/cycle bridges may also be required for certain route options.

7.2.18 Based on the considerable constraints within the 'Deep Sinking' section both natural and man-made (outlined in Chapter 4), additional field surveys and ground investigation surveys were undertaken to fully understand the likely constructability of particular options between Coolmine and Castleknock stations.

7.2.19 This criterion represents a high-level assessment of the constructability impact of the route options considered in the Multi–Criteria Analysis (MCA). The anticipated construction method due to the width constraints and required infrastructure as a result of the different route options will be assessed.

c. Quality of Service

7.2.20 The cycle route options were assessed under the following sub-criteria based on the 'needs of a cyclist' as set out in the NCM:

i. Segregation & Traffic Volumes

Traffic volumes on adjacent roadways have a significant effect on the quality of service provided by a pedestrian/cycle route. Heavy traffic volumes and speeds adjacent to cycle facilities can make users feel uncomfortable and discourage users from utilising the facility. Off-road facilities which provide segregation from live traffic have substantial benefit compared to on-road facilities which place cyclists immediately adjacent to live traffic.

ii. Comfort

The quality of the greenway provision practically achievable on route options has been assessed. For comparison purposes, the highest level of practical greenway provision achievable on each route has been determined and compared between route options. The following were considered: greenway width, gradients etc.

iii. Directness

For the purposes of comparing route options, the number of junctions, length of the route and the number of detours & gaps from the principal route has been used as a proxy for directness.

iv. ***Attractiveness***

The environment along the route should be pleasant and interesting. Monotony and lack of points of interest along the route are unattractive to users.

2. Integration

a. Cycle Network Integration

7.2.21 This criterion is established to assess route options for the practicality of achieving greenway segregation and their potential to integrate high quality cycle facilities. The assessment considers the following: -

i. *Compatibility with the GDA Cycle Network Plan*

7.2.22 This criterion considers whether a route option forms part of the GDA Cycle Network Plan, particularly the Royal Canal Greenway route.

ii. Quality of Infrastructure for Cyclists

7.2.23 The quality of cycle provision practically achievable on route options has been assessed. For comparison purposes, the highest level of practical cycle provision achievable on each route has been determined and compared between route options.

b. Traffic Network Integration

7.2.24 A comparative assessment of the expected traffic impact of each option has been undertaken for the routes. This assessment was undertaken based on professional judgement and an understanding of traffic conditions in the Study Area.

7.2.25 This represents a high-level assessment of the traffic impact of the route options considered in the Stage 2 Multi–Criteria Analysis (MCA). The anticipated traffic impact expected to be incurred by motorists using private vehicles as a result of the different route options will be assessed.

c. Potential Impact on Rail Network

7.2.26 A comparative assessment of the potential impact each option has on the Rail network. This assessment was undertaken based on the proximity of the proposed greenway to the railway line and the number of locations where the greenway crosses the railway line.

7.2.27 This represents a high-level assessment of the potential impact on the Rail Network for the route options considered in the Multi – Criteria Analysis (MCA). The anticipated impact expected to be incurred by Iarnród Éireann as a result of the different route options will be assessed.

d. Potential Impact on Canal Users

7.2.28 A comparative assessment of the potential impact each option has on canal users such as anglers, walkers and barges.

7.2.29 This will also include potential impact on Waterways Ireland maintenance of the canal. This assessment was undertaken based on potential impacts such as (i) projected cantilevered boardwalk may impact on the operation of barges (ii) projected cantilevered boardwalk may impact on Waterways Ireland maintenance along the canal bank (ii) safety barriers along the towpath may hinder the used of the towpath to tow barges.

e. Potential Impact on Communities/Residents

7.2.30 A comparative assessment of the potential impact each route option has on communities and residents. From the non-statutory public consultation undertaken in 2019 some of the main concerns from residents were proximity of the route to residential properties, security and the opening of cul-de-sacs. These potential impacts have been incorporated into the assessment along with requirement to provide permeability and linkages to/from the greenway (in accordance with DMURS principles).

3. Safety

a. Road Safety

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

7.2.32 The degree of segregation from live traffic along the route has also been used as a proxy for road safety.

7.2.33 The type of movement required by the cyclist at junctions on the route is also considered with routes where turning movements (either left or right) are required being assigned a lower ranking in terms of safety.

b. Pedestrian Safety

7.2.34 This criterion assesses the safety of pedestrians within the proposed scheme option. This is predominantly concerned with the degree of segregation from live traffic along the route, and the number of pedestrians crossing on the route.

4. Environmental

7.2.35 The scope and methodology for the environmental assessment was established by considering what environmental aspects are likely to be impacted and are therefore of importance in evaluating the route options. A list of the environmental topics considered is outlined in **Table 7.2** overleaf.

Aspect	Rationale
Included in Environmental Assessment	
4a/4b. Archaeological, Architectural and Cultural Heritage	The provision of the greenway route has the potential to impact on the archaeological, architectural and cultural heritage environment. An assessment framework has been set out based on potential impact on known constraints, which have been categorised, this is further described below.
4c. Flora and Fauna	The provision of the greenway route has the potential to impact on flora and fauna.
4d. Soils, Geology & Hydrology	The provision of the Greenway infrastructure has the potential to impact on soil and geology as a result of land-take and possible ground excavation (including potential to encounter ground contamination). In relation to Hydrology, the provision of the Greenway infrastructure has the potential to impact on surface water bodies as a result of land-take (with particular emphasis on floodplains and flood zones).
4e. Landscape and Visual	The provision of the greenway route has the potential to impact the townscape/streetscape along the route.
4.f. Land Use Character	The provision of the greenway has the potential to impact on land use character through land-take, severance or reduction of viability of properties which prevents or reduces it from being used for its intended use.

Table 7.2: Environmental Aspects Considered

a/b. Archaeological, Architectural and Cultural Heritage

7.2.36 As mentioned previously, an assessment framework has been set out based on potential impact on known constraints, which have been categorised, see **Table 7.3** below. The constraints comprise Recorded Monuments and Protected Structures (RMPs) within 50m of each greenway route section. Sites of archaeological and cultural heritage merit and sites of architectural heritage merit which are directly intersected by the greenway route sections are also included within the scope of this assessment.

7.2.37 **Table 7.3** provides an evaluation of the protected structures that could potentially be affected by the Greenway development and a list of general constraints to be taken into account during construction and operation.

ARCHAEOLOGICAL/ BUILT HERITAGE CONSTRAINTS FOR ROYAL CANAL URBAN GREENWAY

Value of Asset	Type	Criteria for evaluation	Constraints
High Value	• Royal Canal, 10th Lock • Collins Bridge • Packenham Bridge • Clonsilla Signal Box • Kennan Bridge • Porterstown School House • Granard Bridge • Royal Canal, 12th Lock • Royal Canal • Callaghan Bridge • Kirkpatrick Bridge • Talbot Bridge	Protected structure subject to statutory protection under the Planning and Development Act.	Physical alterations to the fabric of the structure, along with impacts on setting should be avoided. Where alterations occur, input from a Conservation Engineer/ Architect may be required at detailed design.
Moderate Value	• Railway underpass (remains of old Navan rail line) • Vernacular cottage at Porterstown • Porterstown Crossing Cottage	Non-protected structures that represent well preserved buildings of local/ regional merit.	Physical impacts on the fabric and setting of structures should be avoided. Where structures have been previously compromised, any effects may be less significant. However, if alterations are proposed input from a Conservation Engineer/ Architect may be required at detailed design.
Low Value	• Lucan Station • Possible culvert (overgrown) • Vernacular cottage • Vernacular cottage (renovated) • Vernacular cottage at Barnhill • Stone wall, formerly part of a garden	These structures generally represent elements of built heritage that have been subject to modification/ renovation, or are falling into disrepair and as such are not well preserved examples of same.	Physical impacts on structures or setting would not be considered to be a significant or profound effect. However, retention of same would be more favourable than removal. Full measured, written and photographic records can be made of any structures to be directly affected.

Table 7.3: Archaeological/ Built Heritage Constraints For the Proposed Development

7.2.38 During the detailed design of the proposed scheme, the aim will be to avoid known constraints and/or minimise the number of constraints which may be directly or indirectly impacted by the proposed scheme. Appropriate mitigation for construction will be included which will seek, where practicable, to ensure preservation in situ of archaeological remains and the avoidance of impacts on archaeological and cultural heritage constraints. A similar approach has been adopted in relation to the route options assessment for architectural heritage.

7.2.39 As a result, the assessment effectively evaluates the potential for impact on architectural heritage from façade to façade which provides for a comparative and qualitative evaluation of Protected Structures along route sections.

c. Flora & Fauna

7.2.40 The provision of the greenway infrastructure has the potential to impact on flora & fauna.

7.2.41 A survey of semi-natural woodland between Kennan Bridge and Granard Bridge in Section 3 was conducted during the spring 2018. This was carried out by Natura Environmental Consultants on various dates in March-April 2018 before all trees were in leaf and when the undergrowth was low, allowing better access. Dominant tree species were recorded by species and relative age. This ecological survey was supplemented by a full tree survey that recorded the species, age, condition of mature trees and groups of trees along the entire route (Blackstock 2018).

7.2.42 The grassland on the towpath between Pakenham Bridge and Collins Bridge was surveyed by botanist Katharine Duff and Richard Nairn on 22 June 2018. This included a habitat survey (using the classification of Fossitt 2000), a general species list and a relevé on the canal bank. The criteria and indicators for classification of grasslands listed in Annex I of the EU Habitats Directive are given in the report of the National Grassland Survey (O'Neill et al. 2013). This survey was undertaken in fine warm conditions when the majority of species were in flower.

7.2.43 The surveys undertaken in 2018 & 2019 have confirmed the continued presence of the habitats mapped and described in the BEC survey (Brophy & Devaney 2013). **Table 7.4** provides an evaluation of those habitat types that could potentially be affected by the Greenway development and a list of general constraints to be taken into account during construction and operation.

Ecological evaluation	Habitat types (Fossitt 2000)	Criteria for evaluation	Constraints and Mitigation
High Value	WN2 Oak-ash-hazel woodland	Areas of the habitat types listed in Annex I of the Habitats Directive but which do not satisfy the criteria for valuation as of International or National importance.	Avoid *any* adverse impacts either direct or indirect, during construction or operation. No other mitigation is recommended.
	FP1 Calcareous spring	Semi-natural habitat types with high biodiversity in a regional context and a high degree of naturalness, or populations of species that are uncommon within the County.	Avoid *any* adverse impacts either direct or indirect, during construction or operation. No other mitigation is recommended.
	GS2 Dry meadows and grassy verges with indicators for Annex 1 habitat	Includes some areas of habitat that correspond to the habitat 'Lowland hay meadows *(Alopecurus pratensis, Sanguisorba officinalis)'* listed in Annex 1 of the EU Habitats Directive	Set back the pathway at least 1m from the edge of the canal. Avoid any impacts on this fringe vegetation during construction or maintenance of the pathway.
	BL1 Stonework in bridges and walls	Potential for bat roosts	Survey for bat roosts prior to construction. Implement mitigation recommended in section 1.3.7 above
Moderate Value	FS1 Reed and large sedge swamp FS2 Tall-herb swamp WD1 Mixed broadleaved woodland GM1 Marsh GS4 Wet grassland	Semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon within the local area	Limit adverse impacts to minimum required to complete the scheme. Avoid removal of these habitats where possible. Do not remove vegetation during the period 1st March to 31st August to avoid impacts on breeding birds. Implement standard pollution controls during construction. Implement mitigation to reduce impacts. Where impacts cannot be avoided implement habitat restoration or creation.
Low Value	FW3 Canal water body FW4 Drainage Ditches WL1 Hedgerows WL2 Treelines WS1 Scrub	Habitats that are relatively common in the local area but are unimproved.	Implement standard pollution controls during construction. Do not remove vegetation during the period 1st March to 31st August to avoid impacts on breeding birds.

Table 7.4: Ecological Constraints for the Proposed Development

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

7.2.45 Also, the following Fauna surveys were undertaken as part of the assessment:

- Molluscan Survey (Snail Survey) of the potential Vertigo habitats, was undertaken on 4th and 5th July 2018 by Evelyn Moorkens and Anton Krastev;
- Waterbird Survey was undertaken by a field ornithologist on 1st & 22nd May 2018; and
- Bat survey was undertaken on 13th July 2018 by Tina Aughney.
- A survey of the woodland on the north side of the Royal Canal east of Kirkpatrick Bridge for badger setts (Aug 2019).

7.2.46 Features considered included the following:

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

d. Landscape & Visual

7.2.47 The provision of the greenway infrastructure has the potential to impact the townscape/streetscape along the route.

7.2.48 The assessment comprised the compilation of a desktop understanding of:

- the landscape/townscape, its character and features;
- the visual environment, including the location of residential and other properties and views over the landscape;
- the landscape planning context, including landscape designations, open spaces, identified views and prospects, etc.; and

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

a. Soils, Geology & Hydrology

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

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

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

7.2.52 The impact at each geographic level was compared to allow an order of preference to be determined. The provision of the greenway infrastructure has the potential to impact on surface water bodies as a result of land-take (with particular emphasis on floodplains and flood zones). Attributes (and impacts) assessed for each route option included the following (where relevant):

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

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

b. Land Use Character

7.2.54 The provision of the greenway infrastructure has the potential to impact on land use character through land-take, severance or reduction of viability which prevents or reduces it from being used for its intended use.

Route Options Summary Table

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

7.2.56 The MCA tables for the route options for each section (Section 1-3) are presented in **Appendices A - F**.

7.2.57 For each individual assessment criterion considered, routes have been relatively compared against each other based on a five-point scale, ranging from having significant advantages to having significant disadvantages over other route options. For illustrative purposes, this five-point scale is colour coded as presented in **Table 7.5**, with advantageous routes graded to 'dark green' and disadvantaged routes graded to 'dark red'.

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

Table 7.5: Route Options Colour Coded Ranking Scale

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

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

7.2.60 This is then summarised for each Study Area section under the main assessment criterion as set out in **Table 7.1**.

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

7.2.62 The outcome from the multi-criteria assessment is considered in a holistic manner to derive a preferred 'end-to-end' route.

8.0 SECTION 1 ROUTE OPTION ASSESSMENT

8.1 Section 1 - Introduction

8.1.1 When assessing the route options for Section 1, generally there are 2 principal routes (Option S1-1 and Option S1-2) between Kildare County Council boundary line (Royal Canal Amenity Group building) and Hansfield Railway Bridge. It should be noted that additional scheme options were considered initially but were not progressed to the scheme assessment stage as they were not feasible or were less effective than the scheme options taken forward e.g. route option entirely along the southern side of the Royal Canal.

8.1.2 The following two route options were taken forward:

- Option S1-1 - Greenway along the northern side of the Royal Canal from the Kildare County Border (Royal Canal Amenity Group) to Hansfield Railway Bridge; and
- Option S1-2 - Greenway along the northern side of the Royal Canal from the Kildare County Border (Royal Canal Amenity Group) to the proposed Kellystown Bridge where it crosses to the southern side of the Railway Line.

8.1.3 The route options for Section 1 are illustrated in drawing **170239-2300** in **Appendix J**.

8.1.4 The assessment process has been outlined in Chapter 7 of this report. In this section of the report it is proposed to set out the assessment procedure and results for the section of the Study Area between Kildare County Council boundary line (Royal Canal Amenity Group) and Hansfield Railway Bridge.

8.1.5 The assessment of the options is discussed further in **Chapter 8.2** below.

8.2 Section 1 – Option Assessment

8.2.1 As previously mentioned, there are two principal route options considered for the Study Area between Kildare Count Council boundary line (Royal Canal Amenity Group) and Hansfield Railway Bridge. These options are discussed below in the following paragraphs.

Option S1-1: Greenway along the northern side of the Royal Canal from the Kildare County Border (Royal Canal Amenity Group) to Hansfield Railway Bridge.

8.2.2 This option proposes a 3 - 4m wide greenway (where possible within existing embankment widths) with an unbound pavement surface which follows the existing towpath along the northern side of the Royal Canal from the Kildare County Council boundary line to Hansfield. The greenway will continue through the existing pedestrian underpass by Hansfield Railway Bridge, see **Figure 8.1**.

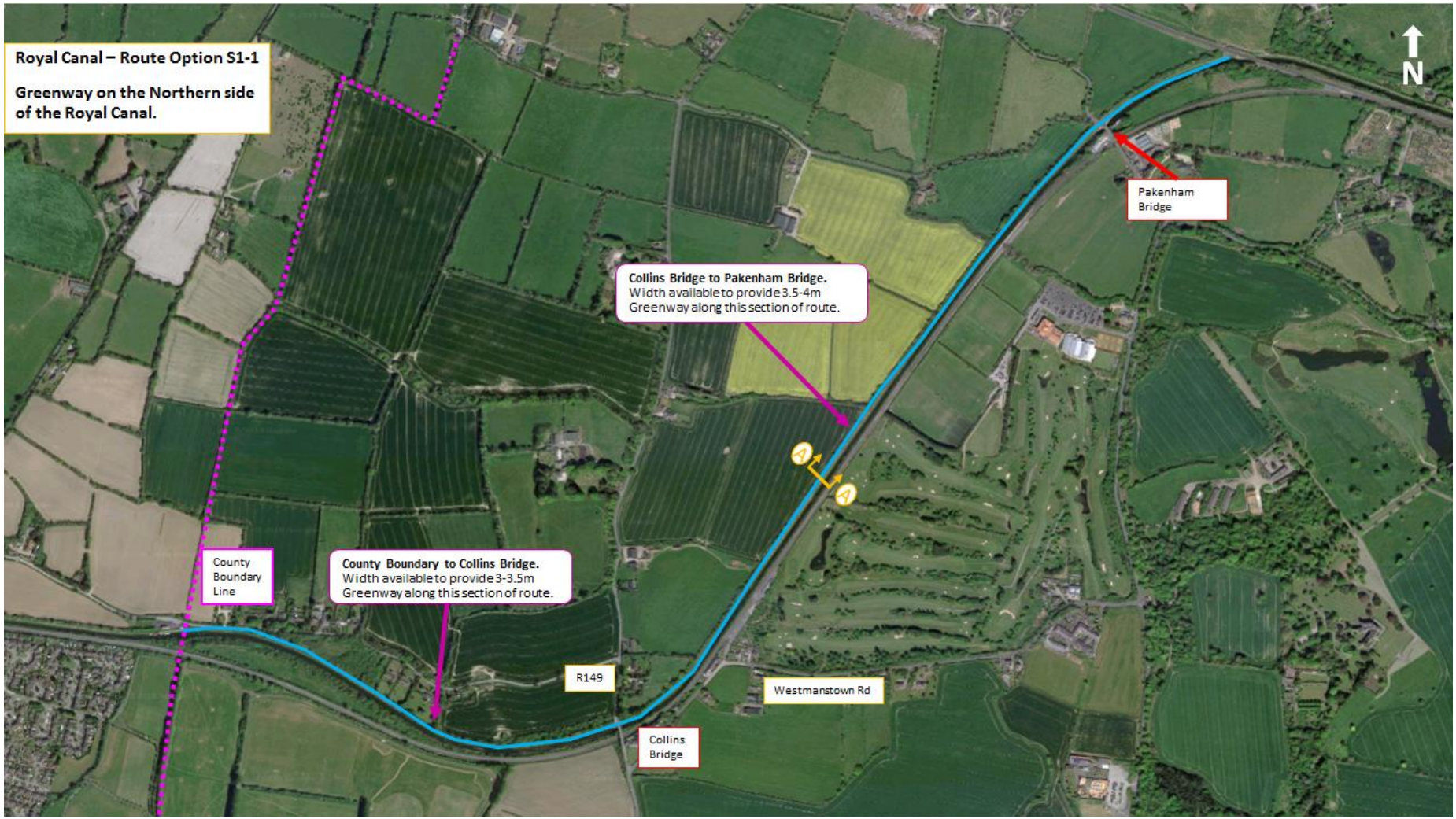


Figure 8.1: Route Option S1-1

8.2.3 The option S1-1 possible cross sections are presented in **Figure 8.2** below.

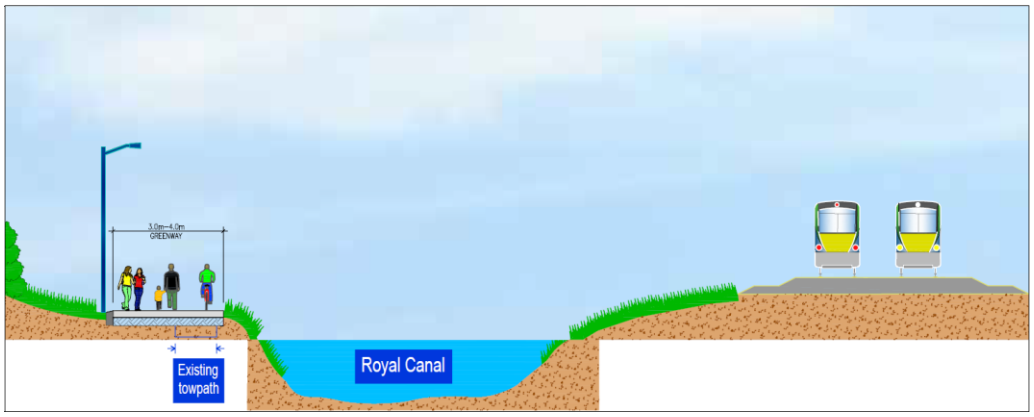


Figure 8.2 Route Option S1-1: Possible Cross Section A-A.

8.2.4 The following constraints would need to be considered if this route option is progressed:

- Protected structures such as The Royal Canal, Collins Bridge and Packenham Bridge.
- Rural environment surrounding the Canal.
- Presence of hedgerow and rich grasslands (Annex 1 habitat).
- Potential Invasive Species.
- Constrained width of 3.5m at Hansfield Railway Bridge underpass.

Option S1-2: Greenway along the northern side of the Royal Canal from the Kildare County Border (Royal Canal Amenity Group) to the proposed Kellystown Bridge which then switches to the southern side of the Railway Line.

8.2.5 This option proposes a 3 - 4m wide (where possible within existing embankment widths) unbound greenway which follows the existing towpath along the northern side of the Royal Canal from the Kildare County Council boundary line to the proposed Kellystown Bridge (some 150m south of Packenham Bridge). The greenway will then switch to the southern side of the railway line via the proposed Kellystown Bridge, see **Figure 5.3.** Land acquisition would be required from farmlands to the south of the railway line.

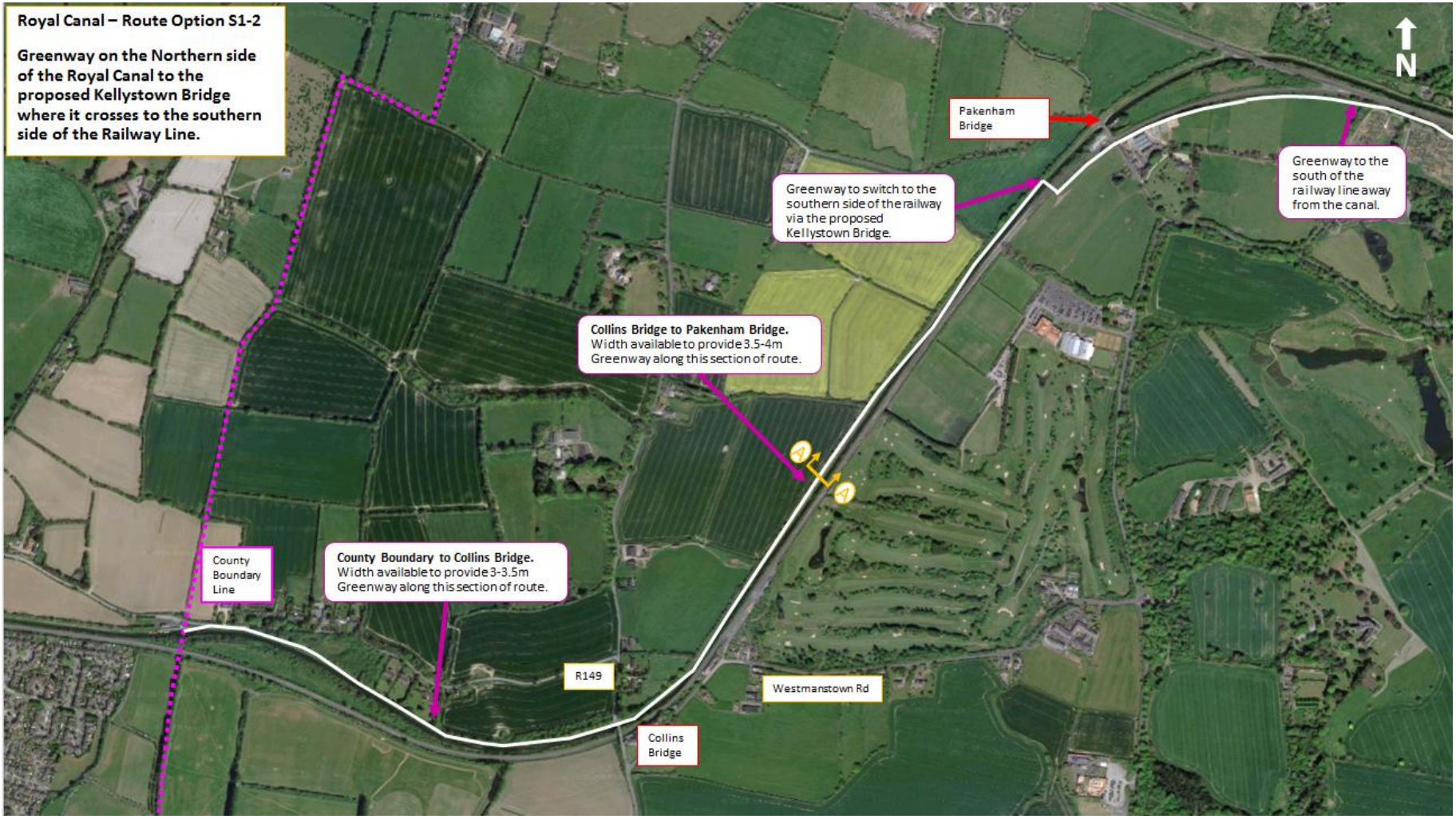


Figure 8.3: Route Option S1-2

8.2.6 The option S1-2 typical cross section is presented in **Figure 8.4** below.

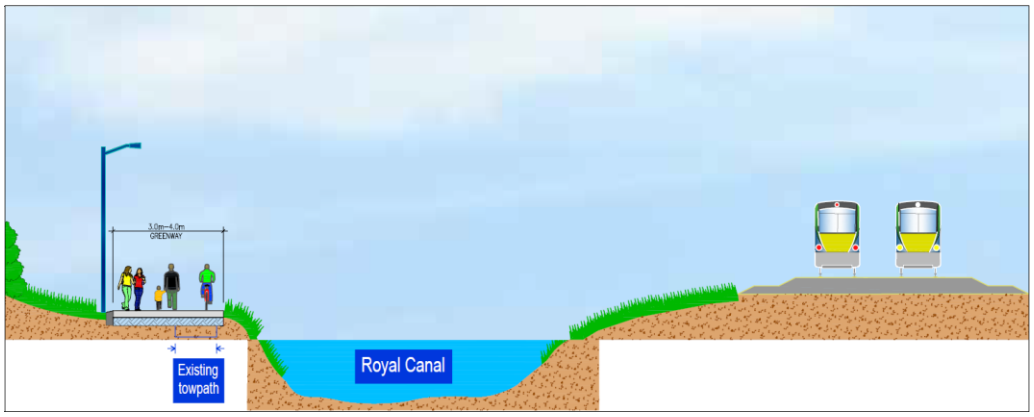


Figure 8.4 Route Option 1-2: Possible Cross Section A-A.

8.2.7 The following constraints would need to be considered if this route option is progressed:

- Protected structures such as The Royal Canal and Collins Bridge.
- Presence of hedgerow and rich grasslands (Annex 1 habitat).
- Dublin to Maynooth Railway Line.
- Land acquisition from lands south of the railway line.

Route Options Multi-Criteria Analysis

8.2.8 The route options assessment summary tables for the Greenway Route Options for Section 1 are presented in **Appendix A**. The relative ranking of route options against the scheme assessment sub-criteria are summarised in **Table 8.1** below.

Royal Canal Urban Greenway Route Options for section 1			
Appraisal Criteria	**Sub-Criteria**	**Option S1-1 Greenway on the Northern side of the Royal Canal.**	**Option S1-2 Greenway on the Northern side of the Royal Canal which then switches to the southern side of the Railway Line.**
1 Economy	1A Capital Cost		
	1B Constructability		
	1C Quality of Service		
2 Integration	2A Cycle Network Integration		
	2B Traffic Network Integration		
	2C Potential Impact on Rail Network		
	2D Potential Impact on Canal Users		
	2E Potential Impact on Communities/Residents		
3 Safety	3A Road Safety		
	3B Pedestrians Safety		
4 Environment	4A Archaeology and Cultural Heritage		
	4B Architectural Heritage		
	4C Flora & Fauna		
	4D Soils, Geology & Hydrology		
	4E Landscape and Visual		
	4F Land Use Character		

Table 8.1: Principal Route Options MCA Summary (Sub-Criteria)

8.2.9 **Economy** - Option S1-1 is ranked the highest in terms of economy. The primary differentiator between route options is the Land acquisition costs. Option S1-2 proposes to provide pedestrian and cycle facilities on the proposed Kellystown Bridge and requires land acquisition from a number of Farmlands, while option S1-1 does not require any Land acquisition.

8.2.10 **Quality of Service** - Option S1-2 is ranked lower than S1-1, because the greenway detours from the Royal Canal via the proposed Kellystown Bridge for 700m. Also, the environment along the outer side of the railway line, away from the canal, is not as pleasant or interesting compared to S1-1 route along the towpath of the Royal Canal.

8.2.11 **Integration** - Option S1-1 is considered to be the most attractive because it provides segregated cycle & pedestrian facilities along Royal Canal for the entire Section 1 and it has no impact on the Rail Network.

8.2.12 **Safety** - Option S1-1 is ranked the highest, as it provides segregated pedestrian facilities along the entire section, with the only interaction with vehicular traffic at toucan crossings at the canal bridges. Option S1-2 has pedestrian facilities provided along/adjacent to vehicular traffic on the proposed Kellystown Bridge and adjacent to the railway line.

8.2.13 **Architecture Heritage** – Option S1-2 is considered more attractive because it may impact on one less protected bridge (Pakenham Bridge). While option S1-1 may potentially directly impact 2 bridges (Collins Bridge and Pakenham Bridge).

8.2.14 **Environment** - Route option S1-1 is the preferred option. The New Kellystown Bridge as part of the route option S1-2 may have a visual impact on the royal canal. Option S1-2 also involves land acquisition of up to 700m in length (approximately 3,500m^2). The route passes through a farmyard, which may affect the viability of one farm. Route option S1-2 has less impact on Architectural Heritage as it switches to the southern side of the railway line prior to Pakenham Bridge (protected structure). It also results in less potential to impact to the royal canal (protected structure) as it detours from the canal to the southern side of the railway line.

8.2.15 A summary of the assessment and relative ranking of route options against the four main assessment criteria is presented in **Table 8.2** below.

Royal Canal Urban Greenway (main criteria) Route Options for section 1		
Appraisal Criteria	Option S1-1 Greenway on the Northern side of the Royal Canal.	Option S1-2 Greenway on the Northern side of the Royal Canal which then switches to the southern side of the Railway Line.
1 Economy		
2 Integration		
3 Safety		
4 Environment		

Table 8.2: Principal Route Options MCA Summary (Main Criteria)

8.2.16 Based on the assessment undertaken, route option S1-1 appears to offer more benefits over the other option. Option S1-1 is therefore preferred route option for the following reasons:

- It is more economical, as it does not require private land-take;
- It provides a better quality of service;
- It has less traffic impact compared to Option S1-2;
- It has no impact on the Iarnród Éireann network;
- It is a safer option;
- It has less environmental impacts.

8.2.17 Based on the multi-criteria assessment undertaken for this section of the Study Area, Option S1-1 is identified as the preferred route option for the Section 1 between the Kildare County Council boundary line (Royal Canal Amenity Group) and Hansfield Railway Bridge. Therefore, S1-1 will form part of the preferred route.

8.2.18 The benefits of the preferred route (Option S1-1) can be summarised as follows:

i. Continuous and direct greenway provided for the majority of the route.

ii. The environmental impact of delivering the scheme would be minimal as the proposed greenway would be provided within the available land along the Royal Canal Towpath.

iii. It has little impact on the Iarnród Éireann network;

9.0 SECTION 2 ROUTE OPTION ASSESSMENT

9.1 Section 2 - Introduction

9.1.1 When assessing the route options for Section 2, generally there are 7 principal route options (Option S2-1, S2-2, S2-3, S2-4, S2-5, S2-6 and S2-7) between Hansfield Railway Bridge and Kennan Bridge (Porterstown Bridge). It should be noted that a number of additional scheme options were considered initially but were not progressed to the scheme assessment stage as they were not feasible or were less effective than the scheme options taken forward. For example, two options along the southern embankment of the canal (which were included in the previous Draft Route Options Report) have not been included in this assessment following consultation with Iarnród Éireann who have outlined their requirements and the constraints with the route options adjacent to the railway line.

9.1.2 The following seven route options, as identified above, were taken forward:

- Option S2-1 – Greenway along the northern side of the Royal Canal from the Hansfield Railway Bridge to Kennan Bridge;
- Option S2-2 – Greenway along the northern side of the Royal Canal from Hansfield Railway Bridge via Hansfield Road and Clonsilla Road;
- Option S2-3 – Greenway along the northern side of the Royal Canal from Hansfield Railway Bridge via Hansfield Road, Clonsilla Road and via the new development at Weavers Walk;
- Option 2-4 – Greenway route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.
- Option S2-5 – Greenway along the northern side of the Royal Canal from the Hansfield Railway Bridge to Kennan Bridge via Porterstown School House lands;
- Option S2-6 – Greenway along the northern side of the Royal Canal from Hansfield Railway Bridge to Kennan Bridge via Weavers Walk and Porterstown School house lands.

- Option S2-7 Greenway on the Northern side of the Royal Canal from Hansfield Railway Bridge to Kennan Bridge through residential back gardens and Porterstown School house lands.

9.1.3 The assessment process has been outlined in **Chapter 7** of this report. In this section of the report, it is proposed to set out the assessment procedure and results for the section of the Study Area between Hansfield Railway Bridge and Kennan Bridge (Porterstown Road).

9.1.4 The assessment of the options is discussed further in **Chapter 9.2** below.

9.2 Initial Assessment of Scheme Sub-options for Hansfield.

9.2.1 Within the aforementioned route options, there is a location on the western side of Section 2 between Hansfield Railway Bridge and Hansfield Road which requires specific consideration. These three route options have been brought through an initial assessment to determine the optimum layout for this area to be included in the principal route options listed above.

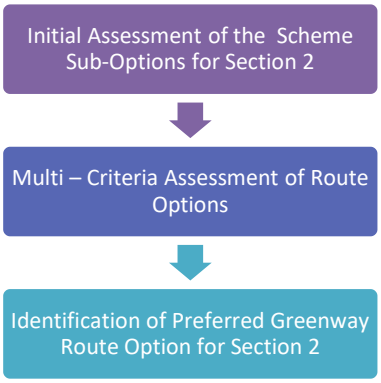


Figure 9.1: Route Option Assessment Stages for Section 2

9.2.2 These sub-options are presented in **Figure 9.2** below:

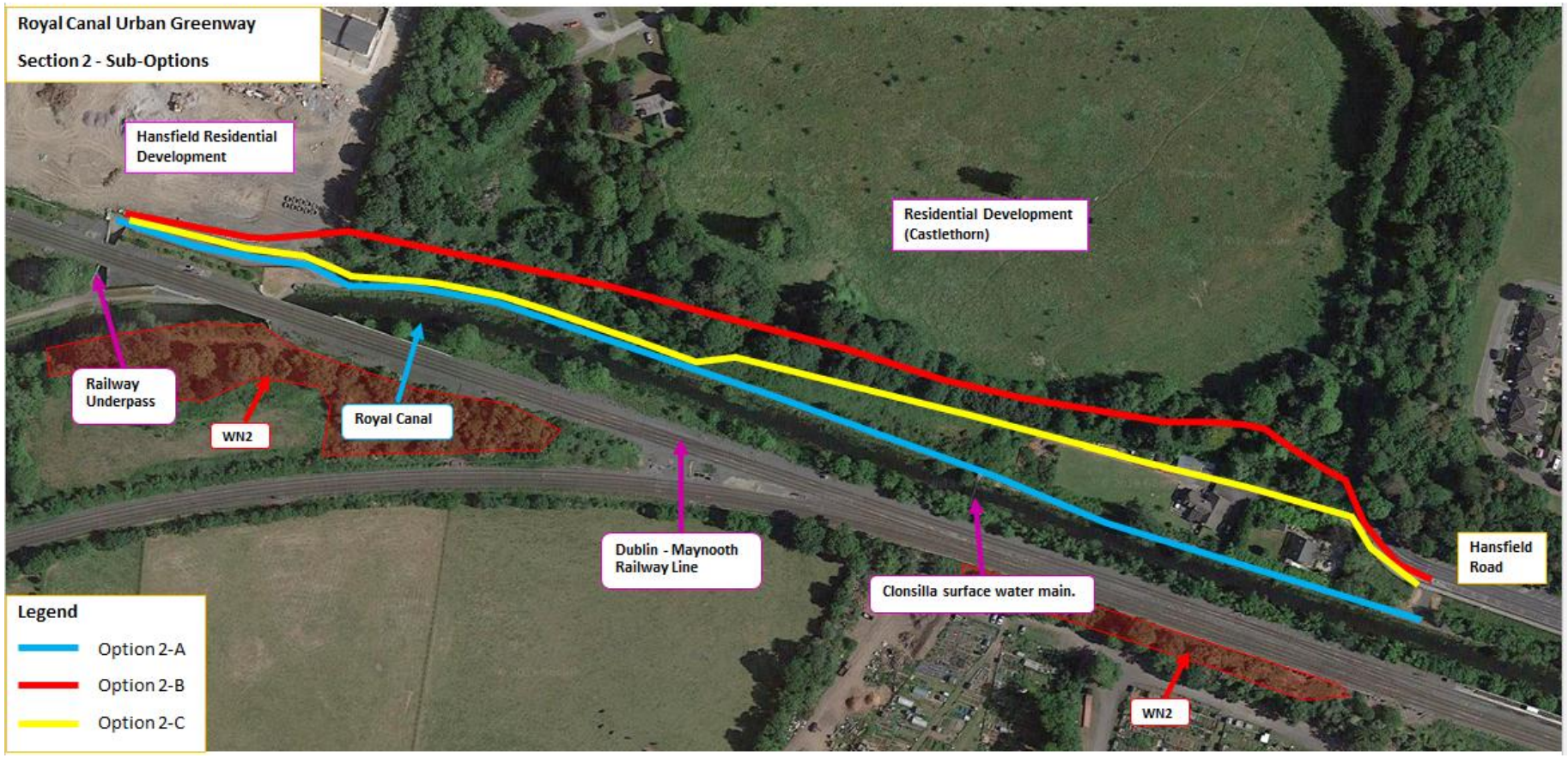


Figure 9.2: Section 2 Sub-Options

9.2.3 The following three route options, as identified above, were taken forward to initial assessment:

- Option 2-A - Greenway along the existing towpath on the northern embankment of the Royal Canal from the Hansfield Railway Bridge to Hansfield Road (service access);
- Option 2-B - Greenway via the proposed pedestrian/cycle route through the Hansfield Residential Development (Alannah Homes) and the Castlethorn development on the northern side of the Royal Canal;
- Option 2-C - Greenway along the existing towpath on the northern embankment of the Royal Canal from the Hansfield Railway Bridge for 250m, greenway detours via residential property to Hansfield Road;

9.2.4 The sub-options for Section 2 are illustrated in drawing **170239-2301** in **Appendix J**.

9.2.5 Multi-criteria assessment has been utilised to assess these sub-options to determine the optimum layout to be included in the principal route options considered for Section 2. The initial assessment of this constrained location is outlined below.

Option S2-A – Greenway along the existing towpath on the northern embankment of the Royal Canal from the Hansfield Railway Bridge to Hansfield Road (service access);

9.2.6 This option proposes a 4m wide paved greenway which follows the existing towpath along the northern side of the Royal Canal from the Hansfield Railway Bridge to the service access at Hansfield Road, see **Figure 9.3.**

9.2.7 The existing pedestrian route/towpath would be widened towards the northern side of the towpath, possibly requiring the removal of some trees (not High Value).

9.2.8 Possible land acquisition may be required from a residential property due to widening towards the northern side of the towpath.

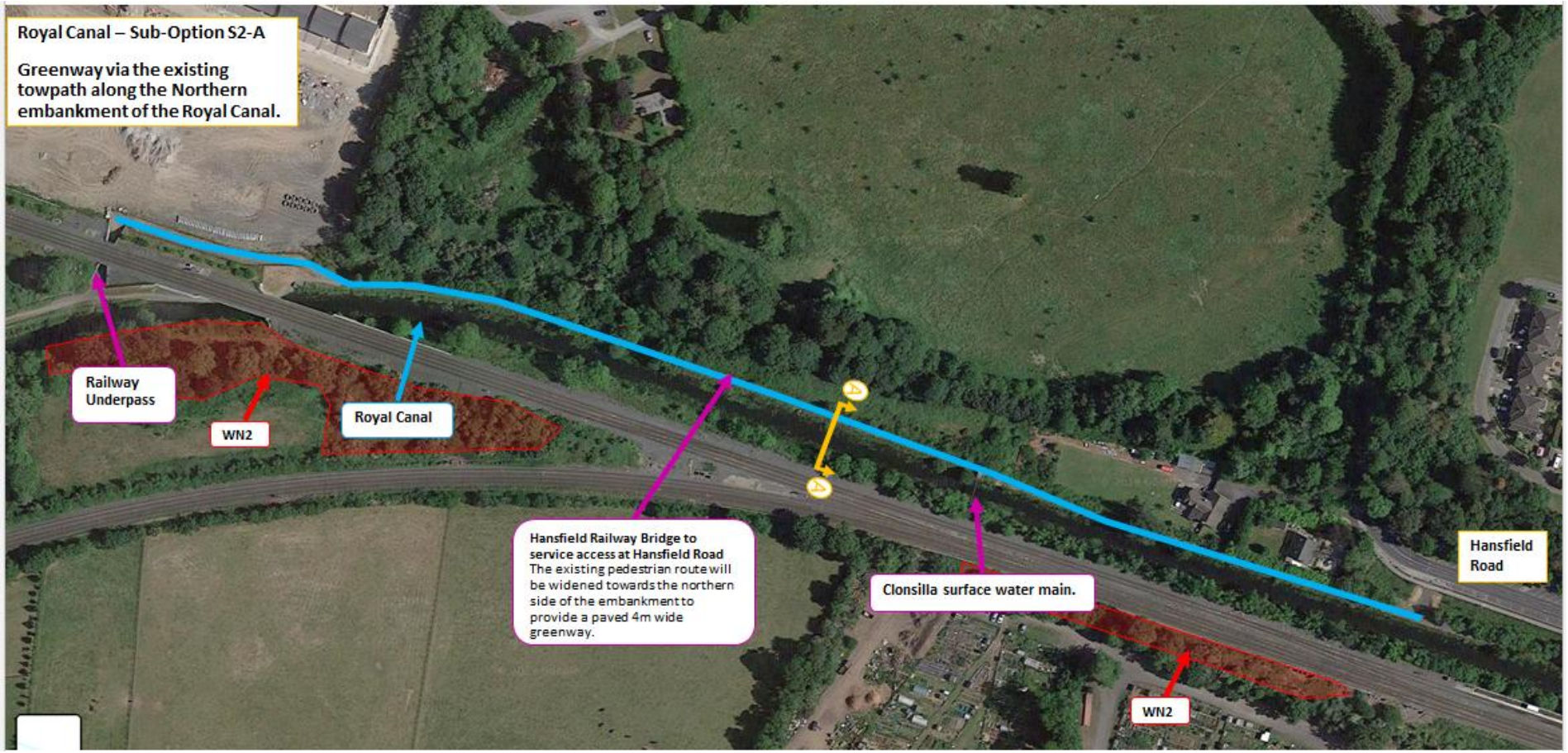


Figure 9.3: Route Option S2-1

9.2.9 The option S2-A sample cross section is presented in **Figure 9.4** below.

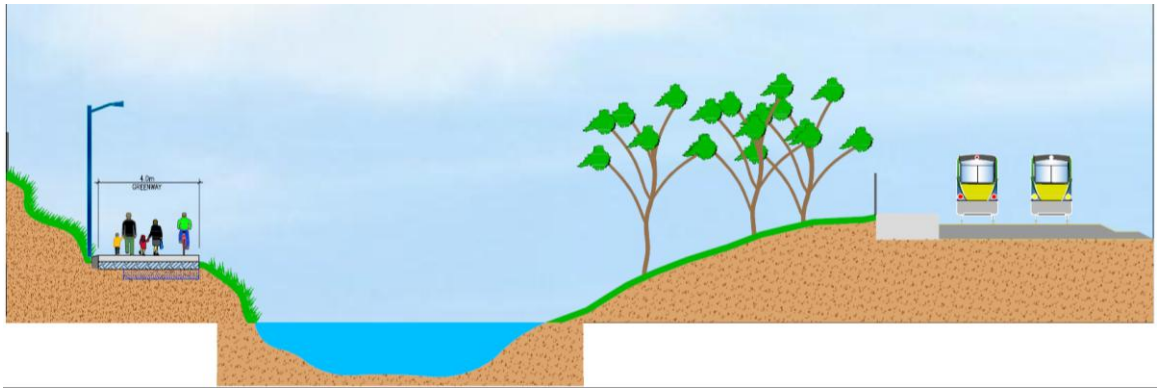


Figure 9.4 Route Option S2-A: Proposed Cross Section A-A.

9.2.10 The following constraints would need to be considered if this route option is progressed:

- Presence of hedgerow and rich grasslands (Annex 1 habitat);
- Water main thrust block on the banks of the Canal;
- Land acquisition from a residential property may be required; and
- The existing pedestrian route would be widened towards the northern side of the towpath, potential removal of trees (not High Value).

Option S2-B – Greenway via the proposed pedestrian/cycle route through the Hansfield Residential Development (Alannah Homes) and the Castlethorn Residential Development on the northern side of the Royal Canal;

9.2.11 This option proposes to direct the greenway users onto the pedestrian/cycle facilities as part of the Hansfield Residential Development and the Castlethorn Residential Development. The Hansfield Residential Development has proposed a 2.25m two-way cycle facility with a 2m footpath while the Castlethorn Residential Development proposes a 4.5m shared pedestrian/cycle route which the greenway would use under this option. The pedestrian/cycle route through the two residential developments is illustrated in **Figure 9.5** below.

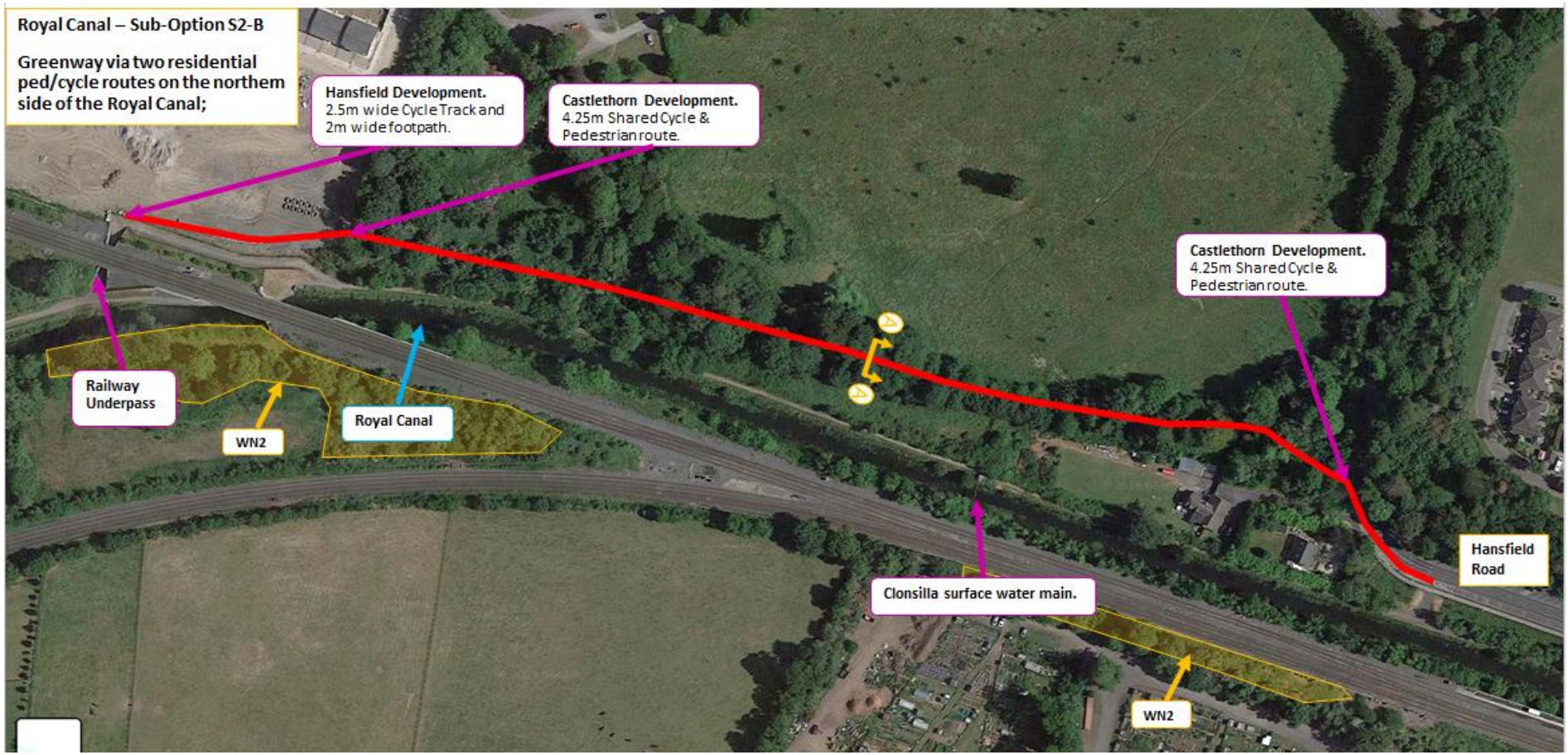


Figure 9.5: Route Option S2-B

9.2.12 The option S2-B sample cross section is presented in **Figure 9.6** below.

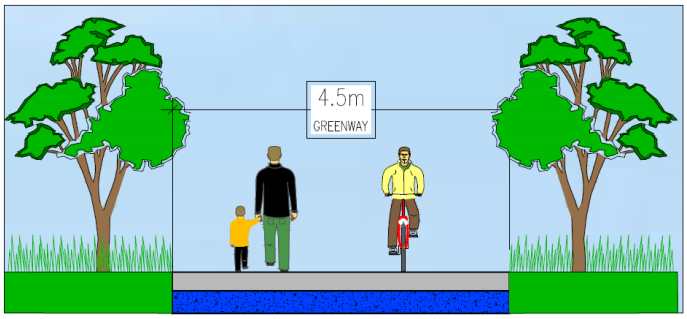


Figure 9.6 Route Option S2-B: Proposed Cross Section A-A.

9.2.13 The following constraints would need to be considered if this route option is progressed:

- Inconsistent cycle/pedestrian infrastructure (segregated cycle track to shared ped/cycle route);
- Access from the Railway Underpass to the footpath and cycle track in the new residential development may prove difficult due to level differences.
- Providing pedestrian & cycle facilities on Hansfield Road may prove difficult because of the width constraints and level differences at a residential access on the corner.

Option 2-C - Greenway along the existing towpath on the northern embankment of the Royal Canal from the Hansfield Railway Bridge for 250m, greenway detours via residential property to Hansfield Road;

9.2.14 This option proposes a 4m wide paved greenway which follows the existing towpath along the northern side of the Royal Canal from the Hansfield Railway Bridge for 250m.

9.2.15 The existing pedestrian route/towpath will be widened towards the northern side of the towpath.

9.2.16 The greenway will detour from the canal towpath through a residential property to Hansfield Road. The potential routing of the greenway through these lands may facilitate the provision of amenities such as a pocket park within the lands. A paved 4m wide paved greenway will be provided on the northern side of the lands to Hansfield Road. The greenway route is illustrated in **Figure 9.7** below.

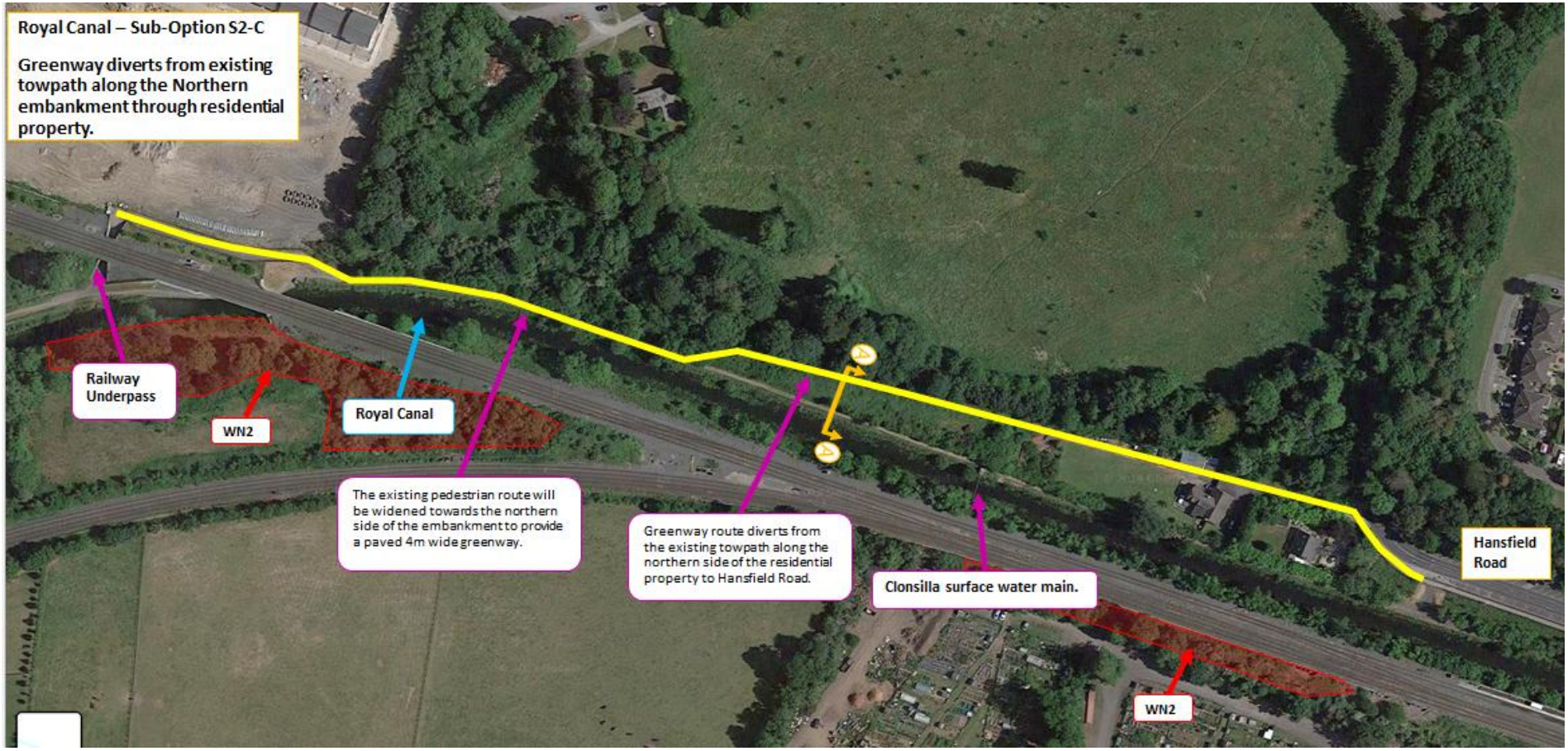


Figure 9.7: Route Option S2-C

9.2.17 The option S2-C sample cross section is presented in **Figure 9.8** below.

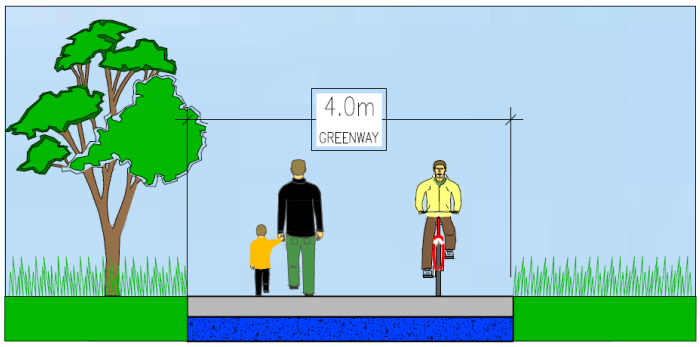


Figure 9.8 Route Option S2-C: Proposed Cross Section A-A.

9.2.18 The following constraints would need to be considered if this route option is progressed:

- Presence of hedgerow and rich grasslands (Annex 1 habitat);
- Access from the Railway Underpass to the proposed greenway in the residential land may prove difficult due to level differences; and
- Land acquisition from a residential property;

Route Options Multi-Criteria Analysis

9.2.19 The route options assessment summary tables for the Sub-Options for Section 2 are presented in **Appendix B**. The relative ranking of route options against the scheme assessment sub-criteria are summarised in **Table 9.1** below.

Royal Canal Urban Greenway – Section 2 Sub-Options Hansfield Railway Bridge to the service access at Hansfield Road				
Appraisal Criteria	**Sub-Criteria**	**Option S2-A Greenway via the existing towpath along the Northern embankment of the Royal Canal.**	**Option S2-B Greenway via two residential ped/cycle routes on the northern side of the Royal Canal.**	**Option S2-C Greenway along the existing towpath on the northern embankment of the Royal Canal from the Hansfield Railway Bridge for 250m, greenway detours via residential property to Hansfield Road.**
1 Economy	1A Capital Cost			
	1B Constructability			
	1C Quality of Service			
2 Integration	2A Cycle Network Integration			
	2B Traffic Network Integration			
	2C Potential Impact on Rail Network			
	2D Potential Impact on Canal Users			
	2E Potential Impact on Communities/Residents			
3 Safety	3A Road Safety			
	3B Pedestrians Safety			
4 Environment	5A Archaeology and Cultural Heritage			
	5B Architectural Heritage			
	5C Flora & Fauna			
	5D Soils, Geology & Hydrology			
	5E Landscape and Visual			
	5F Land Use Character			

Table 9.1: Sub-Options MCA Summary (Sub-Criteria)

9.2.20 **Capital Costs** - The primary differentiator between route options is that the majority of the route option S2-B will be constructed as part of two separate residential schemes (540m). A 60m section of shared ped/cycle route along Hansfield Road will be constructed as part of route option S2-B. Option S2-A

provides a paved 4m greenway along the existing towpath which will require widening towards the northern side of the towpath (580m). However, the capital cost for S2-C is the highest due to land acquisition of the private residential property.

9.2.21 **Constructability** - Option S2-A is ranked the lowest, as it involves widening of the existing towpath to 4m along the northern side of Royal Canal for the entire section (approx. 580m). Working widths for tracking equipment (drilling rigs or excavators) is limited on the towpath. Whereas Option S2-B proposes to direct greenway users onto the pedestrian/cycle facilities proposed as part of the Hansfield Residential Development and the Castlethorn Residential Development, construction works will only be required at the tie-in point at Hansfield Road. This includes potential new boundary wall treatments (construction works due to level differences between residential access and Hansfield Road) and a shared ped/cycle facility on Hansfield Road.

9.2.22 **Quality of Service** - Options S2-A is ranked the best, because the greenway is generally segregated from vehicular traffic for the entire route (580m), it runs along the entire bank of the Royal Canal, it does not have any detours, the environment along the route is pleasant and interesting and the greenway would be 4m wide with no excessive gradients. Compared to the other options that detour from the Royal Canal. Also, for Option S2-B the greenway route will vary from a 2.5m two-way cycle track and 2m footpath (Hansfield Development) to a 4.5m width shared pedestrian/cycle route (Castlethorn Development). Which could cause confusion and potential collisions between pedestrians and cyclists.

9.2.23 **Cycle Network Integration** - Options S2-A scores highest because it provides Greenway facilities along the Royal Canal which aligns with the GDA Cycle Network Plan compared to the circuitous route taken by option S2-B and S2-C.

9.2.24 **Traffic Network** - Route option S2-B is ranked the worst, as it will result in modifications to the existing driveways at the bend on Hansfield Road and the cycle facility will be along/adjacent to the busy Hansfield Road (approx. 60m). While route option S2-A is proposed along the exiting canal towpath away from vehicular traffic.

9.2.25 **Potential Impact on Canal Users** - Options S2-B may have a higher impact on the canal users. Due to the detour of the greenway route from the canal, cyclist and walkers may choose to continue to use the more direct existing towpath (more direct route) for the 580m section. This may have a negative impact on walkers and anglers who currently use the towpath as there will be very little room for both cyclists & pedestrians on the existing towpath. This could also result in collisions between cyclists and pedestrians due to the lack of space. For option S2-A, walkers will benefit from the existing towpath being upgraded to 4m bound surface from Hansfield Railway Bridge to Kennan Bridge.

9.2.26 **Potential Impact on Communities/Residents** - Options S2-B may have a higher negative impact on the Communities/Residents. Greenway users (potentially non-residents) will be rerouted from the canal towpath through the new residential development. There will be an increase level of use along the facility (which is proposed for residential use) which could lead to greater levels of activity which may not have been envisaged as part of the design. However, accessibility to the greenway is provided through the residential developments, providing permeability and linkages from residential catchments. For Option S2-C land acquisition is required from a residential property, however, the landowner advised that he is positive towards the disposal of the lands and the potential routing of the greenway through the lands. As part of this route option, amenities such as a pocket park etc are proposed.

9.2.27 **Safety** - Option S2-B is ranked the worst. The footpath and cycle facilities are segregated through the Hansfield development (100m), however, shared pedestrian/footpath provided though the Castlethorn Development (440m). This may cause confusion for pedestrians/cycles which may result in ped/cycle conflicts. Also, due to the detour of the greenway route from the canal, cyclist and walkers may choose to use the existing towpath (more direct route) for the 580m section. This could also result in collisions between cyclists and pedestrians due to the lack of space. Also, 60m of the route will be a shared pedestrian/cycle route adjacent to the busy Hansfield Road. Option S2-A, proposes 4m shared

greenway facility provided along the bank of the Royal Canal, segregated from vehicular traffic.

9.2.28 **Architecture Heritage** - Route options S2-A is considered the least attractive due to the fact that the fabric of the canal itself is a protected structure and this route option propose the Greenway along the bank of the Royal Canal for the entire the route (580m).

9.2.29 **Flora & Fauna** - Route options S2-A is ranked least attractive. Option S2-B does not have a significant impact on Flora or Fauna to tie the Castlethorn ped/cycle route to the proposed route adjacent to Hansfield Road. Options S2-A may require possible removal of trees on the northern side of the towpath along the route.

9.2.30 **Landscape & Visual** - Options S2-A is the least attractive option. Option S2-A may require the removal of trees on the northern side of the towpath which may have a potential impact on the visual landscape of the Royal Canal.

9.2.31 **Land Use Character** - Options S2-B and S2-C are ranked the lowest. Option S2-B may require land acquisition from the front of two residential properties (boundary walls) on Hansfield Road in order to accommodate access to the properties. While Option S2-C requires land acquisition from a residential property.

9.2.32 A summary of the assessment and relative ranking of route options against the four main assessment criteria is presented in **Table 9.2** below.

Royal Canal Urban Greenway Section 2 – Sub-Options			
Appraisal Criteria	Option S2-A Greenway via the existing towpath along the Northern embankment of the Royal Canal.	Option S2-B Greenway via two residential ped/cycle routes on the northern side of the Royal Canal.	Option S2-C Greenway along the existing towpath on the northern embankment of the Royal Canal from the Hansfield Railway Bridge for 250m, greenway detours via residential property to Hansfield Road.
1 Economy			
2 Integration			
3 Safety			
4 Environment			

Table 9.2: Sub-Options MCA Summary (Main Criteria)

9.2.33 Based on the assessment undertaken, route option S2-A appears to offer more benefits over the other options. Option S2-A is therefore the preferred route for the eastern section of the Study Area for Section 2 for the following reasons:

- It provides direct cycle facilities segregated from vehicular traffic for the entire route;
- It is the safer option for both cyclists and pedestrians;
- It has no impact on the traffic network;
- This option is along the canal, which aligns with the GDA Cycle Network Plan.
- It does not significantly impact on Communities/Residents.

9.2.34 Based on the multi-criteria assessment undertaken, option S2-A is identified as the preferred route option for the eastern section of the Study Area from the section between Hansfield Railway Bridge and Hansfield Road. Therefore, Option S2-A will form part of the principal option.

9.3 Section 2 – Principal Route Options Assessment

Introduction

9.3.1 As previously mentioned, there are seven principal route options considered for Section 2 of the Study Area between the Hansfield Railway Bridge and Kennan Bridge (Porterstown Road).

9.3.2 The route options for Section 2 are illustrated in drawing **170239-2302** in **Appendix J**.

9.3.3 These options are discussed below in the following paragraphs.

Option S2-1 – Greenway along the northern towpath of the Royal Canal from the Hansfield Railway Bridge to Kennan Bridge;

9.3.4 This option proposes a 4m wide paved greenway which follows the existing towpath along the northern side of the Royal Canal from the Hansfield Railway Bridge to Kennan Bridge, see **Figure 9.9.**

9.3.5 The existing pedestrian route/towpath will be widened towards the northern side, retaining structures or soil nailing into the embankment is likely to be required from the service access at Hansfield Road to Callaghan Bridge.

9.3.6 Land acquisition from a residential property at Callaghan Bridge may be required to enable the greenway to ramp up to Clonsilla Road and ramp back down to the canal towpath. However, to prevent the land acquisition, an alternative option via the existing towpath under Callaghan Bridge (localised pinch point, 2m width) may be utilised.

9.3.7 Cantilevered type boardwalk design required from Callaghan Bridge to Kennan Bridge due to the inadequate width along this section and to protect high value grasslands along the canal embankment whilst avoiding tree removal on the upper embankment (northern side of the greenway).

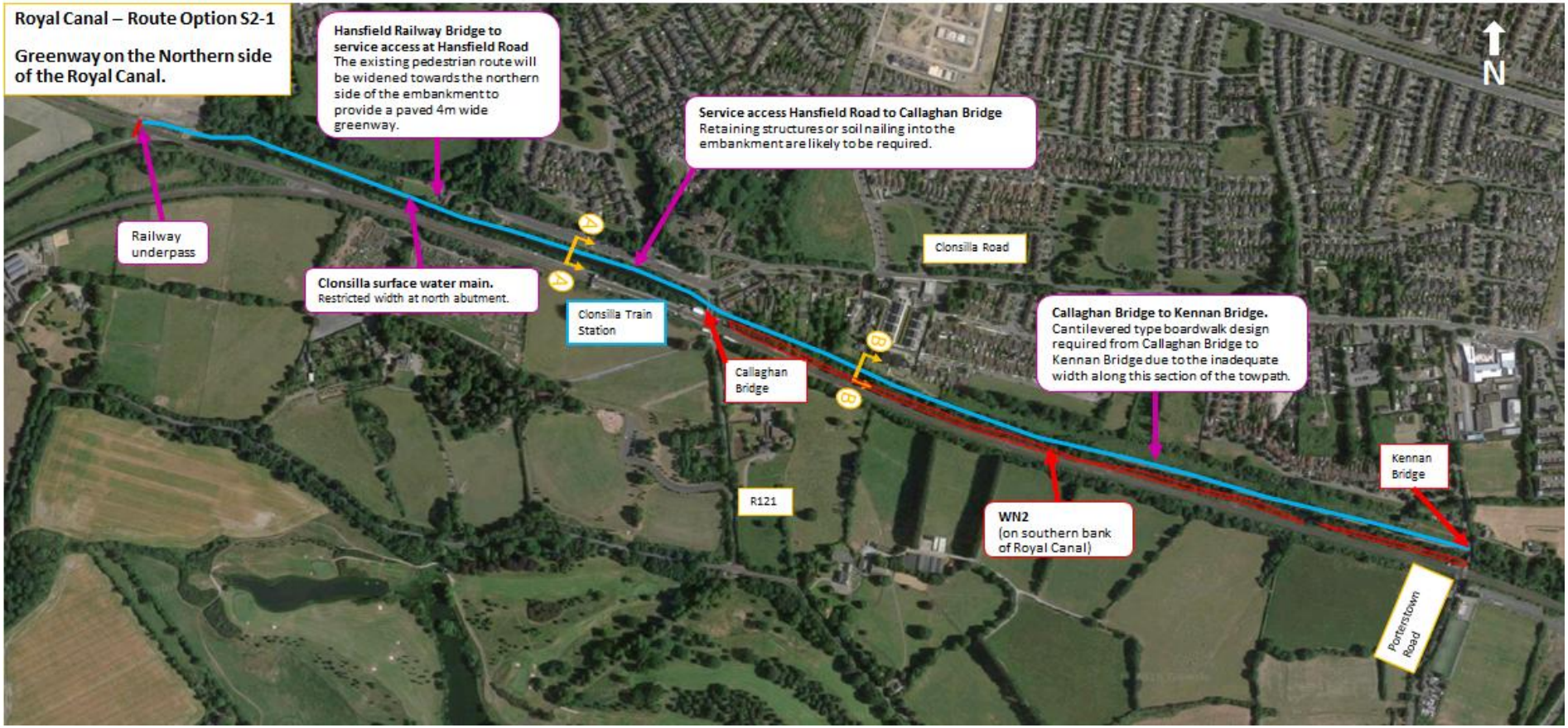


Figure 9.9: Route Option S2-1

9.3.8 The option S2-1 sample cross sections are presented in **Figure 9.10** and **9.11** below.

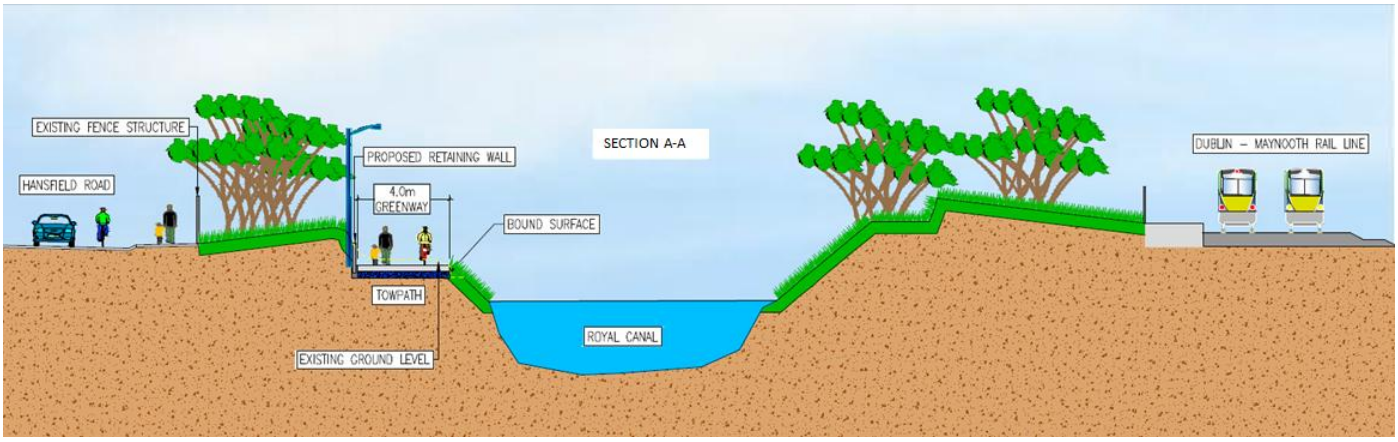


Figure 9.10 Route Option S2-1: Proposed Cross Section A-A.

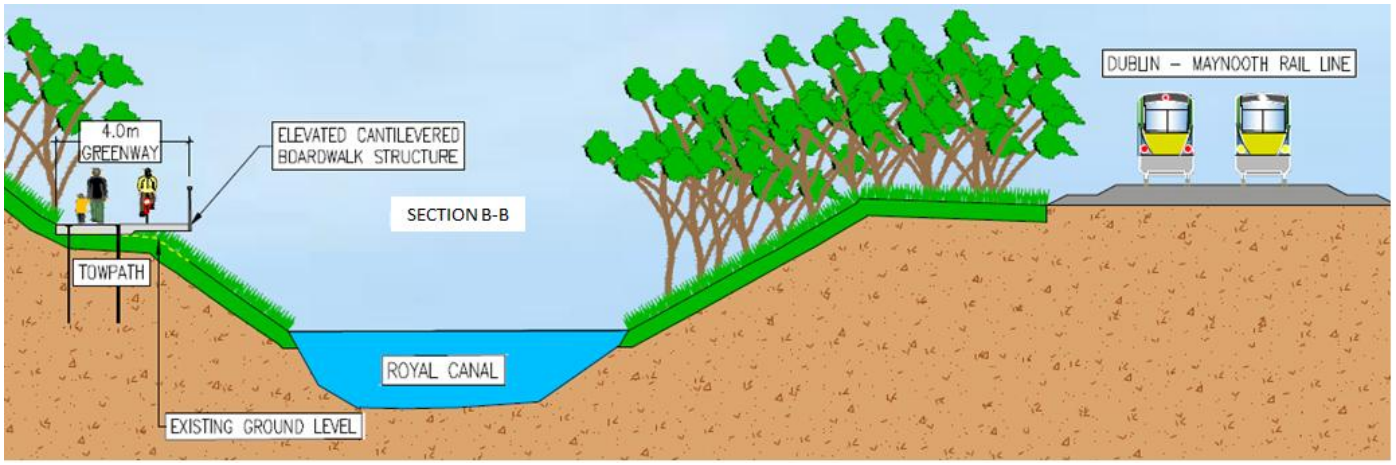


Figure 9.11 Route Option S2-1: Proposed Cross Section B-B.

9.3.9 The following constraints would need to be considered if this route option is progressed:

- Protected structures such as The Royal Canal, Callaghan Bridge and Kennan Bridge.
- Presence of hedgerow and rich grasslands (Annex 1 habitat);
- Watermain thrust block on the banks of the Canal;
- The existing pedestrian route would be widened towards the northern side from Hansfield Railway Bridge to Callaghan Bridge, retaining

structures or soil nailing into the embankment are likely to be required along the majority of the route.

- Pinch point via the existing towpath under Callaghan Bridge (approx. 1.8m);
- Cantilevered type boardwalk design required from Callaghan Bridge to Kennan Bridge due to the inadequate width along this section and to protect high value grasslands along the canal embankment whilst avoiding tree removal on the upper embankment (northern side of the greenway).

Option S2-2 – Greenway along the northern side of the Royal Canal detours from the canal corridor via Hansfield Road, Clonsilla Road and the lands zoned as Town & District Centre;

9.3.10 This option proposes to provide a greenway on the northern side of the Royal Canal from Hansfield Railway bridge along the existing towpath to the service vehicle access onto Hansfield Road and from the lands zoned as Town & District Centre (see Sheet No. 13, Fingal Development Plan 2017-2023 Zoning Maps) to Kennan Bridge. Cycle facilities would be provided along Clonsilla Road (700m) and through the lands zoned as Town & District Centre.

9.3.11 A paved greenway would be provided on the northern side of the Royal Canal from Hansfield Railway Bridge to the service vehicle access at Hansfield Road. The existing cycle facilities on Hansfield Road would be upgraded to a two-way facility on the southern side of the road. Cycle facilities would be provided along Clonsilla Road (may require widening of the existing road reservation) and through the lands zoned as Town & District Centre, see **Figure 9.12** below. Greenway facilities would be provided along the towpath of the Royal Canal (northern bank) from the lands zoned as Town & District Centre to Kennan Bridge.

9.3.12 A cantilevered boardwalk greenway is required along the towpath from lands zoned as Town & District Centre to Kennan Bridge, due to the inadequate width along this section and to protect high value grasslands along the canal embankment whilst avoiding tree removal on the upper embankment (northern side of the greenway).

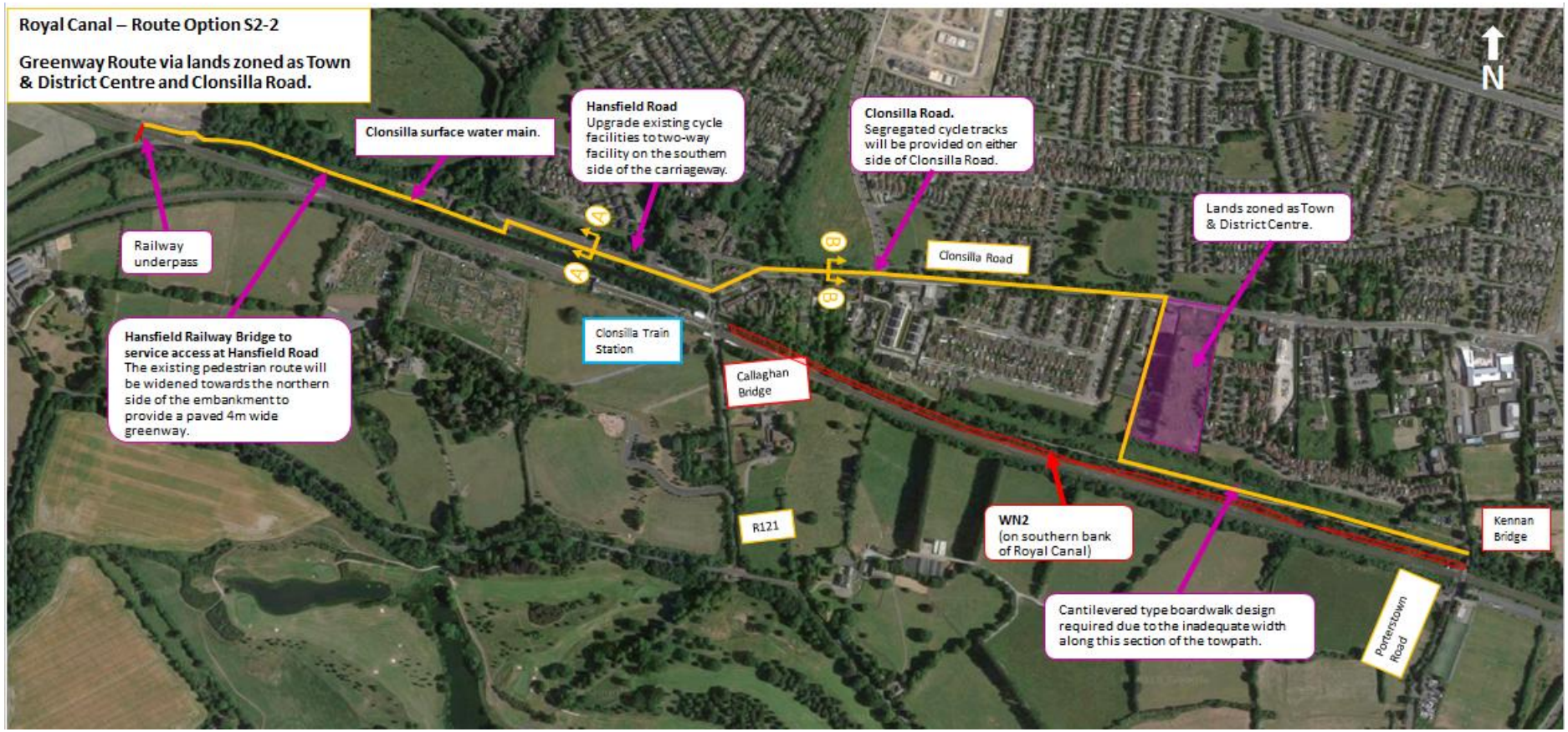


Figure 9.12: Route Option S2-2

9.3.13 The option S2-2 sample cross sections are presented in **Figures 9.13 - 9.14** below.

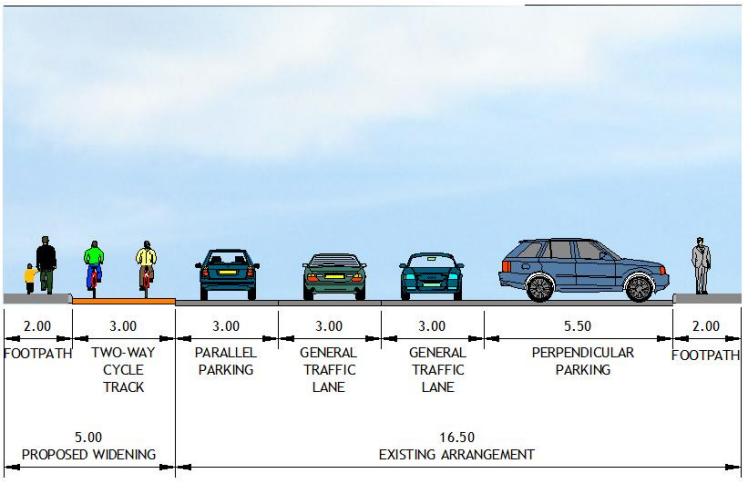


Figure 9.13: Route Option S2-2: Proposed Cross Section A-A.

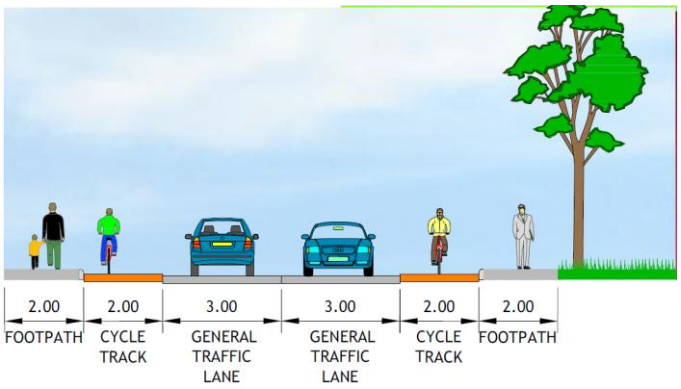


Figure 9.14: Route Option S2-2: Proposed Cross Section B-B.

9.3.14 The following constraints would need to be considered if this route option is progressed:

- Protected structures such as The Royal Canal and Kennan Bridge.
- Watermain thrust block on the banks of the Canal;
- Providing cycle facilities along Clonsilla Road may require widening of the existing road reservation into the verge;
- Cycle facilities required through the lands zoned as Town & District Centre;

- Cantilevered type boardwalk design required along the towpath from the lands zoned as Town & District Centre and Kennan Bridge due to the inadequate width along this section and to protect high value grasslands along the canal embankment whilst avoiding tree removal on the upper embankment (northern side of the greenway).

Option S2-3 – Greenway along the northern side of the Royal Canal detours from the canal corridor via Hansfield Road, Clonsilla Road and Weavers Wood;

9.3.15 This option proposes to provide the Greenway on the northern side of the Royal Canal, along the existing towpath, from Hansfield Railway Bridge to Hansfield Road and from Weavers Wood to Kennan Bridge. Cycle facilities would be provided along Clonsilla Road (250m) and through Weavers Wood to Kennan Bridge.

9.3.16 A paved greenway would be provided on the northern side of the Royal Canal from Hansfield Railway Bridge to the service vehicle access at Hansfield Road. The existing cycle facilities on Hansfield Road would be upgraded to a two-way facility on the southern side of the road. Cycle facilities would be provided along Clonsilla Road (would require widening of the existing road reservation) and through Weavers Wood residential estate. Cyclists will share the road carriageway with vehicles along Weavers Wood (cul-de-sac, low vehicular volumes) to the northern bank of the canal. Greenway facilities would be provided on the northern bank of the Royal Canal from Weavers Wood to Kennan Bridge. See **Figures 9.15** below.

9.3.17 A cantilevered boardwalk greenway is required along the towpath from the Weavers Wood to Kennan Bridge along the towpath, due to the inadequate width along this section and to protect high value grasslands along the canal embankment whilst avoiding tree removal on the upper embankment (northern side of the greenway).

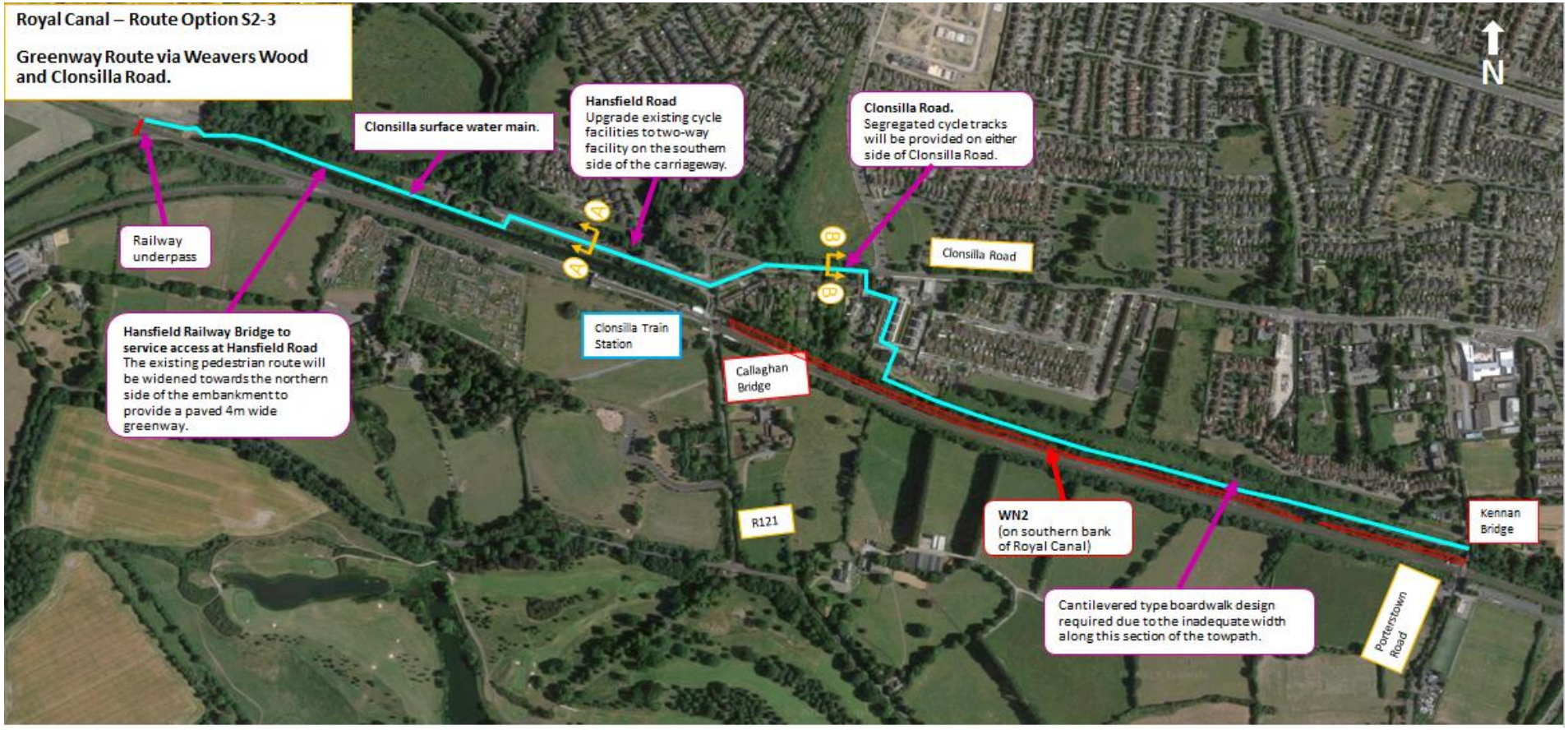


Figure 9.15: Route Option S2-3

9.3.18 The option S2-3 sample cross sections are presented in **Figures 9.16 - 9.17** below.

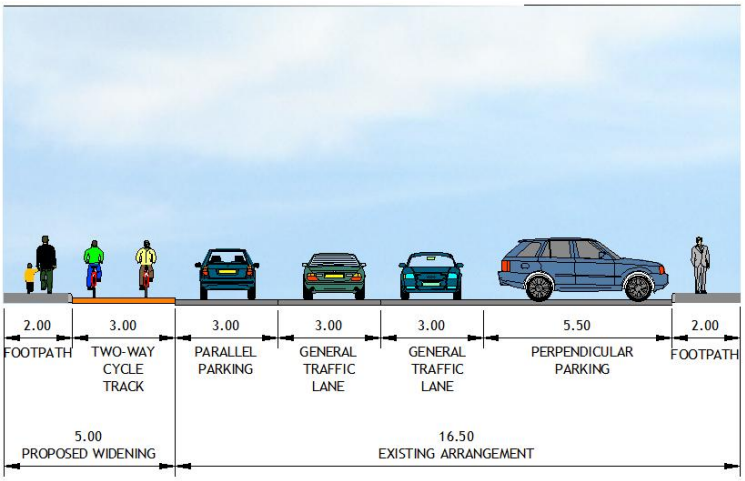


Figure 9.16: Route Option S2-3: Proposed Cross Section A-A.

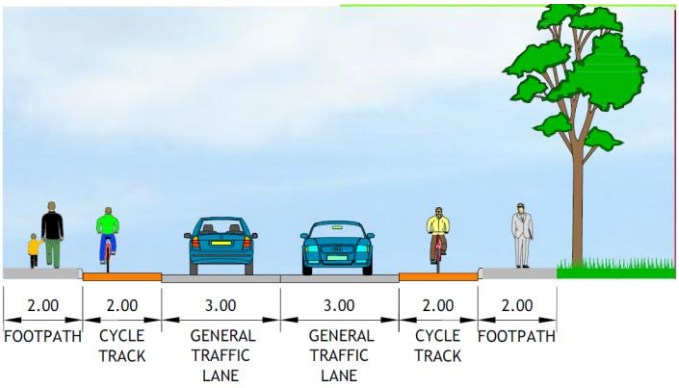


Figure 9.17: Route Option S2-3: Proposed Cross Section B-B.

9.3.19 The following constraints would need to be considered if this route option is progressed:

- Protected structures such as The Royal Canal, Callaghan Bridge and Kennan Bridge;
- Water main thrust block on the banks of the Canal;
- Providing Cycle facilities along Clonsilla Road may require widening of the existing road reservation;

- Cyclists will share the road carriageway with vehicles along Weavers Wood (cul-de-sac, low vehicular volumes);
- Cantilevered type boardwalk design required along the towpath from Weavers Wood to Kennan Bridge due to the inadequate width along this section and to protect high value grasslands along the canal embankment whilst avoiding tree removal on the upper embankment (northern side of the greenway).

Option S2-4 – Greenway along the northern side of the Royal Canal detours from the canal corridor via Hansfield Road, Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.

9.3.20 This option proposes to provide a Greenway on the northern side of the Royal Canal, along the existing towpath, from Hansfield Railway Bridge to Hansfield Road. Cycle facilities would be provided along Clonsilla Road (250m) and through Weavers Walk. Greenway facilities would be provided from Weavers Walk to Kennan Bridge via the Lambourn Park and The Village green areas.

9.3.21 A paved 4m wide greenway would be provided on the northern side of the Royal Canal from Hansfield Railway Bridge to the service vehicle access at Hansfield Road. The existing cycle facilities on Hansfield Road would be upgraded to a two-way facility on the southern side of the road. Cycle facilities would be provided along Clonsilla Road (may require widening of the existing road reservation) and through Weavers Walk. Greenway facilities would be provided from the Weavers Walk to Kennan Bridge via both green areas in Lambourn Park and The Village residential estates and through the lands zoned as Town & District Centre. See **Figure 9.18** below.

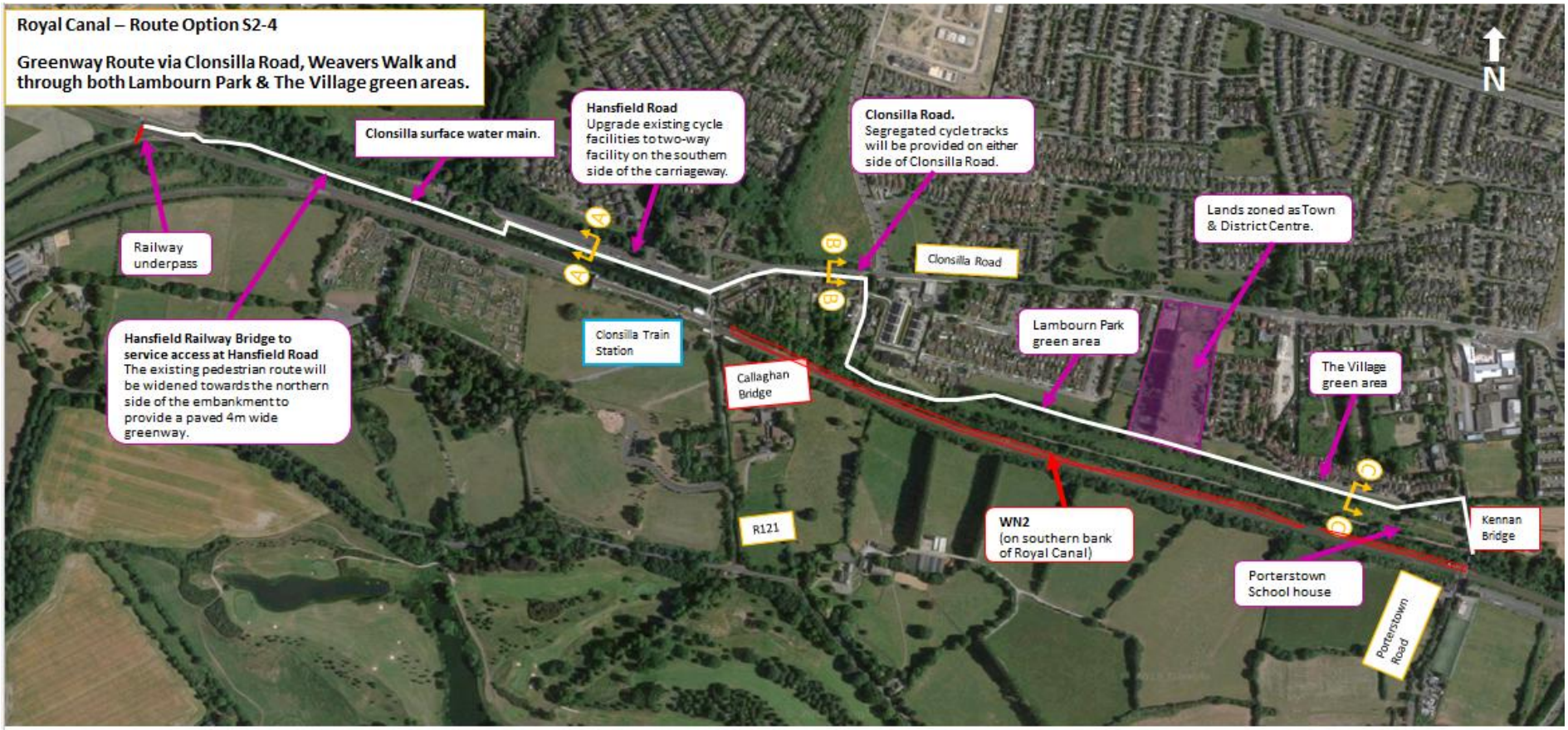


Figure 9.18: Route Option S2-4

9.3.22 The option S2-4 proposed cross sections are presented in **Figures 9.19 - 9.21** below.

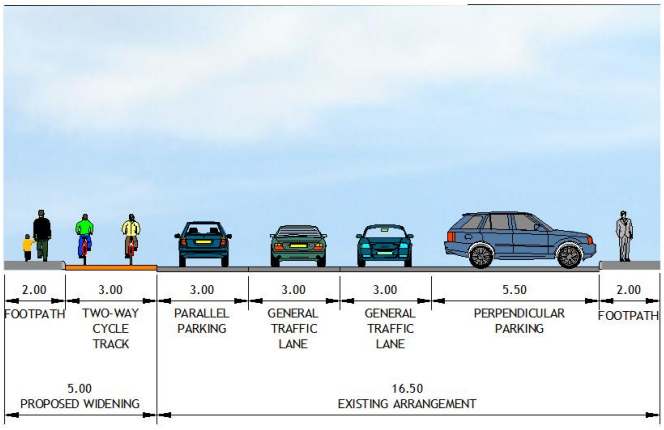


Figure 9.19: Route Option S2-4: Proposed Cross Section A-A.

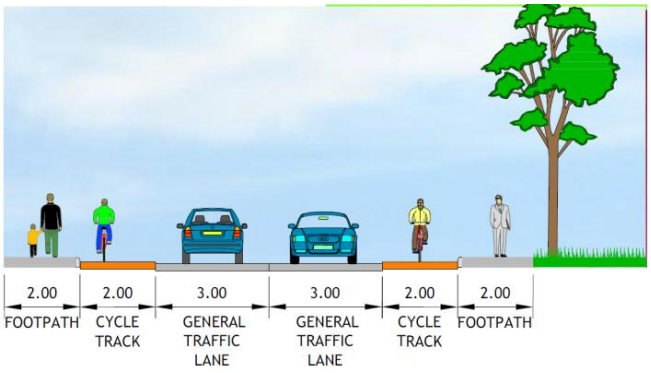


Figure 9.20: Route Option S2-4: Proposed Cross Section B-B.

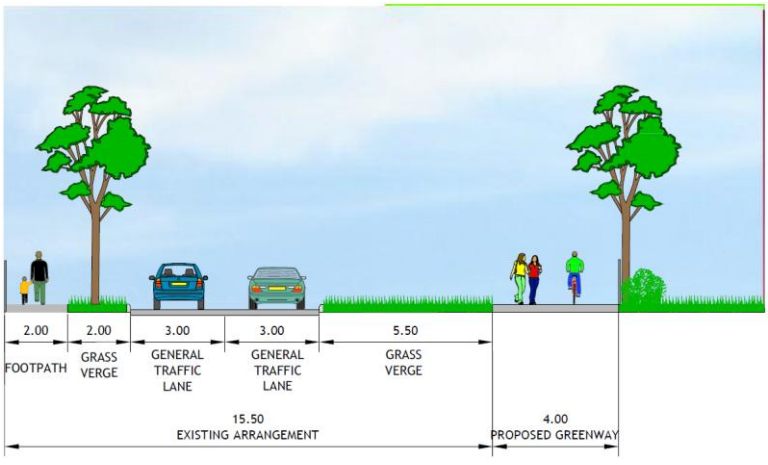


Figure 9.21: Route Option 2-4: Proposed Cross Section C-C.

9.3.23 The following constraints would need to be considered if this route option is progressed:

- Protected bridges such as The Royal Canal, Callaghan Bridge and Kennan Bridge;
- Watermain thrust block on the banks of the Canal;
- Providing Cycle facilities along Clonsilla Road may require widening of the existing road reservation into the verge; and
- Cycle facilities provided through Lambourn Park green area, the lands zoned as Town & District Centre and The Village green area (land acquisition may be required);
- Cyclists will share the road carriageway with vehicles along Weavers Walk (cul-de-sac, low vehicular volumes)

Option S2-5 – Greenway along the northern towpath of the Royal Canal from the Hansfield Railway Bridge to the Portertown Old School House lands where it detours slightly from the canal corridor.

9.3.24 This option proposes to provide a Greenway on the northern side of the Royal Canal from Hansfield to Kennan Bridge via Porterstown School House lands between Callaghan and Kennan bridges.

9.3.25 This involves widening of the existing pedestrian route to 4m along the northern side of Royal Canal from Hansfield Railway bridge to the proposed ramp into the Porterstown Old School House lands. Retaining structures or soil nailing into the embankment may be required on approach to Callaghan Bridge from the west and cantilevered structures may be required from Callaghan Bridge to the Old Schoolhouse lands.

9.3.26 Land acquisition from a residential property at Callaghan Bridge would be required to enable the greenway to ramp up to Clonsilla Road and ramp back down to the canal towpath, however, to prevent the land acquisition, an alternative option via the existing towpath under Callaghan is proposed (localised pinch point, 2m width).

9.3.27 A greenway ramp (approx. 70m in length) and associated retaining works would be required to ramp from the towpath to the upper level of the Old School House lands (<4 metre level difference). A paved surface along the majority of the route within the School House lands would be the primary design solution.

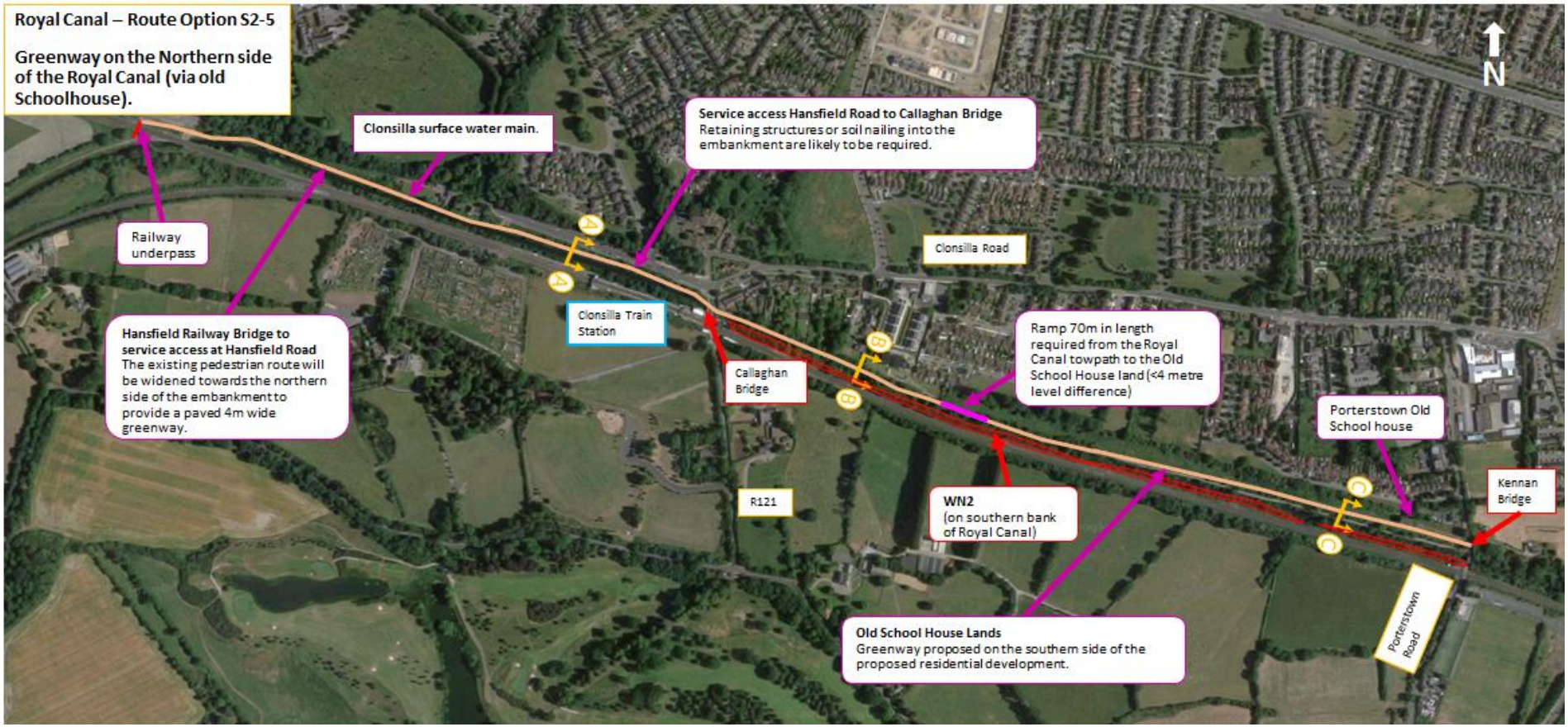


Figure 9.22: Route Option S2-5

9.3.28 The option S2-5 proposed cross sections are presented in **Figures 9.23 - 9.25** below.

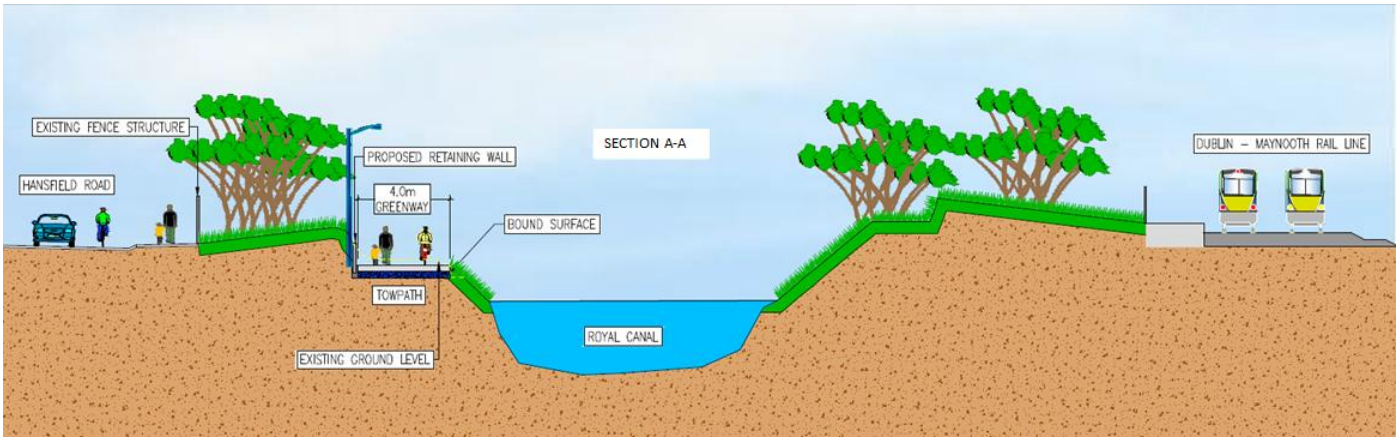


Figure 9.23: Route Option S2-5: Proposed Cross Section A-A.

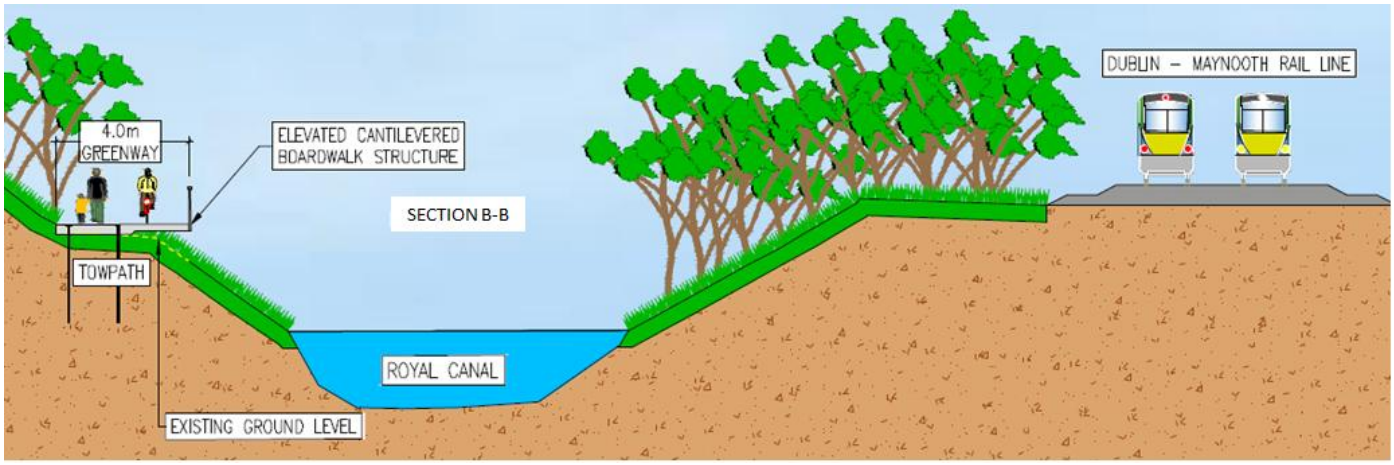


Figure 6.24 Route Option S2-5: Proposed Cross Section B-B.

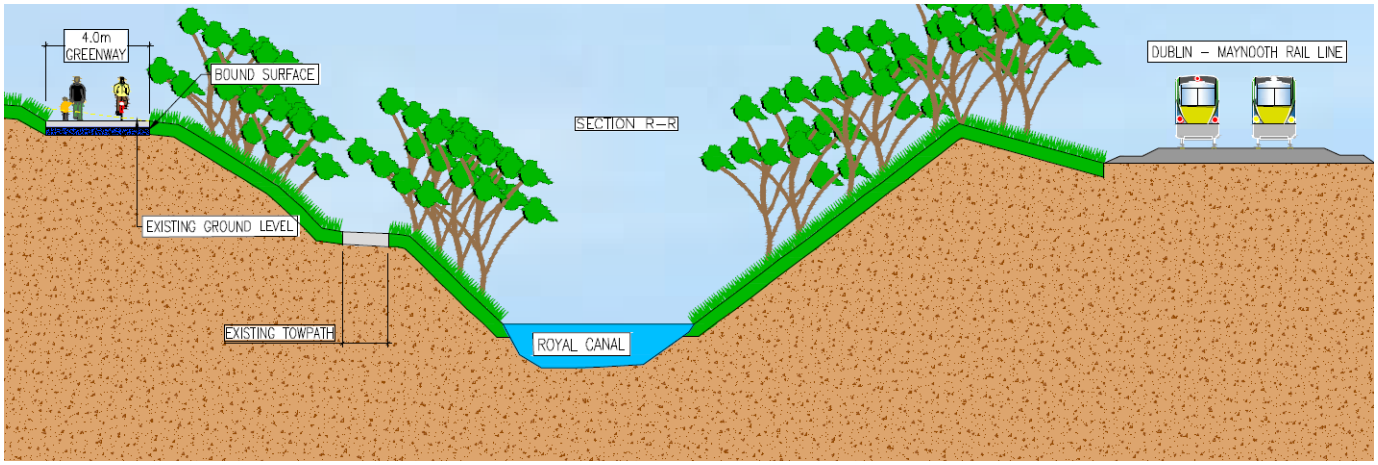


Figure 9.25 Route Option S2-5: Proposed Cross Section C-C.

9.3.29 The following constraints would need to be considered if this route option is progressed:

- Protected bridges structures such as The Royal Canal, Callaghan Bridge and Kennan Bridge;
- Watermain thrust block on the banks of the Canal;
- Presence of hedgerow and rich grasslands (Annex 1 habitat);
- The existing pedestrian route would be widened towards the northern side from Hansfield Railway Bridge to Callaghan Bridge, retaining structures or soil nailing into the embankment are likely to be required along the majority of the route.
- Pinch point via the existing towpath under Callaghan Bridge (approx. 1.8m);
- Ramp 70m in length required from the Royal Canal towpath to the Old School House land (<4 metre level difference);
- Cantilevered type boardwalk design required from the Callaghan Bridge to the proposed ramp due to the inadequate width along this section.
- Greenway via Old School House lands, Porterstown. Land acquisition may be required while the site is the subject of development by the landowner as part of a Strategic Housing Development which is the subject of a separate planning approvals process;

Option S2-6 – Greenway along the northern side of the Royal Canal detours from the canal corridor via Hansfield Road, Clonsilla Road, Weavers Walk and Porterstown Old School house;

9.3.30 This option proposes to provide a Greenway on the northern side of the Royal Canal, along the existing towpath, from Hansfield Railway Bridge to Hansfield Road. Cycle facilities would be provided along Clonsilla Road (250m) and through Weavers Walk. Greenway facilities would be provided from Weavers Walk to Kennan Bridge via the Old School House lands.

9.3.31 A paved 4m wide greenway would be provided on the northern side of the Royal Canal from Hansfield Railway Bridge to the service vehicle access at Hansfield Road. The existing cycle facilities on Hansfield Road would be upgraded to a two-way facility on the southern side of the road. Cycle facilities would be provided along Clonsilla Road (may require widening of the existing road reservation) and through Weavers Walk. Greenway facilities would be provided from Weavers Walk to Kennan Bridge via the Old School House lands. See **Figure 9.26** below.

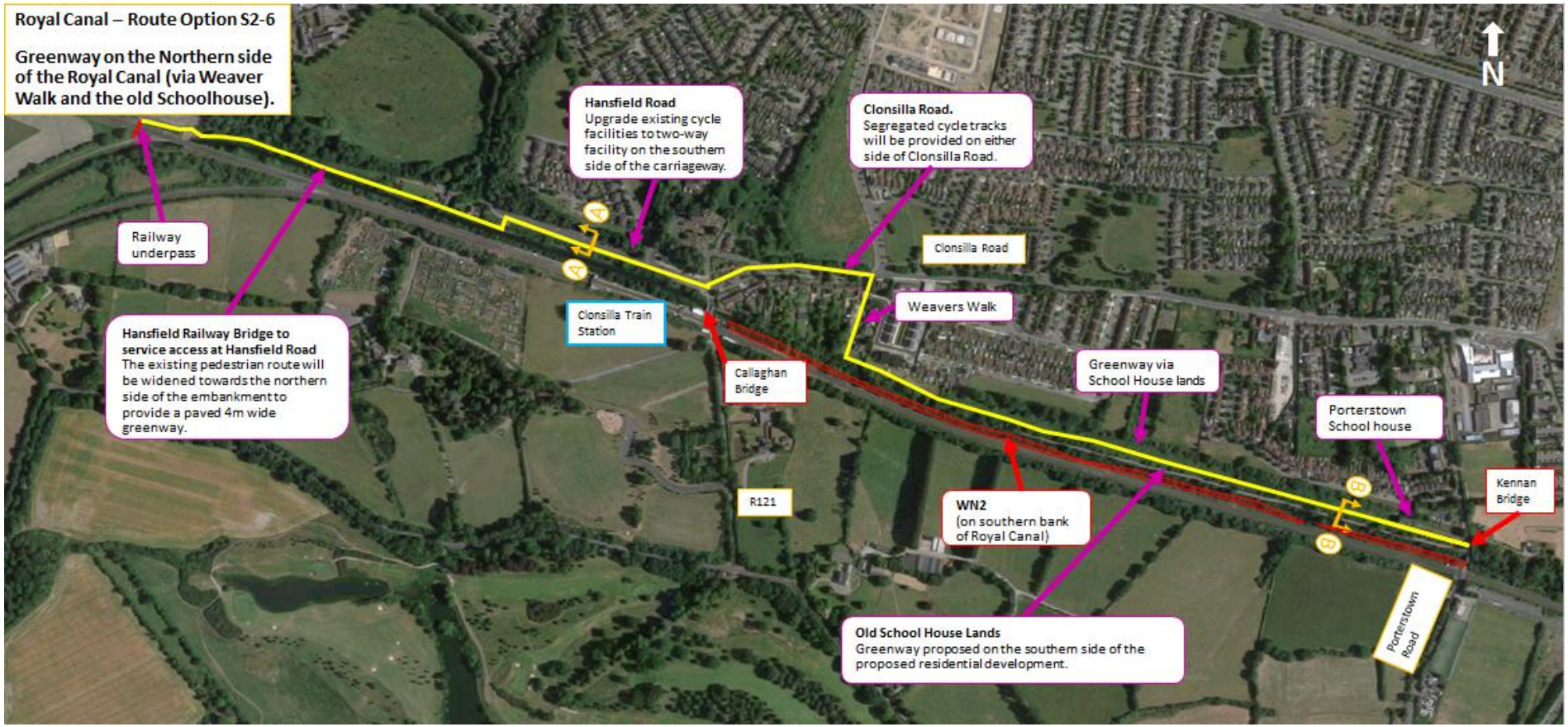


Figure 9.26: Route Option S2-6

9.3.32 The option S2-6 proposed cross sections are presented in **Figures 9.27 - 9.28** below.

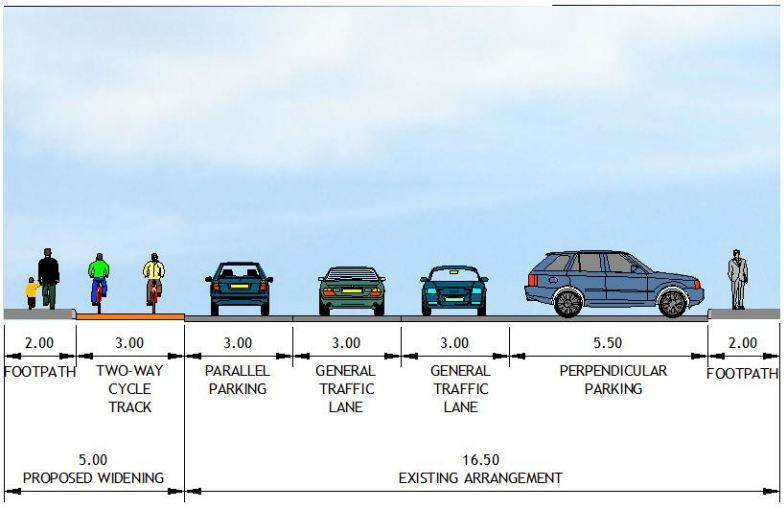


Figure 9.27: Route Option 2-6: Proposed Cross Section A-A.

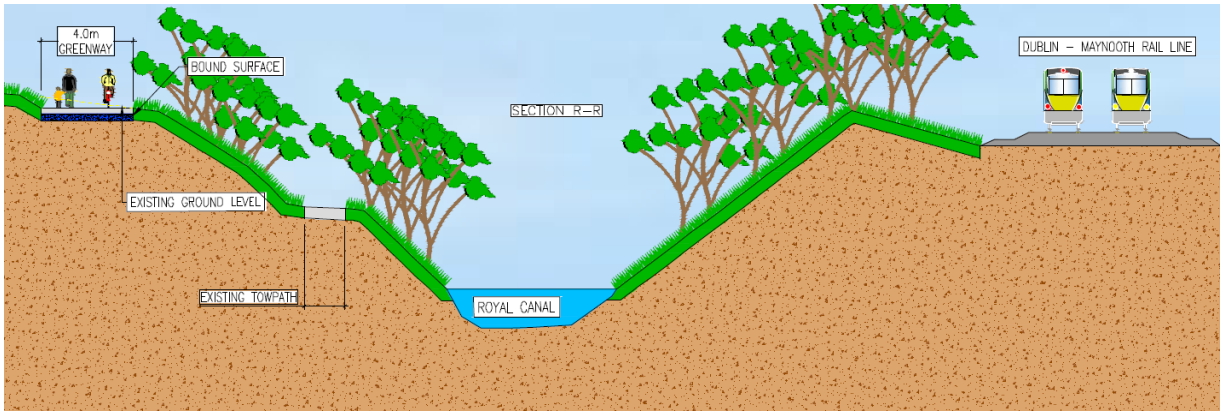


Figure 9.28: Route Option 2-6: Proposed Cross Section B-B.

9.3.33 The following constraints would need to be considered if this route option is progressed:

- Protected structures such as The Royal Canal and Kennan Bridge;
- Watermain thrust block on the banks of the Canal;
- Providing Cycle facilities along Clonsilla Road may require widening of the existing road reservation;
- Cyclists will share the road carriageway with vehicles along Weavers Walk (cul-de-sac, low vehicular volumes); and

- Greenway via the Old School House lands. Land acquisition may be required while the site is the subject of development by the landowner as part of a Strategic Housing Development which is the subject of a separate planning approvals process;

Option S2-7 – Greenway runs along the northern towpath of the Royal Canal to Callaghan Bridge, where it detours slightly from the canal corridor via the Porterstown Old School House Lands (land acquisition from residential properties eastbound from Callaghan Bridge);

9.3.34 This option proposes to provide a Greenway along the existing towpath, on the northern side of the Royal Canal from Hansfield Railway Bridge to Kennan Bridge via the Old School House lands, Porterstown.

9.3.35 This route option involves widening of the existing pedestrian route to 4m along the northern side of Royal Canal from Hansfield Railway bridge to Callaghan Bridge, retaining structures or soil nailing into the embankment may be required along particular sections of the route.

9.3.36 Land acquisition from a residential property at Callaghan Bridge may be required to enable the greenway to ramp up to Clonsilla Road and ramp back down to the canal towpath.

9.3.37 To provide the 4m wide greenway from Callaghan Bridge to Weaver Walk, land acquisition from residential back gardens is proposed. The Greenway facilities will continue through the Old School House lands.

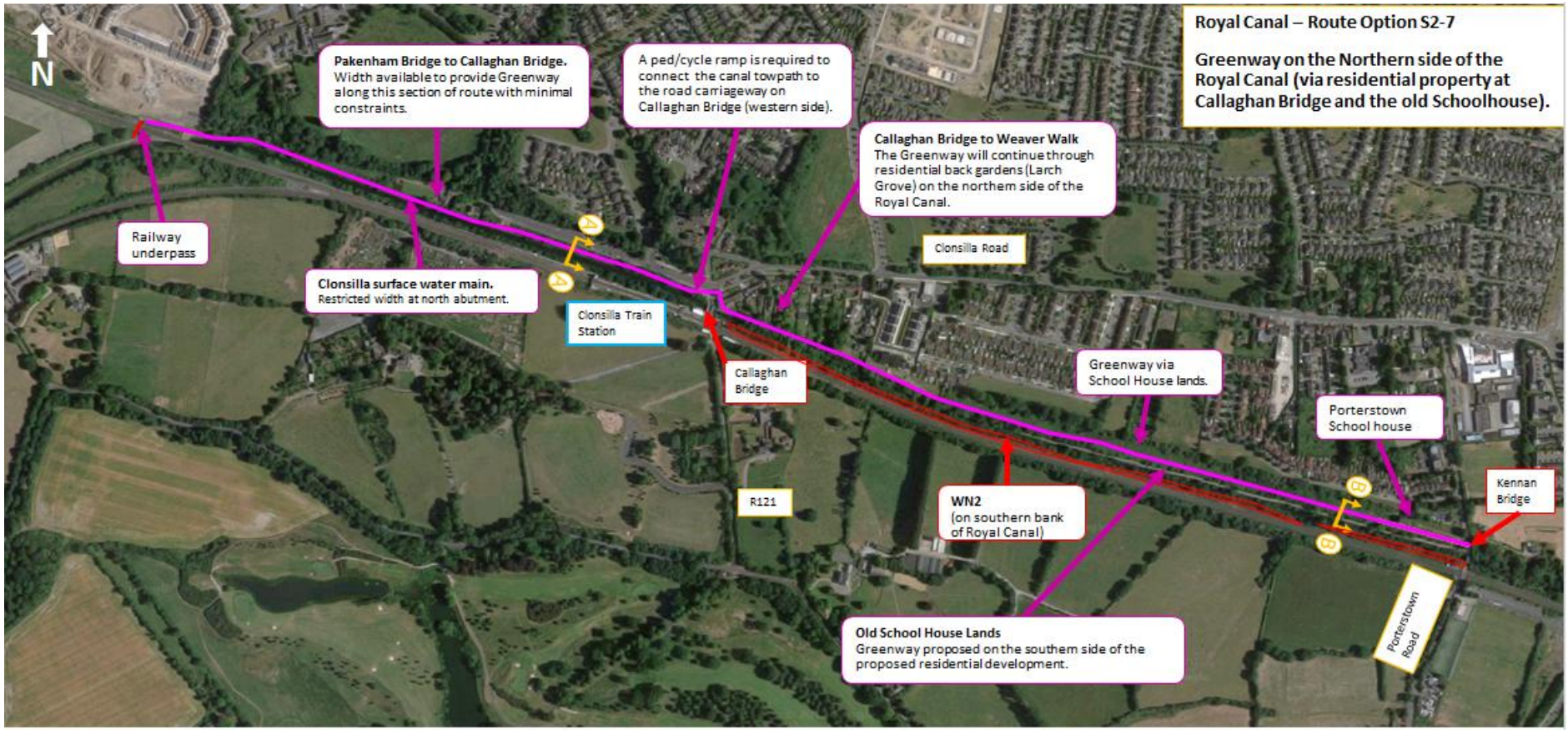


Figure 9.29: Route Option S2-7

9.3.38 The option S2-7 proposed cross sections are presented in **Figures 9.30 & 9.31** below.

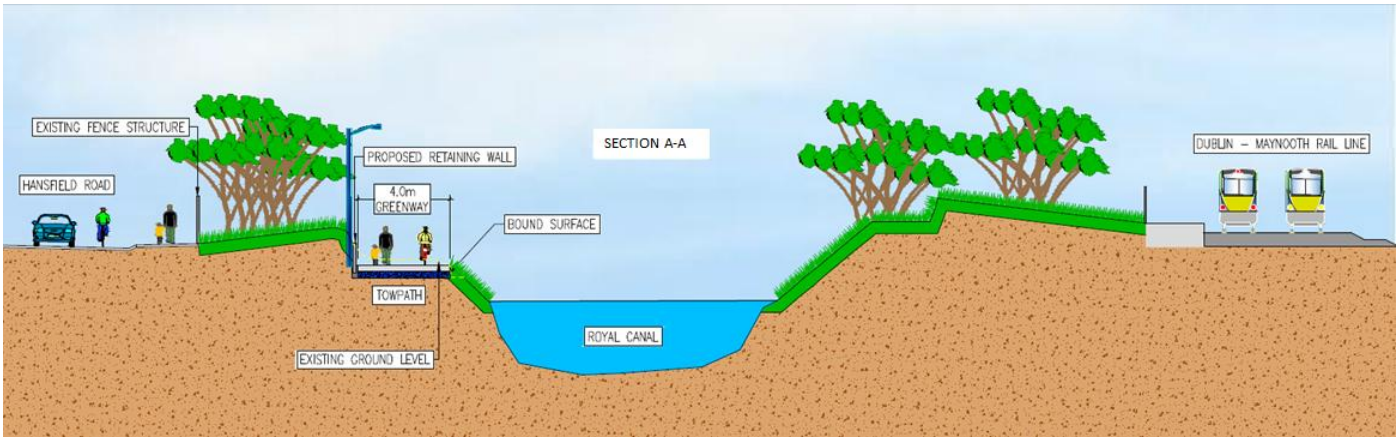


Figure 9.30: Route Option S2-7: Proposed Cross Section A-A.

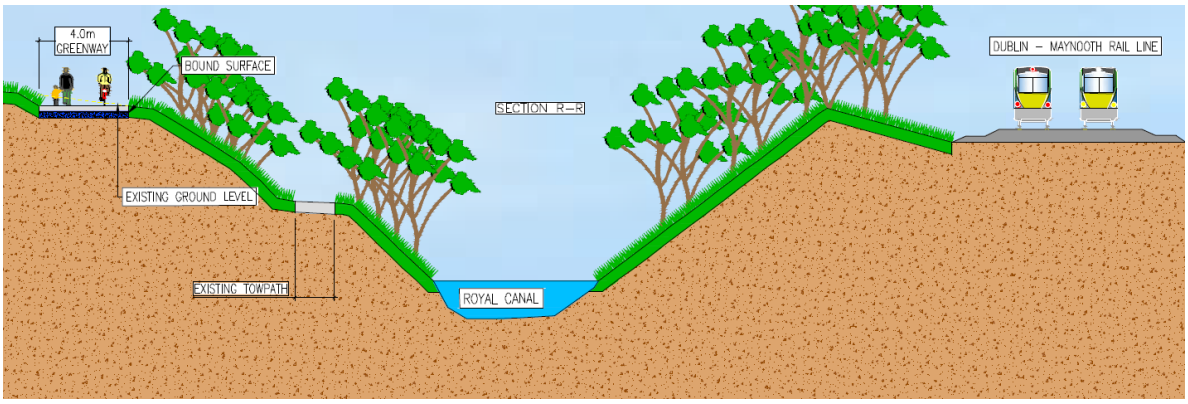


Figure 9.31 Route Option S2-7: Proposed Cross Section B-B.

9.3.39 The following constraints would need to be considered if this route option is progressed:

- Protected structures such as The Royal Canal, Callaghan Bridge and Kennan Bridge;
- Presence of hedgerow and rich grasslands (Annex 1 habitat);
- Watermain thrust block on the banks of the Canal;
- Land acquisition from a residential property at Callaghan Bridge may be required to enable the greenway to ramp up to Clonsilla Road and ramp back down to the canal towpath;
- Greenway provided through residential back gardens east of Callaghan Bridge, land acquisition required; and

- Greenway via Old School House lands. Land acquisition would be required while the site is the subject of development by the landowner as part of a Strategic Housing Development which is the subject of a separate planning approvals process;

Section 2 Route Options Multi-Criteria Analysis

9.3.40 The Multi-Criteria Analysis route options assessment summary tables for the Route Options for Section 2 are presented in **Appendix C**. The relative ranking of route options against the scheme assessment sub-criteria are summarised in **Table 9.3** below.

Royal Canal Urban Greenway Route Options for section 2								
Appraisal Criteria	Sub-Criteria	Option S2-1 Greenway on the Northern side of the Royal Canal.	Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.	Option S2-3 Greenway Route via new development at Weavers Walk and Clonsilla Road.	Option S2-4 Greenway Route via Weavers Walk and Clonsilla Road.	Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).	Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).	Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties at Callaghan Bridge and Porterstown School house).
1 Economy	1A Capital Cost							
	1B Constructability							
	1C Quality of Service							
2 Integration	2A Cycle Network Integration							
	2B Traffic Network Integration							
	2C Potential Impact on Rail Network							
	2D Potential Impact on Canal Users							
	2E Potential Impact on Communities/Residents							
3 Safety	3A Road Safety							
	3B Pedestrians Safety							
4 Environment	5A Archaeology and Cultural Heritage							
	5B Architectural Heritage							
	5C Flora & Fauna							
	5D Soils, Geology & Hydrology							
	5E Landscape and Visual							
	5F Land Use Character							

Table 9.3: Principal Route Options MCA Summary (Sub-Criteria)

9.3.41 **Capital Costs** -The primary differentiator between route options is the land acquisition costs and the structural infrastructure required for particular routes due to inadequate width along the towpath of the canal. Option S2-7 requires significant land acquisition from residential back gardens (Larch Grove) from Callaghan Bridge to Weaver Walk on the northern side of the canal towpath.

9.3.42 **Constructability** - Option S2-1 proposes to provide a cantilevered boardwalk greenway from Callaghan Bridge to Kennan Bridge along the northern towpath due to the inadequate width along this section. This would be more difficult to construct compared to some of the other route options. Working widths for tracking equipment (drilling rigs or excavators) is limited along the towpath.

9.3.43 **Quality of Service** - Option S2-1 is ranked the best, because the greenway is generally segregated from vehicular traffic for the entire route, it runs along the entire bank of the Royal Canal, it does not have any detours, the environment along the route is pleasant and interesting and the greenway would be 4m wide with no excessive gradients. Compared to options S2-2, S2-3, S2-4 and S2-6 which detour significantly from the Royal Canal via Hansfield Road and Clonsilla Road.

9.3.44 **Cycle Network Integration** - Option S2-1 scores highest because it provides Greenway facilities along the Royal Canal which aligns with the GDA Cycle Network Plan compared to the circuitous route taken by options S2-2, S2-3, S2-4 and S2-6.

9.3.45 **Traffic Network** - Route options S2-2, S2-3, S-4, S2-6 provide cycle facilities along/adjacent to the busy Clonsilla Road which will have a negative impact on traffic. Whereas Options S2-1 and S2-5 score the highest. These routes continue along the towpath or along the southern side of the Old Schoolhouse lands, with minimal interaction with the traffic network.

9.3.46 **Potential Impact on Rail Network** - All route options are on the northern side of the canal, therefore there will be no appreciable impact on the Rail Network.

9.3.47 **Potential Impact on Canal Users** - Option S2-1 will have the most potential to impact on the Canal Users, the extent of the projected cantilever may impact on the operation of barges along the route. Also, for option S2-1, the cantilevered

boardwalk will require safety barriers along the towpath from Callaghan Bridge to Kennan Bridge for 1.2km. These barriers may hinder the used of the towpath to tow barges.

9.3.48 **Potential Impact on Communities/Residents** - Route option S2-4 is ranked the least attractive. Route option S2-4 would involve the opening of cul-de-sacs, from the public consultation some of the main concerns from Lambourn Park residents was the opening of cul-de-sacs. However, this option permits permeability and linkages from the residential catchment, which would result in greater passive surveillance and security for greenway users. Route option S2-5 is ranked the highest as it permits permeability and linkages from existing residential catchments and the proposed residential area in the Old School House lands.

9.3.49 **Safety** - Option S2-2 is ranked the worst. This option proposes to reroute pedestrians and cycles via the busy Hansfield Road and Clonsilla Road, while other options propose the Greenways along the Royal Canal segregated from traffic for the majority of the route. Options S2-1, S2-5 and S2-7 are ranked the highest as they are generally segregated from traffic for the entire route.

9.3.50 **Architecture Heritage** - Route options S2-1 is considered the least attractive, due to the fact that the fabric of the canal itself is a protected structure, and this routes option propose the Greenway along the towpath of the Royal Canal for the entire route. Options S2-4 and S2-6 are considered the most attractive because they may not impact on any protected bridges and they have the least impact on the fabric of the canal (protected structure).

9.3.51 **Flora & Fauna** - Route options S2-2 is considered the most attractive option. It requires significantly less impact on environmentally sensitive trees compared to Option S2-1, which may require removal of a number of trees from Hansfield Railway Bridge to Keenan Bridge (1672m^2). Option S2-1 also has the potential to directly impact Callaghan Bridge, which has suitable crevices for bat roosting, however, no bats were recorded during the survey.

9.3.52 **Soil, Geology & Hydrology** - Route options S2-1 is ranked the lowest because it may potentially impact the soil. For option S2-1, to widen the existing pedestrian route to the north, retaining structures or soil nailing into the embankment is likely to be required from the service access at Hansfield Road to Callaghan Bridge (300m). Cantilevered type boardwalk design (using tensile rods into rock) required along the towpath from Callaghan Bridge to Kennan Bridge due to the inadequate width along this section (1.2km), which would have an impact on soils & Geology.

9.3.53 **Landscape & Visual** - Options S2-1 is the least attractive option. Option S2-1 proposes a retaining structures or soil nailing into the embankment from the service access at Hansfield Road to Callaghan Bridge along the Royal Canal Towpath (300m) and a cantilevered boardwalk greenway would along the existing towpath from Callaghan Bridge to Kennan Bridge (with safety barriers) which would have a significant visual impact on the Royal Canal.

9.3.54 **Land Use Character** - Option S2-7 is ranked the lowest. Option S2-7 requires land acquisition from residential back gardens east of Callaghan Bridge. Options S2-3, S2-4 and S2-6 proposes the greenway through Weaver Wood and Weaver Wood which may impact on their land use character.

9.3.55 A summary of the assessment and relative ranking of route options against the four main assessment criteria is presented in **Table 9.4** below.

Royal Canal Urban Greenway (main criteria) Route Options for section 2							
Appraisal Criteria	Option S1-1 Greenway on the Northern side of the Royal Canal.	Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.	Option S2-3 Greenway Route via new development at Weavers Walk and Clonsilla Road.	Option S2-4 Greenway Route via Weavers Walk and Clonsilla Road.	Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).	Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).	Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties at Callaghan Bridge and Porterstown School house).
1 Economy							
2 Integration							
3 Safety							
4 Environment							

Table 9.4: Principal Route Options MCA Summary (Main Criteria)

9.3.56 Based on the assessment undertaken, route option S2-5 appears to offer more benefits over the other options. Option S2-5 is therefore preferred route option for the following reasons:

- It has no impact on the Iarnród Éireann network;
- It has no appreciable impact on traffic;
- It has very low impact on traffic;
- It is one of the safest options; and

9.3.57 Based on the multi-criteria assessment undertaken for this section of the Study Area, Option S2-5 is identified as the preferred route option for the Section 2 between Hansfield Railway Bridge and Kennan Bridge. Therefore, S2-5 will form part of the preferred route.

9.3.58 The benefits of the preferred route (Option S2-5) can be summarised as follows:

i. Continuous and direct greenway provided for the majority of the route which aligns with the GDA Cycle Network Plan.

ii. It has minimal impact on the Traffic Network, Iarnród Éireann Network and the Canal Users.

iii. It is one of the safest options;

iv. The proposed Dart + West infrastructure at the Old School house site will need to be considered in further detail as designs progress for that scheme.

10.0 SECTION 3 ROUTE OPTION ASSESSMENT

10.1 Introduction

10.1.1 Section 3 extends from Kennan Bridge (Porterstown Road) to Talbot Bridge (Old Navan Road). This section is predominately urban with extensive residential catchments on both sides of the Canal. The existing towpath for Section 3 is along the southern side of the Royal Canal directly adjacent to the railway line/stations. The "Deep Sinking" continues through Section 3 from Kennan Bridge to Granard Bridge. It presents significant challenges to the provision of a continuous 4m greenway route. The layout of the existing towpath typically consists of a 2-3m wide track flanked by a deep cutting of 1.0 – 9.0m to the canal on a varying height embankment adjacent to the Dublin – Maynooth Railway.

10.2 Section 3 – Sub-sections

10.2.1 Section 3 has been divided into three sub-sections due to the complexity of the 'deep sinking' section and to simplify the option assessment process as illustrated below in **Figure 10.1**: -

- Section 3a – between Kennan Bridge (Porterstown Road) and Kirkpatrick Bridge (Coolmine Road).
- Section 3b – between Kirkpatrick Bridge (Coolmine Road) and Granard Bridge (Castleknock Road).
- Section 3c – between Granard Bridge (Castleknock Road) and Talbot Bridge (Old Navan Road)

10.2.2 The preferred route option for each sub-section (Section 3a, 3b and 3c) will be combined to create the preferred route option for Section 3.



Figure 10.1: Section 3 Sub-Sections

10.3 Section 3a – Introduction

10.3.1 When assessing the route options for Section 3a, there are 6 route options (Option S3a-1, S3a-2, S3a-3, S3a-4, S3a-5 and S3a-6) between Kennan Bridge (Porterstown Road) and Kirkpatrick Bridge (Coolmine Road).

10.3.2 The following six route options were taken forward:

- Option S3a-1 - Greenway along the southern side of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge;
- Option S3a-2 - Greenway on the northern bank of the Royal Canal and via Sheepmoor lane;
- Option S3a-3 - Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall;
- Option S3a-4 - Greenway via Windmill Court and Sheepmoor lane;
- Option S3a-5 - Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath;
- Option S3a-6 - Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side of the canal from Sheepmoor Lane to Kirkpatrick Bridge.

10.3.3 The route options for Section 3a are illustrated in drawing **170239-2303** in **Appendix J**.

10.3.4 The assessment process has been outlined in **Chapter 7** of this report. In this section of the report it is proposed to set out the assessment procedure and results for the Study Area between Kennan Bridge (Porterstown Road) and Kirkpatrick Bridge (Coolmine Road).

10.3.5 The assessment of the options is discussed further in **Chapter 10.4** below.

10.4 Section 3a – Option Assessment

Option S3a-1 - Greenway along the southern side of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge;

10.4.1 This option proposes to provide a greenway on the southern side of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge.

10.4.2 This route option involves widening of the existing pedestrian route/towpath along the southern side of Royal Canal to 4m for the entire section. A cantilevered boardwalk greenway is required from Kennan Bridge to Kirkpatrick Bridge due to the inadequate width along this section of the towpath (900m). This section via the Deep Sinking has steep banks and is close proximity to the railway line. See **Figure 10.2** below

10.4.3 The cantilever structure would be located at the base of the Iarnród Éireann infrastructure. Measures will need to be undertaken to minimise any effects on the live rail system (e.g. settlement/slope slips).

10.4.4 At narrow canal widths, the final extents of the projected cantilever will need to satisfy Waterways Ireland minimum navigational widths.

10.4.5 Working widths for tracking equipment (drilling rigs or excavators) is limited. The separation distance between existing access points to the towpath is approximately 900m. An option to use canal with a barge type system for a working platform could be considered. This will need to be coordinated with Waterways Ireland and recreational users.

10.4.6 As part of DART + West proposals, Kennan Bridge (Porterstown Road) will be closed to vehicular traffic. However, pedestrians and cyclists will be able to continue to use the Kennan Bridge to access the northern or southern towpath depending on direction of travel.

10.4.7 As part of DART + West proposals, at Kennan Bridge and Kirkpatrick Bridge shared pedestrian/cycle bridges will be provided over the railway lines.



Figure 10.2: Route Option S3a-1

10.4.8 The option S3a-1 proposed cross section A-A is presented in **Figure 10.3** below.

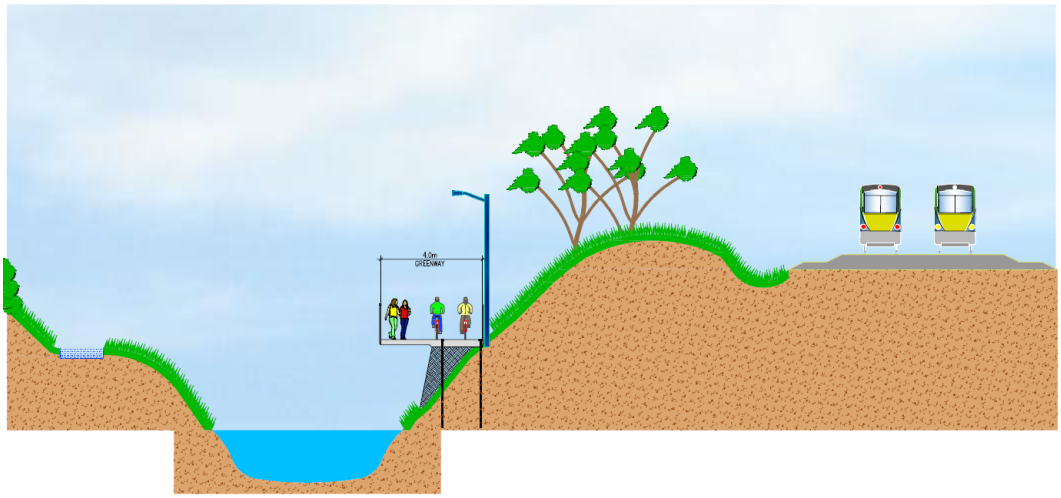


Figure 10.3 Route Option S3a-1: Proposed Cross Section A-A.

10.4.9 The following constraints would need to be considered if this route option is progressed:

- Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Kirkpatrick Bridge (approx. 900m) due to the railway line on the southern side of the towpath, thereby preventing permeability and linkages from existing and future residential catchments which are predominantly on the northern side of the canal (in accordance with DMURS principles).
- Environmentally sensitive trees along the southern bank of the Royal Canal, Oak-Ash-Hazel woodlands (WN2);
- Protected bridges (Kennan Bridge and Kirkpatrick Bridge);
- Route has the potential to directly impact Kirkpatrick Bridge, which has suitable crevice's which have been recorded as a bat roost;
- Cantilevered type boardwalk design is required along the southern bank due to the inadequate width along this section;
- Construction of the greenway under the Dr.Troy bridge in close proximity to bridge piers/abutments.

- At narrow canal widths the final extents of the projected cantilever will need to satisfy Waterways Ireland minimum navigational widths;
- Provision of a cantilevered boardwalk greenway along the southern towpath between Kennan Bridge and Kirkpatrick Bridge would have a significant visual impact on the Royal Canal.
- Greenway route adjacent to the railway line for the entire section (900m length) may have a potential impact on the rail network.
- DART + West proposals at Kennan Bridge (Porterstown Road) and Kirkpatrick Bridge (Coolmine Road).

Option S3a-2 - Greenway on the northern bank of the Royal Canal and via Sheepmoor lane;

10.4.10 This option proposes to provide a greenway on the northern side of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge.

10.4.11 To reduce the impact on highly sensitive trees, the proposed route is located in close proximity to canal edge along the northern embankment from Kennan Bridge to Sheepmoor Lane.

10.4.12 A piled boardwalk structure (4m wide) is proposed along the northern embankment due to the uneven terrain and to minimise impacts on habitats.

10.4.13 Working widths for tracking equipment (drilling rigs or excavators) is limited. An option to use the canal with a barge type system for a working platform could be considered. This will need to be coordinated with Waterways Ireland and recreational users.

10.4.14 At narrow canal widths, the final extents of the projected cantilever will need to satisfy Waterways Ireland minimum navigational widths.

10.4.15 The greenway route will ramp up to Sheepmoor Lane from the northern embankment of the canal.

10.4.16 Greenway users will share the road carriageway with vehicles along Sheepmoor Lane (low volume of vehicular use). See **Figure 10.4** below.



Figure 10.4: Route Option S3a-2

10.4.17 The option S3a-2 proposed cross sections are presented in **Figure 10.5** and **Figure 10.6** below.

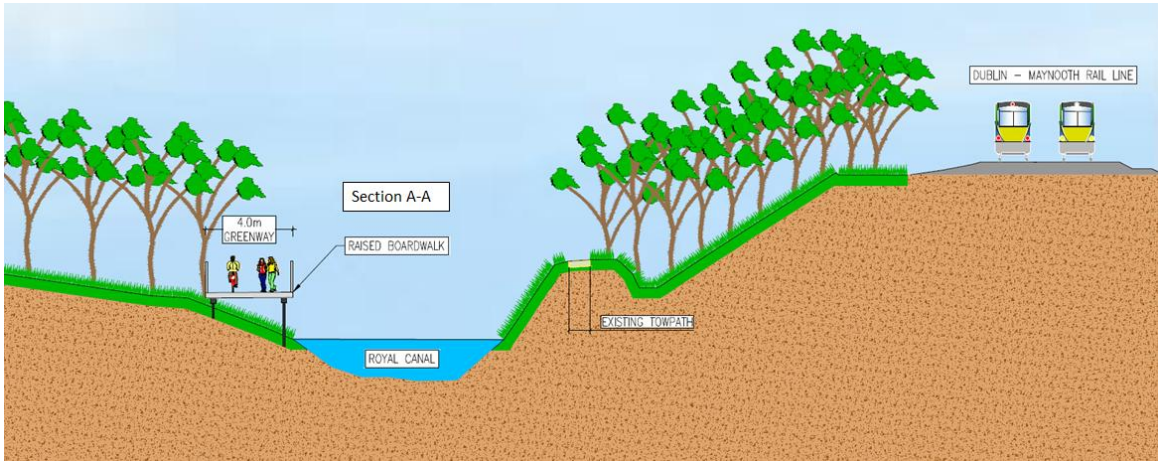


Figure 10.5: Route Option S3a-2: Proposed Cross Section A-A.



Figure 10.6: Route Option S3a-2: Photomontage Section B-B (Sheepmoor Lane).

10.4.18 The following constraints would need to be considered if this route option is progressed:

- Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Sheepmoor Lane (approx. 620m) due to the wooded area on the northern side of the route, thereby resulting in a less secure and safe facility for pedestrians.
- Environmentally sensitive trees from Kennan Bridge to Kirkpatrick Bridge, on the northern side of the Royal Canal (Oak-Ash-Hazel woodlands (WN2);
- The proposed greenway route along the northern embankment of the canal may impact on highly sensitive trees and habitats along the bank of the canal. A piled boardwalk structure is proposed to minimise the impact on habitats
- Possible removal of significant number of trees and habits along the northern bank of the royal canal and when the greenway ramps up to Sheepmoor Lane.
- Provision of a raised boardwalk greenway along the northern bank could have a significant visual impact on the Royal Canal.
- Protected bridges (Kennan Bridge and Kirkpatrick Bridge);
- Greenway users will share the road carriageway with vehicles along Sheepmoor Lane (low volume of vehicular use).
- Construction of the greenway under the Dr. Troy bridge in close proximity to bridge piers/abutments.

Option S3a-3 – Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall;

10.4.19 This option proposes that the Greenway would be provided on the southern side of the Royal Canal from Kennan Bridge via St. Mochta's Football Club to Riverwood and Kirkpatrick Bridge. Greenway users will be routed via Riverwood Dale and Riverwood Hall residential estates which is away from the main corridor of the canal.

10.4.20 For this route, a paved 4m wide greenway will be provided from Keenan Bridge along the southern side of the Railway line, with segregated cycle facilities through Riverwood Dale and shared street through Riverwood Hall (gated cul-de-sac with existing pedestrian access/through route). See **Figure 10.7** below.

10.4.21 As part of DART + West proposals, Kennan Bridge and Kirkpatrick Bridge are proposed to be closed to vehicular traffic. However, shared pedestrian/cycle bridges will be provided over the railway lines.

10.4.22 The greenway route will connect with the Dart + West pedestrian/cycle bridges proposal over the railway line at Kennan Bridge and Kirkpatrick Bridge.



Figure 10.7: Route Option 3a-3

10.4.23 The option S3a-3 sample cross sections are presented in **Figure 10.8** below.

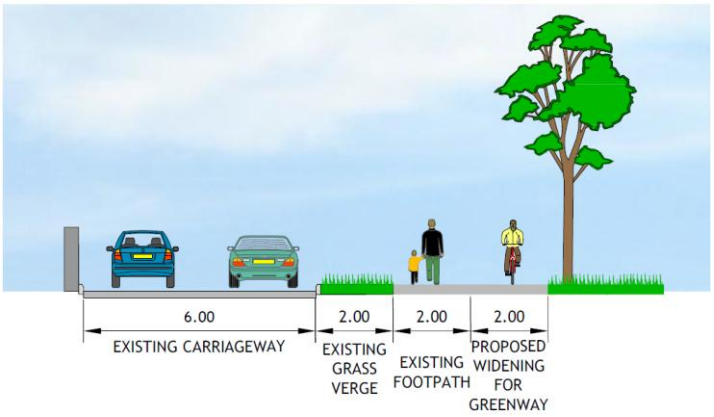


Figure 10.8: Route Option S3a-3: Proposed Cross Section A-A.

10.4.24 The following constraints would need to be considered if this route option is progressed:

- Protected bridges (Kennan and Kirkpatrick Bridge);
- DART + West proposals at Kennan Bridge (Porterstown Road) and Kirkpatrick Bridge (Coolmine Road).
- Shared vehicular/cycle route through Riverwood Hall;
- Potential impact on the rail network.
- Routing greenway users through Riverwood residential area may impact upon its land user character.
- Construction of the greenway under the Dr.Troy bridge in close proximity to bridge piers/abutments.

Option S3a-4 – Greenway via Windmill Court and Sheepmoor lane;

10.4.25 This option proposes that the Greenway would be provided on the northern side of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge via Sheepmoor Lane.

10.4.26 To minimise the impact on highly sensitive trees, the proposed route is located north of the wooded area along the northern embankment from Kennan Bridge, along a Waterways Ireland existing right of way, to Sheepmoor Lane with the route running under Dr Troy bridge.

10.4.27 This option proposes to direct the greenway users onto the pedestrian/cycle facilities proposed as part of the Windmill Court Residential Development.

10.4.28 For this route, where possible, a paved greenway will be the primary solution with the standard 4m wide boardwalk structure utilised as a secondary solution on steep terrain.

10.4.29 Through Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use). See **Figure 10.9** below.



Figure 10.9: Route Option S3a-4

10.4.30 The option S3a-4 proposed cross section A-A is presented in **Figures 10.10**. Cross-section B-B is presented in the **Figure 10.6** previously provided.

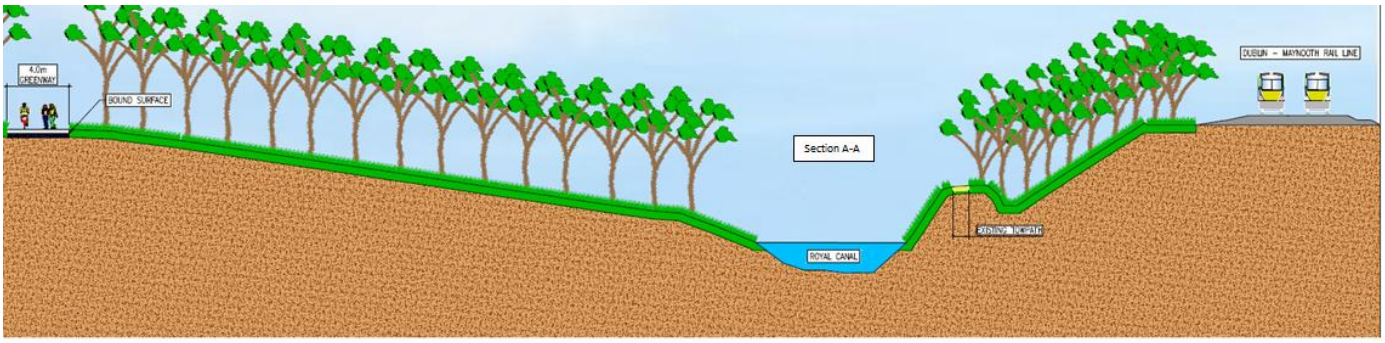


Figure 10.10: Route Option S3a-4: Proposed Cross Section A-A.

10.4.31 The following constraints would need to be considered if this route option is progressed:

- To minimise impact on highly sensitive trees, the proposed greenway will be routed adjacent to a laneway access which is in close proximity to two residential properties between Kennan Bridge and Dr. Troy Bridge.
- Construction of the greenway under the Dr. Troy bridge in close proximity to bridge piers/abutments.
- Greenway users will share the road carriageway with vehicles along Sheepmoor Lane (low volume of vehicular use).

Option S3a-5 – 3m Wide Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.

10.4.32 This option proposes a two-way cycle facility (3m wide) on the northern side of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge via Sheepmoor Lane. The existing towpath on the southern bank of the Royal Canal would also be upgraded to accommodate pedestrian movements only.

10.4.33 This route option offers total segregation of cyclists to the north of the Royal Canal and pedestrians on the southern towpath.

10.4.34 To minimise the impact on highly sensitive trees, the proposed cycle route is located north of the wooded area along the northern embankment from Kennan Bridge to Sheepmoor Lane. The two-way cycle route on the northern side of the Royal Canal follows the same route as option S3a-4, cyclists are directed onto the pedestrian/cycle facilities proposed as part of the Windmill Court Residential Development. For this route, where possible, a paved cycle route will be the primary solution with the standard 3m wide boardwalk structure utilised as a secondary solution on steep terrain.

10.4.35 Through Sheepmoor Lane cyclists will share the road carriageway with vehicles (low volume of vehicular use).

10.4.36 The existing pedestrian route along the southern towpath would be updated to a bound pavement surface. The existing towpath width will be maintained. See **Figure 10.11** below.

10.4.37 As part of DART + West proposals, Kennan Bridge (Porterstown Road) will be closed to vehicular traffic. However, pedestrians will be able to continue to use the Kennan Bridge to access the northern or southern towpath depending on direction of travel.

10.4.38 As part of DART + West proposals, shared pedestrian/cycle bridges will be provided over the railway lines at Kennan Bridge and Kirkpatrick Bridge.

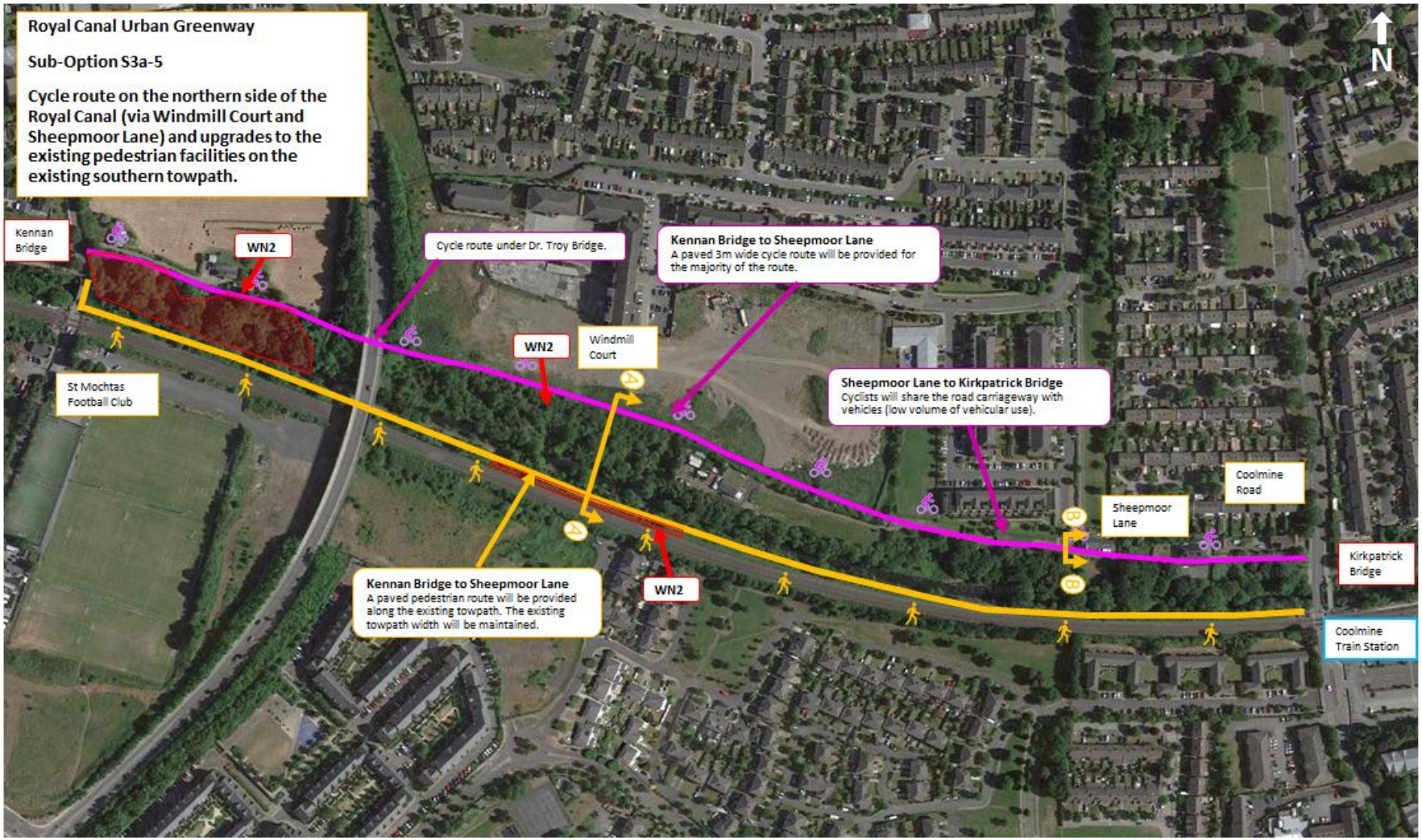


Figure 10.11: Route Option S3a-5

10.4.39 The option S3a-5 proposed cross section A-A is presented in **Figure 10.12** below. Cross-section B-B is presented in the **Figure 10.6** previously provided.

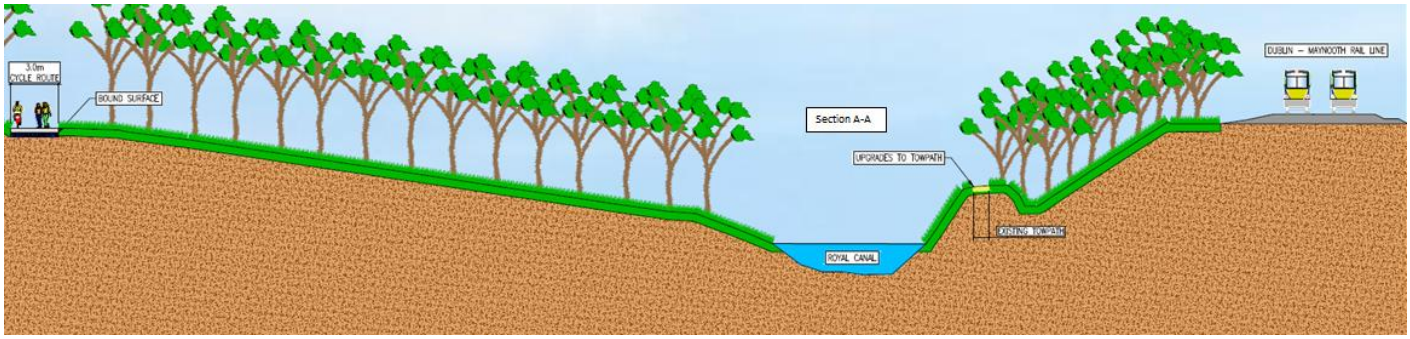


Figure 10.12: Route Option S3a-5: Proposed Cross Section A-A.

10.4.40 The following constraints would need to be considered if this route option is progressed:

- Separate cycle and pedestrian routes either side of the canal does not align with the GDA requirements of a Greenway.
- Accessibility to the pedestrian route on the southern embankment is restricted between Kennan Bridge and Kirkpatrick Bridge (approx. 900m) due to the railway line on the southern side of the towpath, thereby preventing permeability and linkages from residential catchments (in accordance with DMURS principles).
- To minimise impact on highly sensitive trees, the proposed cycle route will be routed adjacent to a laneway access which is in close proximity to two residential properties between Kennan Bridge and Dr. Troy Bridge.
- Construction of the greenway under the Dr.Troy bridge in close proximity to bridge piers/abutments.
- Cyclists will share the road carriageway with vehicles along Sheepmoor Lane (low volume of vehicular use).
- Pedestrian route adjacent to the railway line for the entire section (900m length) may have a potential impact on the rail network.
- DART + West proposals at Kennan Bridge (Porterstown Road) and Kirkpatrick Bridge (Coolmine Road).

Option S3a-6 - Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge;

10.4.41 Greenway will be provided on the southern existing towpath of the Royal Canal from Kennan Bridge to a new ped/cycle bridge located before the train signal/retaining wall (see **Figure 4.27**). This bridge will connect greenway users to Sheepmoor Lane.

10.4.42 A cantilevered boardwalk greenway (4m wide) is proposed from Kennan Bridge to the new ped/cycle bridge due to width constraints along the southern towpath. This section has steep banks and is close proximity to the railway line.

10.4.43 The cantilever structure would be located at the base of the Iarnród Éireann infrastructure. Measures will need to be undertaken to avoid any effects on the live rail system (e.g. settlement/slope slips).

10.4.44 At narrow canal widths, the final extents of the projected cantilever will need to satisfy Waterways Ireland minimum navigational widths.

10.4.45 Working widths for tracking equipment (drilling rigs or excavators) is limited. An option to use the canal with a barge type system for a working platform could be considered. This will need to be coordinated with Waterways Ireland and recreational users.

10.4.46 A new pedestrian/cycle bridge is proposed across the canal from the train signal/retaining wall on the southern towpath to the northern embankment by Sheepmoor Lane. This would be very difficult to construct on the southern towpath due to, the limited working widths along the towpath for tracking equipment (drilling rigs or excavators), the height of the towpath/embankment above the canal (option of construction from a barge on the canal) and the proximity of the railway line adjacent to the towpath.

10.4.47 Through Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use). See **Figure 10.13** below.

10.4.48 As part of DART + West proposals, Kennan Bridge (Porterstown Road) will be closed to vehicular traffic. However, pedestrians and cyclists will be able to continue to use the Kennan Bridge to access the northern or southern towpath depending on direction of travel.

10.4.49 As part of DART + West proposals shared pedestrian/cycle bridges will be provided over the railway lines at Kennan Bridge and Kirkpatrick Bridge.

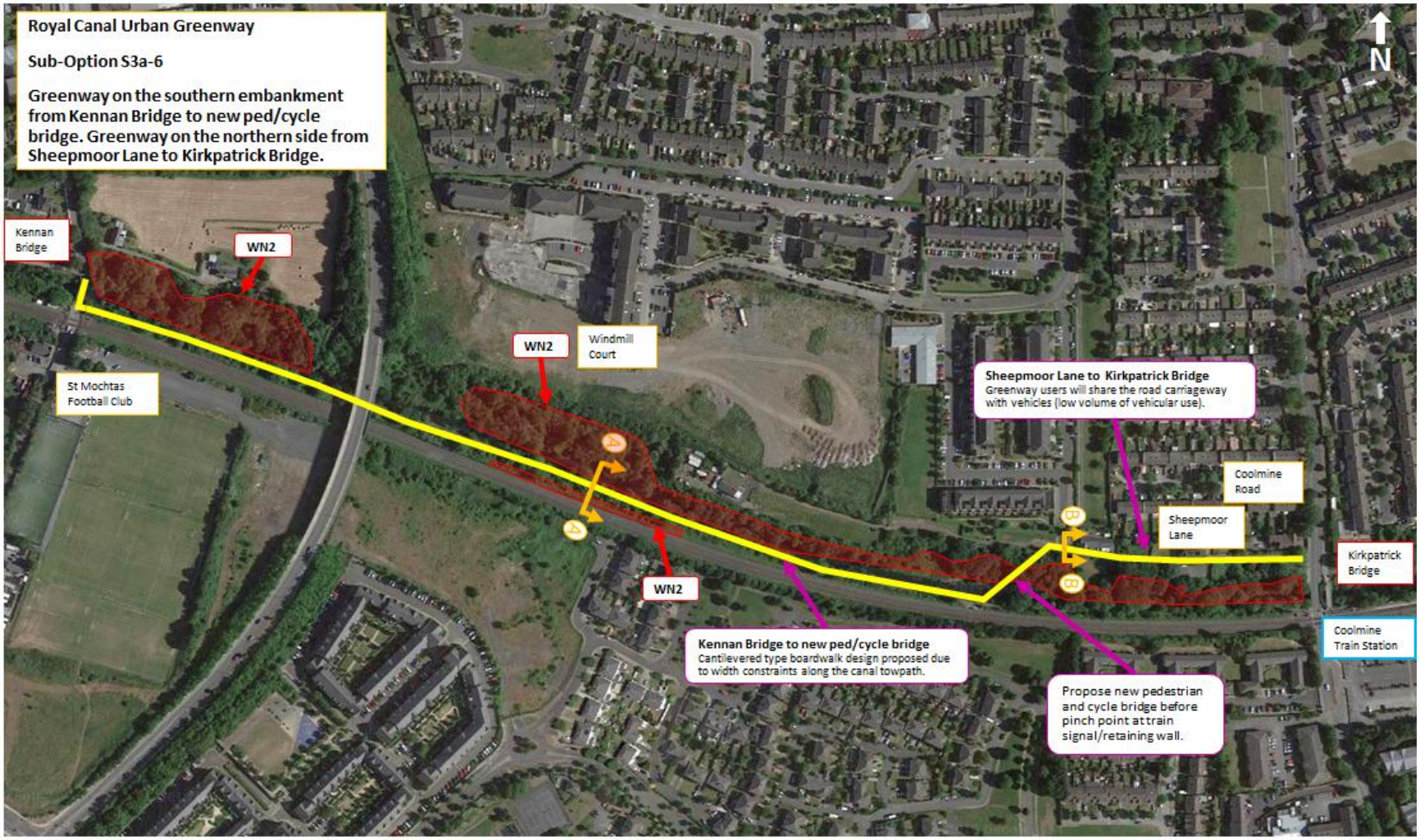


Figure 10.13: Route Option S3a-6

10.4.50 The option S3a-6 proposed cross section A-A is presented in **Figure 10.14** below. Cross-section B-B is presented in the **Figure 10.6** previously provided.

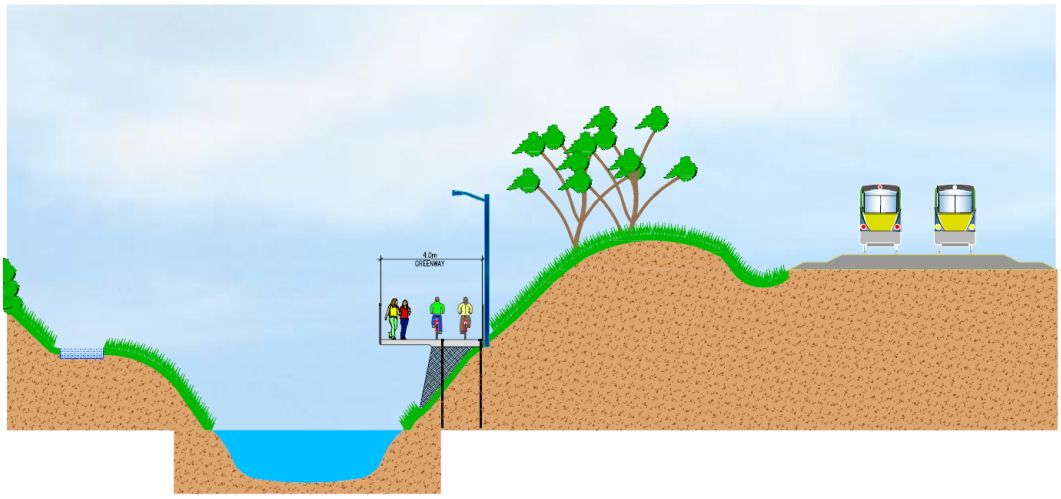


Figure 10.14: Route Option S3a-6: Proposed Cross Section A-A.

10.4.51 The following constraints would need to be considered if this route option is progressed:

- Potential impact on the rail network due to the greenway route adjacent to the railway line for the majority of the route (730m length) and the proposed new pedestrian/cycle bridge over the canal.
- Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and the proposed ped/cycle bridge (approx. 730m) due to the railway line on the southern side of the towpath, thereby preventing permeability and linkages from residential catchments (in accordance with DMURS principles).
- Cantilevered type boardwalk design is required along the southern bank due to the inadequate width along this section (730m);
- Provision of a cantilevered boardwalk greenway along the southern towpath between Kennan Bridge and Kirkpatrick Bridge would have a significant visual impact on the Royal Canal.

- At narrow canal widths, the final extents of the projected cantilever will need to satisfy Waterways Ireland minimum navigational widths;
- Construction of the bridge on the southern towpath due to, limited working widths, the height of the towpath/embankment above the canal and proximity of the railway line adjacent to the towpath.
- Possible removal of a number of trees and habits on the northern side of the canal due to the proposed ped/cycle bridge and greenway ramp up to Sheepmoor Lane.
- DART + West proposals at Kennan Bridge (Porterstown Road) and Kirkpatrick Bridge (Coolmine Road).
- Greenway users will share the road carriageway with vehicles along Sheepmoor Lane (low volume of vehicular use).

Section 3a Route Options Multi-Criteria Analysis

10.4.52 The Multi-Criteria Analysis route options assessment summary tables for the cycle Route Options for Section 3a are presented in **Appendix D**. The relative ranking of route options against the scheme assessment sub-criteria are summarised in **Table 10.1** below.

Royal Canal Urban Greenway – Sub-Section 3a Kennan Bridge to Kirkpatrick Bridge							
Appraisal Criteria	Sub-Criteria	Option S3a-1 Greenway on the southern side of the Royal Canal.	Option S3a-2 Greenway on the northern side of the Royal Canal.	Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.	Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.	Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.	Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.
1 Economy	1A Capital Cost						
	1B Constructability						
	1C Quality of Service						
2 Integration	2A Cycle Network Integration						
	2B Traffic Network Integration						
	2C Potential Impact on Rail Network						
	2D Potential Impact on Canal Users						
	2E Potential Impact on Communities/Residents						
3 Safety	3A Road Safety						
	3B Pedestrians Safety						
4 Environment	5A Archaeology and Cultural Heritage						
	5B Architectural Heritage						
	5C Flora & Fauna						
	5D Soils, Geology & Hydrology						
	5E Landscape and Visual						
	5F Land Use Character						

Table 10.1: Principal Route Options MCA Summary (Sub-Criteria)

10.4.53 **Economy** - Option S3a-4 is ranked the most economical. The primary differentiator in terms of 'Capital Costs' between route options is the structural infrastructure required for particular options due to inadequate width along the towpath of the canal and proposed new canal bridge crossings. Options S3a-1 requires a cantilevered boardwalk for the entire section, while option S3a-6 proposes cantilevered boardwalk structure along the southern embankment with a new pedestrian/cycle bridge over the canal.

10.4.54 **Constructability** - Options S3a-1 and S3a-6 propose to provide cantilevered boardwalk greenway along either the majority of or sections of their route, due to the inadequate width along the towpath. These sections have steep banks and are in close proximity to the railway line. This may prove very difficult to construct. The cantilever structure would be located at the base of the Iarnród Éireann infrastructure. Measures will need to be undertaken to minimise any effects on the live rail system (e.g. settlement/slope slips). Working widths for tracking equipment (drilling rigs or excavators) is limited. Option S3a-6 also proposes to construct a new pedestrian/cycle bridge across the canal.

10.4.55 **Quality of Service** - Options S3a-1 is ranked highest because the greenway is generally segregated from vehicular traffic for the entire route, it runs along the entire southern towpath of the Royal Canal, it does not have any detours, the environment along the route is pleasant and interesting and the greenway would be 4m wide with no excessive gradients. Compared to options S3a-3 which detours significantly from the Royal Canal via Riverwood.

10.4.56 **Cycle Network Integration** - options S3a-1 scores highest followed by S3a-2 & S3a-6 because they provide Greenway facilities along the Royal Canal which aligns with the GDA Cycle Network Plan, compared to the circuitous route taken by option S3a-3. Option 3a-5 is also ranked lowest because the separation of the cycle and pedestrian routes does not align with the requirements of the Greenway and it detours from the Royal Canal Greenway route (as identified in the GDA Cycle network Plan) via Windmill Court (old landfill site) and Sheepmoor Lane. However, routes along Sheepmoor Lane do offer enhanced connectivity to

existing and proposed cycle routes north of the canal through residential estates such as Windmill Court and Stationcourt.

10.4.57 **Traffic Network** - Route options S3a-3, provide cycle facilities through residential areas (Riverwood) which may impact on the residential traffic network.

10.4.58 **Potential Impact on Rail Network** - Options S3a-1 and S3a-6 have the most potential to impact on the Rail Network. Route option S3a-1 is adjacent to the railway line for the entire section. The cantilever structure would be located at the base of the Iarnród Éireann infrastructure and measures will need to be undertaken to minimise any effects on the live rail system (e.g. settlement/slope slips). Option S3a-6 is adjacent to the railway line along the southern towpath and also proposes a new pedestrian/cycle bridge from the southern towpath (adjacent to the railway line).

10.4.59 **Potential Impact on Canal Users** - Option S3a-1 has the most potential to impact on the Canal Users, the extent of the projected cantilever may impact on the operation of barges along the route. Also, for option S3a-1, the cantilevered boardwalk will require safety barriers along the towpath from Kennan Bridge to Granard Bridge for 900m. These barriers may hinder the used of the towpath to tow barges.

10.4.60 **Communities/Resident** - Option S3a-1 is ranked the worst because accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Kirkpatrick Bridge due to the railway line on the southern side of the towpath, thereby preventing permeability and linkages from residential catchments (in accordance with DMURS principles). Options S3a-3 routes the greenway through an existing gated private residential area (Riverwood Hall), residents may not want non-residents travelling through their private residential community via the greenway.

10.4.61 **Safety** - Option S3a-3 is ranked the worst, rerouting pedestrians and cycles via Riverwood increases the possibility of conflicts with vehicles, compared to other

route options along the Royal Canal segregated from traffic for the majority of the route.

10.4.62 **Architectural Heritage** - Route options S3a-1, S3a-2 & S3-6 are considered the least attractive due to the fact that the fabric of the canal itself is a protected structure, and these routes options propose the Greenway along the bank of the Royal Canal for the majority of the route, using significant constructed elements such as cantilever structures. They may also potentially directly impact Kennan Bridge and Kirkpatrick Bridge, which are protected structures.

10.4.63 **Flora & Fauna** - Route option S3a-3 is the most attractive. It requires the removal of a relatively small number of trees (approx. 250m^2). Compared to Options S3a-2 which may require the removal of a larger number of Environmentally sensitive trees of high value (1700m^2, Oak-ash-hazel woodlands) located along the route.

10.4.64 **Soil, Geology & Hydrology** - Route option S3a-2 is ranked the lowest as this route option may impact on soil through piling along the northern side of the Royal Canal to provide a boardwalk facility.

10.4.65 **Landscape & Visual** - Options S3a-1, S3a-2 and S3-6 are the least attractive. Options S3a-1 and S3a-2 propose boardwalk greenways along the bank of the Royal canal for the majority of the route which may have a visual impact on the Royal Canal. Option S3a-6 proposes boardwalk greenway facilities for a section of the route and also a new pedestrian/cycle bridges over the canal which may have a visual impact on the Royal Canal.

10.4.66 **Land Use Character** - Option S3a-3, S3a-4 and S3a-5 are ranked the lowest. Options S3a-4 and S3a-5 proposed route will be routed adjacent to a laneway access to two residential properties between Kennan Bridge and Dr. Troy Bridge, which may have an impact upon their Land Use Character. While option S3a-3 proposes the greenway route through Riverwood Hall (gated cul-de-sac with existing pedestrian access/through route) may impact upon its Land Use Character.

10.4.67 A summary of the assessment and relative ranking of route options against the four main assessment criteria is presented in **Table 10.2** below.

Royal Canal Urban Greenway Sub-Options for section 3a						
Appraisal Criteria	Option S3a-1 Greenway on the southern side of the Royal Canal.	Option S3a-2 Greenway on the northern side of the Royal Canal.	Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.	Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.	Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.	Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.
1 Economy						
2 Integration						
3 Safety						
4 Environment						

Table 10.2: Principal Route Options MCA Summary (Main Criteria)

10.4.68 Based on the assessment undertaken, route option S3a-4 appears to offer more benefits over the other options. Option S3a-4 is therefore preferred route option for the following reasons:

- It is the most economical option;
- It has no impact on the rail network or canal users;
- It has no impact on Architectural Heritage;
- It does not have a significant impact on Flora or Fauna
- It has less Environmental Impacts compared to options S3a-1, S3a-2, S3a-5 and S3a-6.
- It has no visual impact upon the Royal Canal.

10.4.69 Based on the multi-criteria assessment undertaken for this section of the Study Area, Option S3a-4 is identified as the preferred route option for Section 3a, from Kennan Bridge to Kirkpatrick Bridge.

10.4.70 The benefits of the preferred route (Option S3a-4) can be summarised as follows:

i. Continuous and direct greenway provided for the majority of the route.

ii. The proposed route is located north of the wooded area along the northern embankment from Kennan Bridge to Sheepmoor Lane, to minimises the impact on highly sensitive trees.

iii. It has no impact on the rail network or canal users.

iv. Accessibility to the greenway is provided at Windmill Court area and Sheepmoor lane, providing permeability and linkages from residential catchments (in accordance with DMURS principles).

10.5 Section 3b – Introduction

10.5.1 When assessing the route options for section 3b, there are 11 route options (Option S3b-1, S3b-2, S3b-3, S3b-4, S3b-5, S3b-6, S3b-7, S3b-8, S3b-9, S3b-10 and Option S3b-11) between Kirkpatrick Bridge (Coolmine Road) and Granard Bridge (Castleknock Road).

10.5.2 The following eleven route options were considered:

- Option S3b-1 - Greenway along the southern towpath of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment);
- Option S3b-2 - Greenway along the southern towpath of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).
- Option S3b-3 - Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank at Roselawn.
- Option S3b-4 - Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.
- Option S3b-5 - Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.
- Option S3b-6 - Greenway on the northern bank of the Royal Canal to the south of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge;
- Option 3b-7 - Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn;
- Option S3b-8 - Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge;

- Option S3b-9 - Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.
- Option S3b-10 - Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood and Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment;
- Option S3b-11 - Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.

10.5.3 The route options for Section 3b are illustrated in drawing **170239-2304** in **Appendix J**.

10.5.4 The assessment process has been outlined in **Chapter 7** of this report. In this section of the report it is proposed to set out the assessment procedure and results for the Section 3b, between Kirkpatrick Bridge (Coolmine Road) and Granard Bridge (Castleknock Road).

10.5.5 The assessment of the options is discussed further in **Chapter 10.6** below.

10.6 Section 3b – Option Assessment

Option S3b-1 - Greenway along the southern towpath of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment);

10.6.1 This option proposes to provide a greenway on the southern side of the Royal Canal from Kirkpatrick Bridge to Granard Bridge.

10.6.2 The existing pedestrian bridge adjacent to Kirkpatrick bridge will be required to be either (i) widened to 4m to cater for the greenway users or (ii) removed and a new 4m wide ped/cycle bridge provided.

10.6.3 This route option involves widening of the existing pedestrian route along the southern side of Royal Canal to 4m for the entire section. A cantilevered boardwalk greenway is required from Kirkpatrick Bridge towards Granard Bridge for 950m (Ch.6250-Ch.7200). This section via the 'Deep Sinking' has steep banks and is close proximity to the railway line.

10.6.4 The cantilever structure would be located at the base of the Iarnród Éireann infrastructure. Measures will need to be undertaken to minimise any effects on the live rail system (e.g. settlement/slope slips). To prevent any settlement/slope slips on the railway embankment and to minimise any effects on the live rail system, a retaining structure will be provided halfway up the railway embankment, with the material in front of the wall to be excavated and planted with native trees (providing a green belt of planting below the wall) see **Figure 10.15** below. This will require the removal of existing vegetation on the upper embankment between the existing towpath and rail line.

10.6.5 At the pinch point, created by the railway masonry retaining wall and the towpath (Ch.7000-7200), illustrated in **Figure 4.32** Chapter 4), an anchored cantilever option with piled retaining wall would not be feasible due to the limited width between the railway line and the towpath (1.5-1.7m) and the structural stability issues associated with the masonry wall (wall appears to be overturning in the direction of the towpath and previous efforts including retrofitted concrete buttresses to rectify this instability). The cantilevered boardwalk will be continued

along this section and the existing masonry gravity retaining wall will be reinforced by providing a structural facing to overlie the face of the existing wall and secured by anchors below the retained ground level (railway embankment) at the 2m high wall face. These anchors could possibly be severed during the installation of future Overhead infrastructure required for the Dart + West scheme. As such this could preclude the future upgrade of the rail line.

10.6.6 Working widths for tracking equipment (drilling rigs or excavators) is limited. An Option is to use canal with a barge type system for a working platform could be considered. This will need to be coordinated with Waterways Ireland and recreational users.

10.6.7 For the remainder of the route to Granard Bridge, a bound pavement greenway would be the primary solution on the southern side of the Royal Canal, with the standard 4m wide greenway fitting along the existing embankment. See **Figure 10.15** below.

10.6.8 The greenway will tie into a proposed pedestrian/cycle underpass at Granard Bridge.

10.6.9 Accessibility to the greenway on the southern embankment is restricted between Kirkpatrick Bridge and Granard Bridge (approx. 1.5km) due to the railway line on the southern side of the towpath, thereby preventing permeability and linkages from residential catchments. This would result in less passive surveillance and security for greenway users.

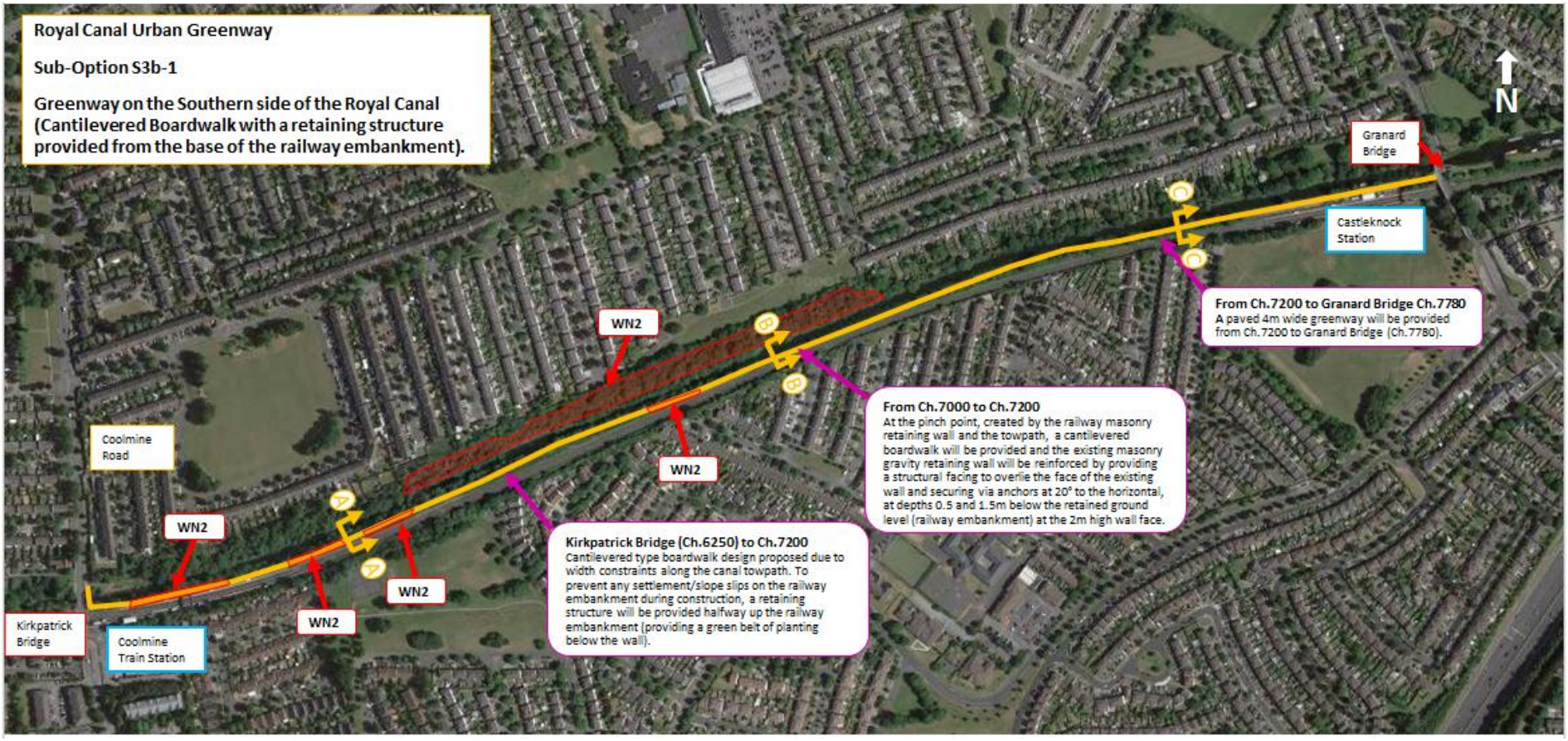


Figure 10.15: Route Option S3b-1

10.6.10 The option S3b-1 proposed cross sections are presented in **Figure 10.16 – 10.18** below.

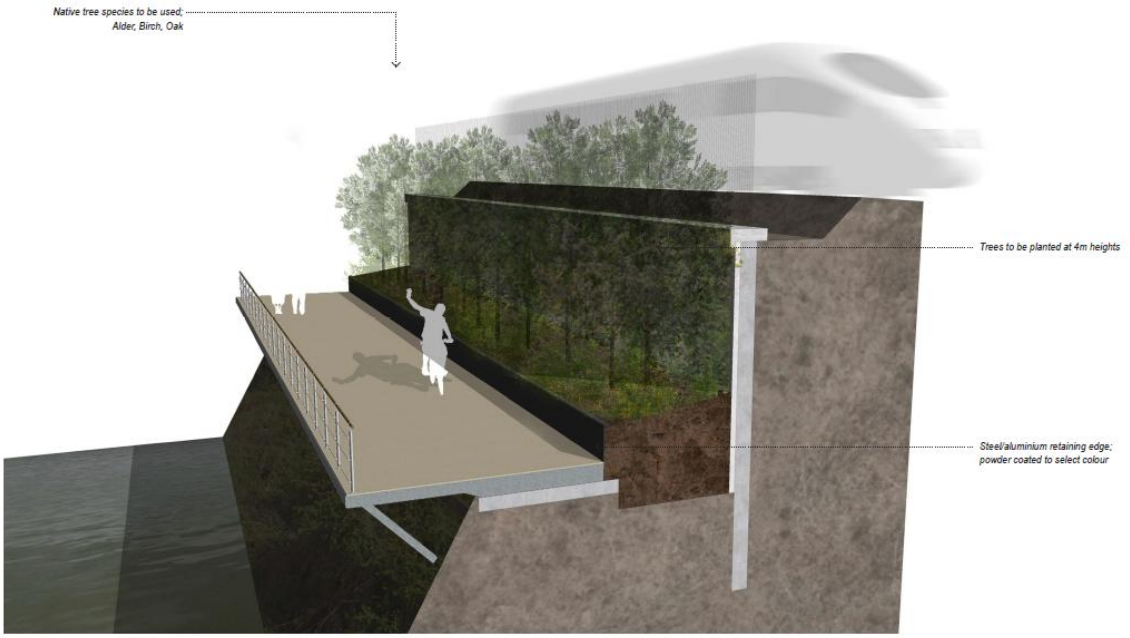


Figure 10.16 Route Option S3b-1: Proposed Cross Section A-A.

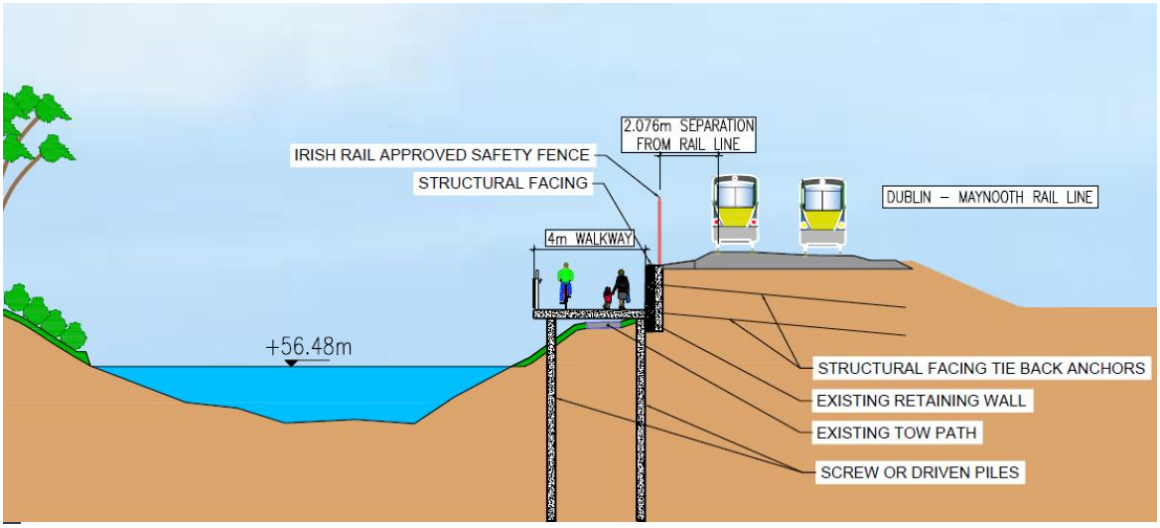


Figure 10.17 Route Option S3b-1: Proposed Cross Section B-B.



Figure 10.18 Route Option S3b-1: Proposed Cross Section C-C.

10.6.11 The following constraints would need to be considered if this route option is progressed:

- Accessibility to the greenway on the southern embankment is restricted between Kirkpatrick Bridge and Granard Bridge (1.5km) due to the railway line on the southern side of the route, thereby resulting in a less secure and safe facility for pedestrians and cyclists (in accordance with DMURS).
- Provision of a cantilevered boardwalk greenway along the southern towpath between Kirkpatrick Bridge and 600m west of Granard Bridge would have a significant visual impact on the Royal Canal and would result in loss of trees on the upper embankment. The fabric of the Royal Canal is designated as a Protected Structure. See **Figures 10.19 & 10.20** below.

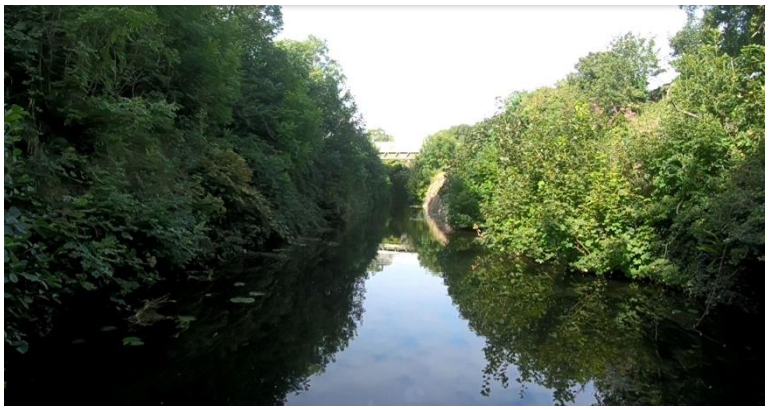


Figure 10.19 Photograph of existing southern embankment in Zone 1 (facing west toward Kirkpatrick bridge)



Figure 10.20 Photomontage of cantilevered boardwalk in Zone 1 (facing west toward Kirkpatrick bridge)

- The removal of this ecological corridor would have a significant impact on corridor function of the canal for fauna, particularly in terms of bats (commuting and feeding routes), birds (breeding habitat) and invertebrates (commuting and feeding routes).
- The existing pedestrian bridge adjacent to Kirkpatrick bridge would require to be either (i) widened to 4m to cater for the greenway users or (ii) removed and a new 4m wide ped/cycle bridge provided.
- The cantilevered boardwalk and retaining wall would require removal of environmentally sensitive trees along the southern bank of the Royal Canal, Oak-Ash-Hazel woodlands (WN2);
- Route has the potential to directly impact Protected bridges (Kirkpatrick Bridge and Granard Bridge);
- Cantilevered type boardwalk design is required along the southern bank due to the inadequate width along this section;
- At narrow canal widths, the final extents of the projected cantilever will need to satisfy Waterways Ireland minimum navigational widths; and
- Greenway route adjacent to the railway line for the entire section (1.5km length) may have a potential impact on the rail network in terms of existing operations during construction and also future proposals under DART + West.

- The most feasible option to gain access and construct the retaining wall is via the railway line. The construction of such a wall would necessitate the closure of the rail line. Iarnród Éireann have advised that there would likely be time restraints, night time works for 5 hours per day.
- For the construction of the cantilevered boardwalk, working widths for tracking equipment (drilling rigs or excavators) is limited.
- Pinch point at the railway retaining wall/access to Coolmine Station and the existing pedestrian bridge.
- During construction, there is a risk of construction workers falling off the embankment (towpath) into the canal. Also, safety concerns due to the proximity of workers to a live railway line particularly at the pinch point 400m west of Castleknock Station Ch. 7000-7160 between the canal towpath's edge and masonry retaining wall structure for Irish Rail (1-2m width).
- Health and safety concerns for workers during on-going maintenance.
- Underpass proposed adjacent to the Granard Bridge (protected structure).

Option S3b-2 - Greenway along the southern towpath of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).

10.6.12 This option proposes to provide a greenway on the southern side of the Royal Canal from Kennan Bridge to Talbot Bridge.

10.6.13 The existing pedestrian bridge adjacent to Kirkpatrick bridge will be required to be either (i) widened to 4m to cater for the greenway users or (ii) removed and a new 4m wide ped/cycle bridge provided.

10.6.14 This route option involves widening of the existing pedestrian route along the southern side of Royal Canal to 4m for the entire section. Cantilevered type boardwalk design is required from Kirkpatrick Bridge towards Granard Bridge for 950m (Ch.6250-Ch.7200). This section via the 'Deep Sinking' has steep banks and is in close proximity to the railway line.

10.6.15 The cantilever structure would be located at the base of the Iarnród Éireann infrastructure. Measures will need to be undertaken to minimise any effects on the live rail system (e.g. settlement/slope slips). To prevent any settlement/slope slips on the railway embankment an anti-erosion geocell will be installed. To place the geocell anti-erosion net, the majority of the existing vegetation will have to be removed with the geocell to span between mature trees that are deemed to be in an acceptable condition. Once the geocell anti-erosion mat is laid and seeded, it will act to stabilise the slope in the permanent condition and will bring the stability of the slope within the requirements of the current geotechnical design codes.

10.6.16 At the pinch point, created by the railway masonry retaining wall and the towpath (Ch.7000-7200, illustrated in **Figure 4.32** Chapter 4), an anchored cantilever option with piled retaining wall would not be feasible due to the limited width between the railway line and the towpath (1.5-1.7m) and the structural stability issues associated with the masonry wall (wall appears to be overturning in the direction of the towpath and previous efforts including retrofitted concrete buttresses to rectify this instability). The cantilevered boardwalk will be continued

along this section and the existing masonry gravity retaining wall will be reinforced by providing a structural facing to overlie the face of the existing wall and secured by anchors below the retained ground level (railway embankment) at the 2m high wall face. These anchors could possibly be severed during the installation of future Overhead infrastructure required for the Dart + West scheme. As such this could preclude the future upgrade of the rail line.

10.6.17 For the remainder of the route to Granard bridge, a bound pavement greenway would be the primary solution on the southern side of the Royal Canal, with the standard 4m wide. See **Figure 10.21** below.

10.6.18 A greenway underpass is proposed at Granard Bridge.

10.6.19 Accessibility to the greenway on the southern embankment is restricted between Kirkpatrick Bridge and Granard Bridge (approx. 1.5km) due to the railway line on the southern side of the towpath, thereby preventing permeability and linkages from residential catchments. This would result in less passive surveillance and security for greenway users.

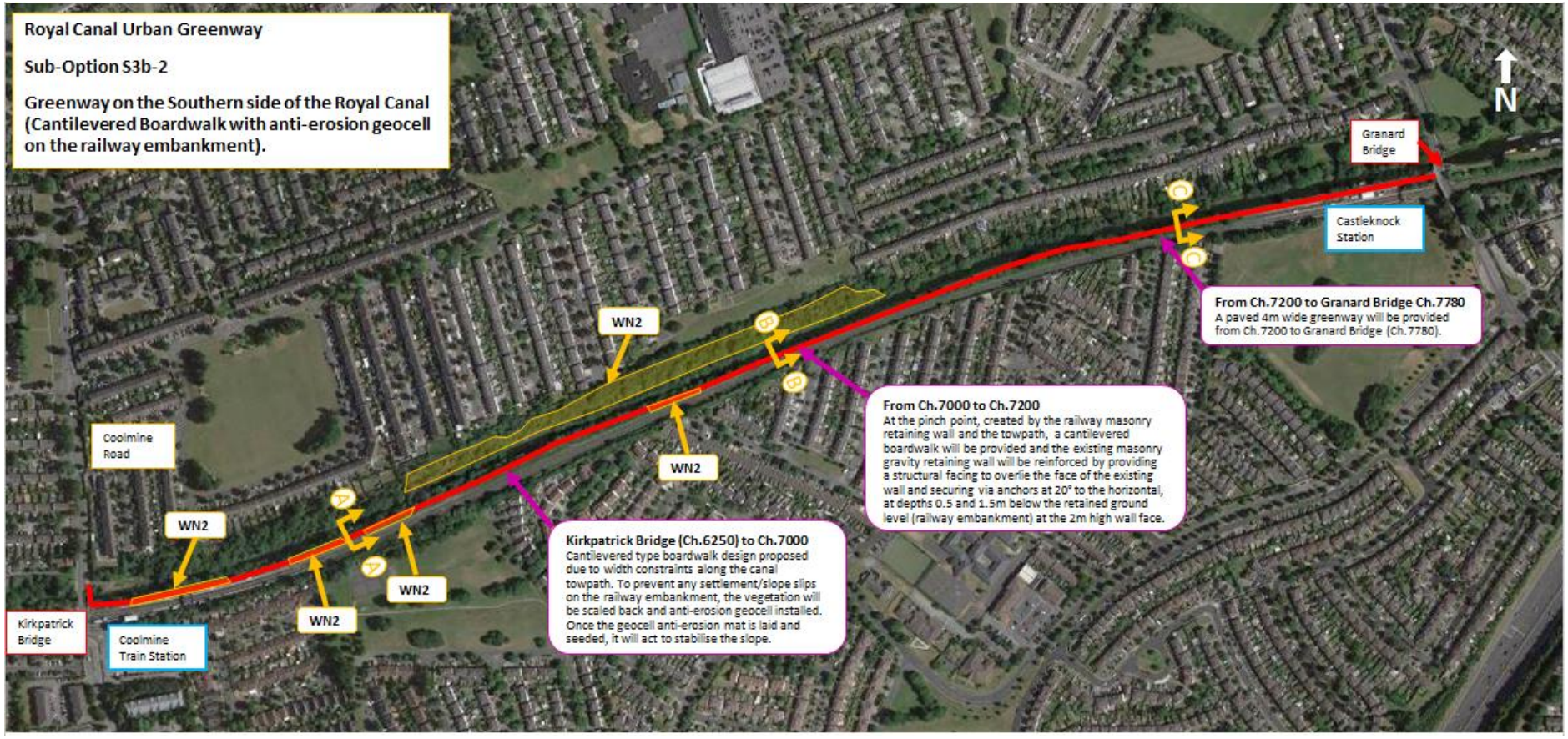


Figure 10.21: Route Option S3b-1

10.6.20 The option S3b-2 proposed cross sections are presented in **Figure 10.22 – 10.23** below. Cross-section C-C is presented in the **Figure 10.18** previously provided.

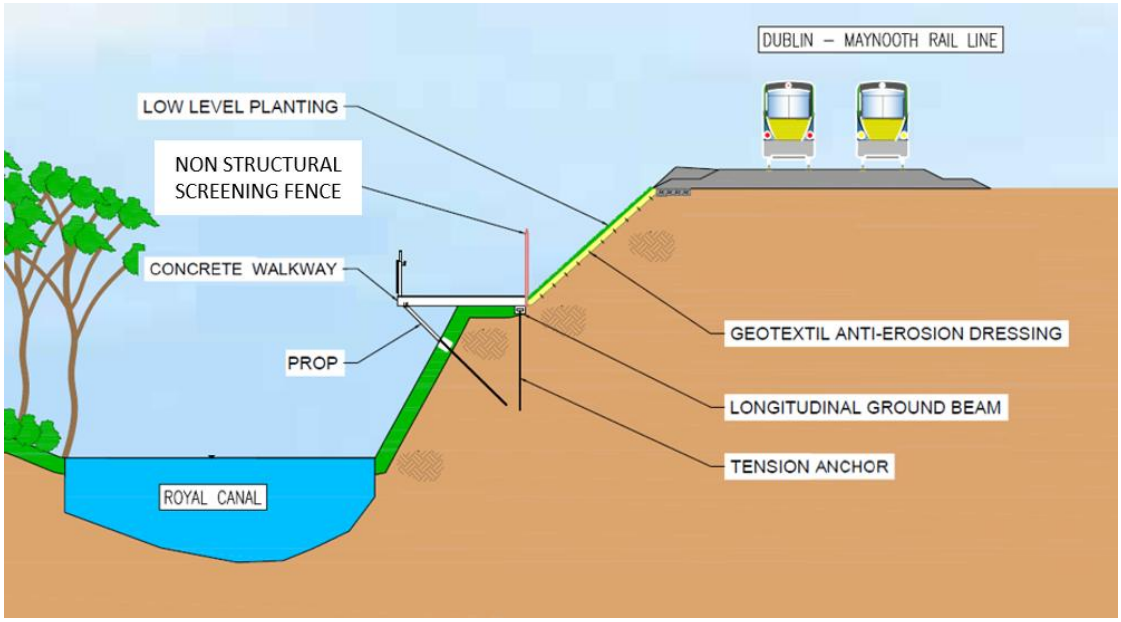


Figure 10.22 Route Option S3b-2: Proposed Cross Section A-A.

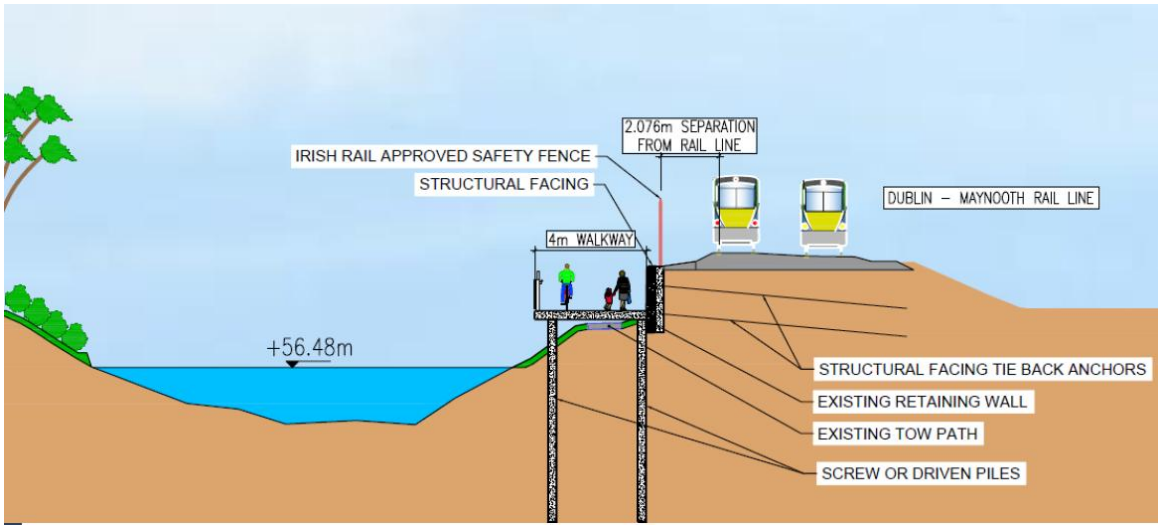


Figure 10.23 Route Option S3b-2: Proposed Cross Section B-B.

10.6.21 The following constraints would need to be considered if this route option is progressed:

- Accessibility to the greenway on the southern embankment is restricted between Kirkpatrick Bridge and Granard Bridge (1.5km) due to the railway line on the southern side of the route, thereby resulting in a less secure and safe facility for pedestrians and cyclists (in accordance with DMURS).
- Provision of a cantilevered boardwalk greenway along the southern towpath between Kirkpatrick Bridge and 600m west of Granard Bridge would have a significant visual impact on the Royal Canal and would result in loss of trees on the upper embankment. The fabric of the Royal Canal is designated as a Protected Structure and this would be compromised. See **Figures 10.19 & 10.20** previously provided.
- The existing pedestrian bridge adjacent to Kirkpatrick bridge would require to be either (i) widened to 4m to cater for the greenway users or ii) removed and a new 4m wide ped/cycle bridge provided.
- The cantilevered boardwalk and geo-cell matting would require removal of environmentally sensitive trees along the southern bank of the Royal Canal, Oak-Ash-Hazel woodlands (WN2);
- The removal of this ecological corridor would have a significant impact on corridor function of the canal for fauna, particularly in terms of bats (commuting and feeding routes), birds (breeding habitat) and invertebrates (commuting and feeding routes).
- Route has the potential to directly impact Protected bridges (Kirkpatrick Bridge and Granard Bridge);
- Cantilevered type boardwalk design is required along the southern bank due to the inadequate width along this section;
- At narrow canal widths, the final extents of the projected cantilever will need to satisfy Waterways Ireland minimum navigational widths; and
- Greenway route adjacent to the railway line for the entire section (1.5km length) may have a potential impact on the rail network in terms of existing operations during construction and also future proposals under DART + West.
- For the construction of the cantilevered boardwalk, working widths for tracking equipment (drilling rigs or excavators) is limited.

- Pinch point at the railway retaining wall/access to Coolmine Station and the existing pedestrian bridge.
- During construction, there is a risk of construction workers falling off the embankment (towpath) into the canal. Also, safety concerns due to the proximity of workers to a live railway line particularly at the pinch point 400m west of Castleknock Station Ch. 7000-7160 between the canal towpath's edge and masonry retaining wall structure for Irish Rail (1-2m width).
- Health and safety concerns for workers during on-going maintenance.
- Underpass proposed adjacent to the Granard Bridge (protected structure).

Option S3b-3 - Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.

10.6.22 This option proposes to provide a greenway on the northern side of the Royal Canal from Kennan Bridge to Granard Bridge.

10.6.23 A concrete greenway will be provided from Kirkpatrick Bridge to the Brompton green area from Ch. 6250-6850, however, boardwalk/bridge structures will be required to enable the proposed greenway to continue past steep terrain such as the area of the old quarry etc.

10.6.24 To minimise the impact on highly sensitive trees, the proposed route is located in close proximity to the back gardens of Delwood Park and into the open space (green area) at Brompton.

10.6.25 A 4m paved greenway will be provided on the southern side of the Brompton green area (Ch. 6850-7100).

10.6.26 In terms of permeability/connectivity benefits, multiple access points from residential catchments would be more achievable for this greenway route option proposed along the upper level of the northern embankment. This would also result in greater passive surveillance and security for greenway users.

10.6.27 For the section of the route along the northern embankment by Roselawn (Ch. 7100-7800), a piled boardwalk structure is proposed due to the uneven terrain and to minimise impacts on habitats. Along this section a number of the residential back gardens extend to the canal, which results in pinch points/inadequate width. See **Figure 10.24** below.

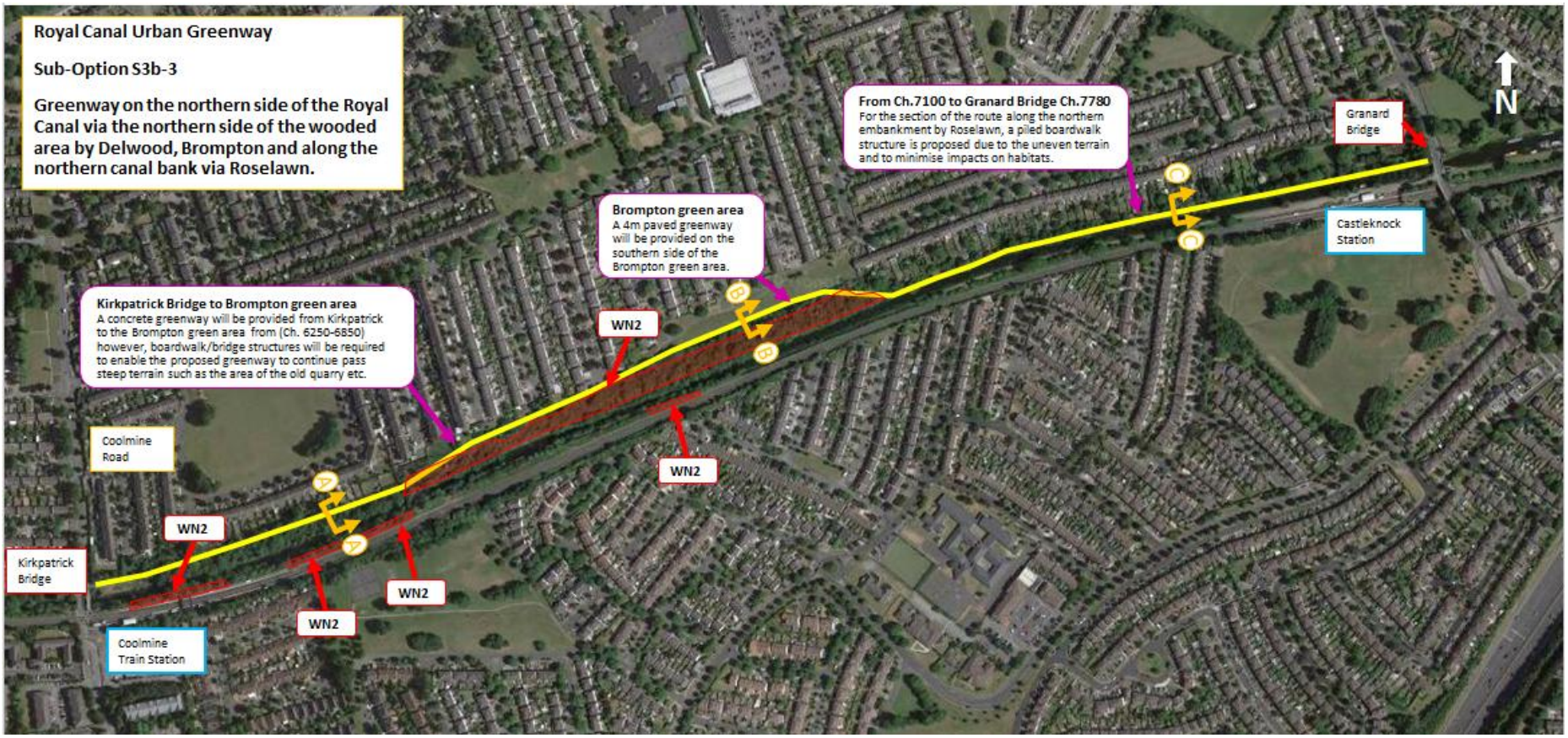


Figure 10.24: Route Option S3b-3

10.6.28 The option S3b-3 proposed cross sections are presented in **Figure 10.25 – 10.27** below.

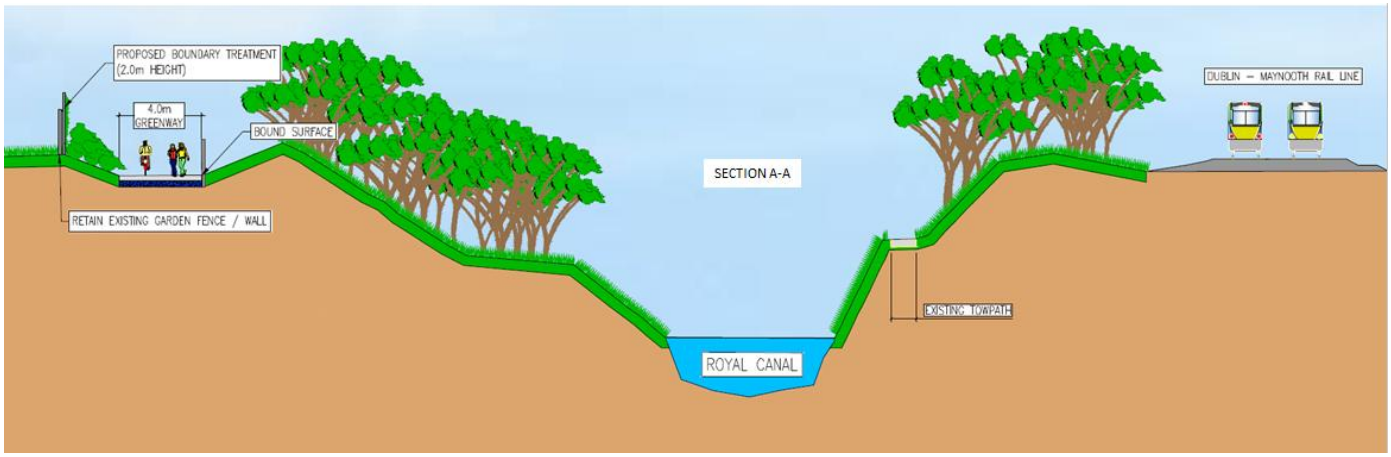


Figure 10.25: Route Option S3b-3: Proposed Cross Section A-A.

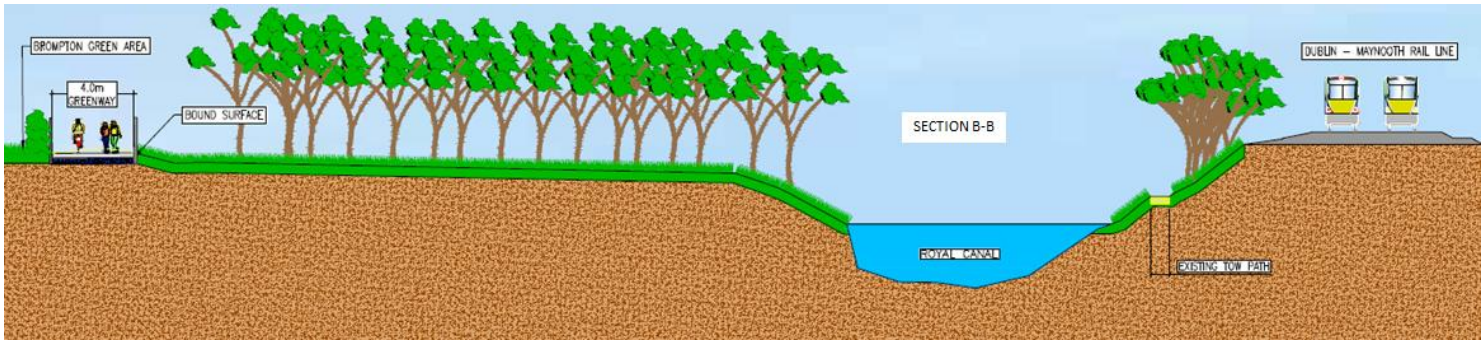


Figure 10.26: Route Option S3b-3: Proposed Cross Section B-B.

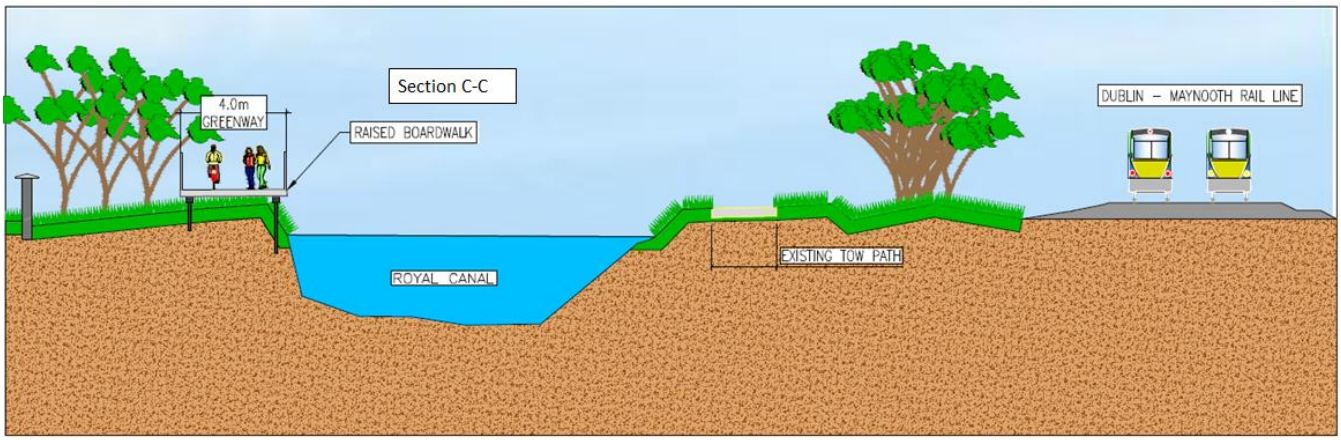


Figure 10.27: Route Option S3b-3: Proposed Cross Section C-C.

10.6.29 The following constraints would need to be considered if this route option is progressed:

- Environmentally sensitive trees on the northern side of the Royal Canal (Oak-Ash-Hazel woodlands (WN2);
- To minimise the impact on highly sensitive trees, the proposed route would be located on the upper side of the northern embankment. To prevent the greenway overlooking the back gardens of the residents of Delwood Park, a cutting through the embankments will be undertaken to reduce the proposed level of the greenway. Also, fencing and landscaping will be provided between the greenway and the back gardens to increase security and deter anti-social behaviour.
- Possible increased parking on surrounding roads which would need to be controlled/managed.
- There are two locations along the northern embankment where rock was originally quarried to create the Royal Canal, resulting in very steep cuttings/terrain at these locations. A boardwalk/bridge structure will be required to enable the proposed greenway to continue pass these locations.
- Behind Roselawn Road, along the northern bank of the canal, a number of the residential back gardens extend to the canal, which has resulted in pinch points/inadequate width along this section of the route.
- The boardwalk along the northern bank will more than likely have to be constructed from a barge on the canal.

Option S3b-4 – Greenway on the northern side of the Royal Canal, north of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.

10.6.30 Greenway would be provided on the northern side of the Royal Canal from Kirkpatrick Bridge to the new proposed ped/cycle bridge past the Brompton green area. The greenway will transfer to the southern embankment via the proposed bridge and continue along the southern embankment of the Royal Canal to Granard Bridge.

10.6.31 A concrete greenway will be provided from Kirkpatrick Bridge to the Brompton green area from Ch. 6250-6850, however, boardwalk/bridge structures will be required to enable the proposed greenway to continue pass steep terrain such as the area of the old quarry etc.

10.6.32 To minimise the impact on highly sensitive trees, the proposed route will be located on the upper embankment at Delwood Park and into the open space (green area) at Brompton.

10.6.33 A 4m paved greenway will be provided on the southern side of the Brompton green area (Ch. 6850-7100).

10.6.34 In terms of permeability/connectivity benefits, multiple access points from residential catchments would be more achievable for this greenway route option proposed along the upper level of the northern embankment. This would also result in greater passive surveillance and security for greenway users. There will be further mitigation measures provided which will give added security to adjacent residential properties, these are outlined in **Chapter 11.3**.

10.6.35 The route switches from the northern side to the southern side of the Royal Canal at chainage 7100-7200 (before Roselawn Road). A new shared pedestrian/cycleway bridge structure will be installed at the crossing. Further details on the proposed bridge are outlined in the detailed Technical Note in **Appendix I**.

10.6.36 Paved greenway facilities will be provided on the southern bank of the Royal Canal from new ped/cycle bridge to Granard Bridge (Ch.7200-7780), see **Figure 10.28** below.

10.6.37 A greenway underpass is proposed at Granard Bridge.



Figure 10.28: Route Option Sb3-4

10.6.38 The option S3b-4 proposed cross sections are presented in **Figures 10.29 – 10.30** below. Cross-section C-C is presented in the **Figure 10.18** previously provided.

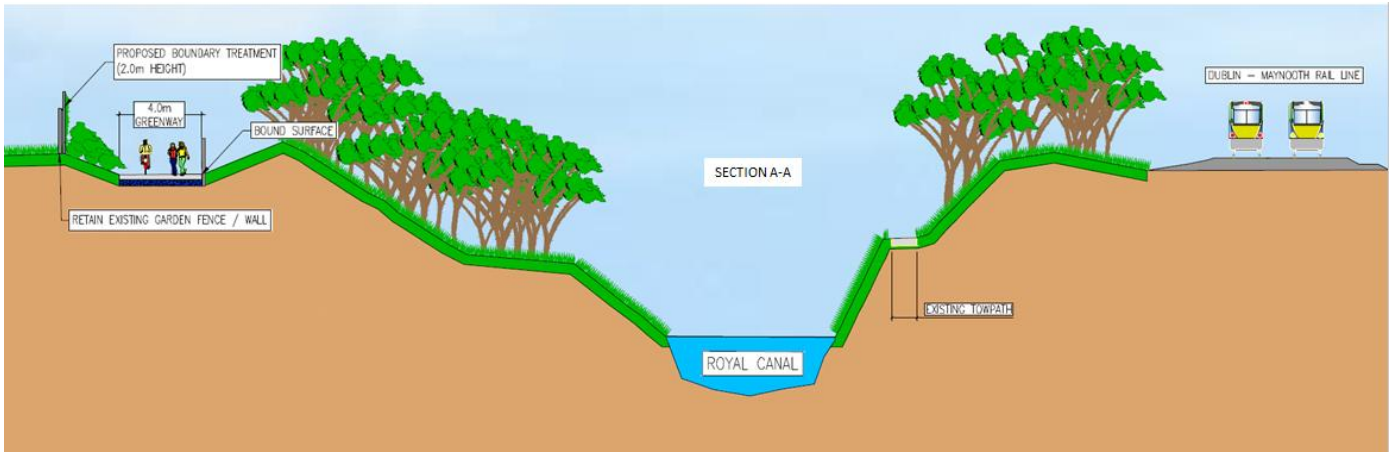


Figure 10.29: Route Option S3b-4: Proposed Cross Section A-A.

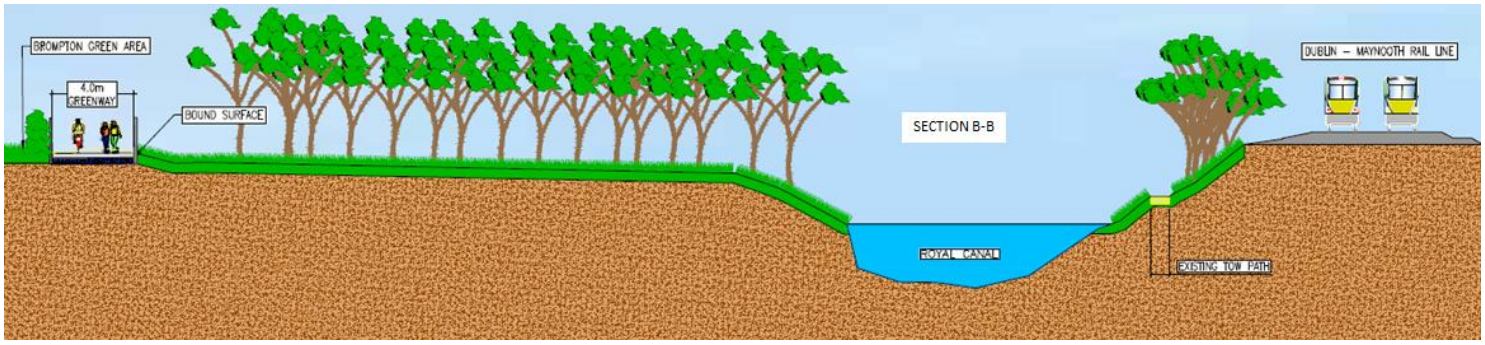


Figure 10.30: Route Option S3b-4: Proposed Cross Section B-B.

10.6.39 The following constraints would need to be considered if this route option is progressed:

- Environmentally sensitive trees on the northern side of the Royal Canal (Oak-Ash-Hazel woodlands (WN2);
- To minimise the impact on highly sensitive trees, the proposed route would be located on the upper embankment at Delwood Park. To prevent the greenway overlooking the back gardens of the residents of Delwood Park, a cutting through the embankments would need to be undertaken in areas which generally consist of made ground, to reduce the proposed level of the greenway. Also, fencing and landscaping will be provided

between the greenway and the back gardens to increase security and deter anti-social behaviour.

- Possible increased parking on surrounding roads which would need to be controlled/managed.
- There are two locations along the northern embankment where rock was originally quarried to create the Royal Canal, resulting in very steep cuttings/terrain at these locations. A boardwalk/bridge structure will be required to enable the proposed greenway to continue pass these locations.
- The proposed pedestrian/cycle bridge tie-in on the southern towpath is in close proximity to the railway line.
- Underpass proposed adjacent to the Granard Bridge (protected structure).

Option S3b-5 – Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.

10.6.40 Greenway would be provided on the northern side of the Royal Canal from Kirkpatrick Bridge to the new proposed ped/cycle bridge past the Brompton green area. The greenway will transfer to the southern embankment via the proposed bridge and continue along the southern embankment of the Royal Canal to Granard Bridge.

10.6.41 This route option is proposed through the middle of the wooded area from Kirkpatrick Bridge to the Brompton green area. It would be anticipated that this would result in the loss of a significant amount of the wooded area.

10.6.42 A concrete greenway will be provided from Kirkpatrick Bridge to the Brompton green area from Ch. 6250-6850, however, boardwalk/bridge structures will be required to enable the proposed greenway to continue past steep terrain such as the area of the old quarry etc.

10.6.43 A 4m paved greenway will be provided on the southern side of the Brompton green area (Ch. 6850-7100).

10.6.44 In terms of permeability/connectivity benefits, multiple access points from residential catchments would be achievable for this greenway route option however, it would be difficult owing to the vegetation between both areas.

10.6.45 The route switches from the northern side to the southern side of the Royal Canal at chainage 7100-7200 (before Roselawn Road). A new shared pedestrian/cycleway bridge will be installed at the crossing.

10.6.46 Paved greenway facilities will be provided on the southern bank of the Royal Canal from new ped/cycle bridge to Granard Bridge (Ch.7200-7780). See **Figure 10.31** below.

10.6.47 A greenway underpass is proposed at Granard Bridge.



Figure 10.31: Route Option S3b-5

10.6.48 The option S3b-5 proposed cross section A-A is presented in **Figure 10.32** below. Cross-section B-B is presented in the **Figure 10.18** previously provided.

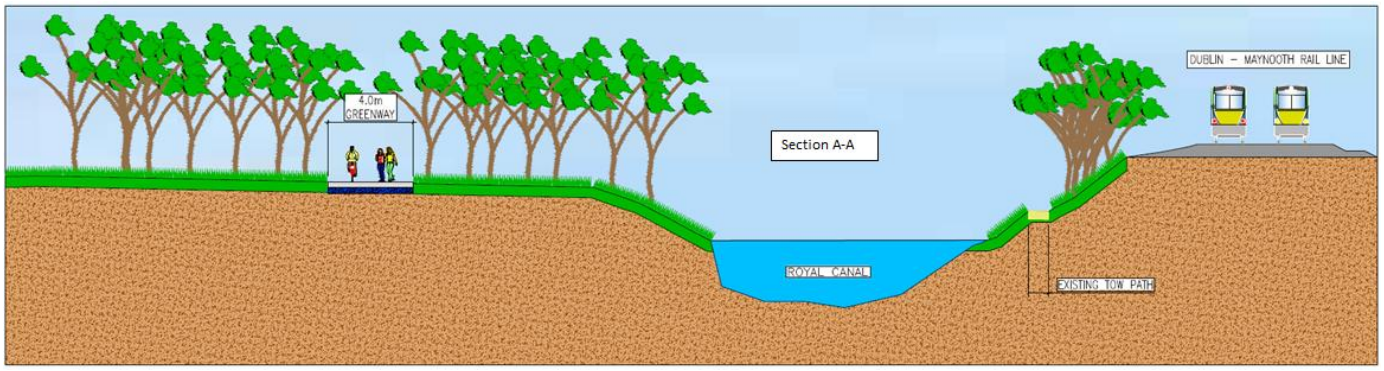


Figure 10.32: Route Option S3b-5: Proposed Cross Section A-A.

The following constraints would need to be considered if this route option is progressed:

- Environmentally sensitive trees on the northern side of the Royal Canal (Oak-Ash-Hazel woodlands (WN2);
- The proposed greenway route from Kirkpatrick Bridge to the Brompton green area is through the middle of the wooded area on the northern embankment, which would have a significant impact on highly sensitive trees and habitats.
- There are two locations along the northern embankment where rock was originally quarried to create the Royal Canal, resulting in very steep cuttings/terrain at these locations. A boardwalk/bridge structure will be required to enable the proposed greenway to continue pass these locations.
- Permeability/connectivity between the greenway and residential areas would be more difficult owing to the level difference and vegetation between both areas.
- The proposed pedestrian/cycle bridge tie-in on the southern towpath is in close proximity to the railway line.
- Underpass proposed adjacent to the Granard Bridge (protected structure).

Option S3b-6 – Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.

10.6.49 Greenway would be provided on the northern side of the Royal Canal (south of the wooded area) from Kirkpatrick Bridge to the new proposed ped/cycle bridge past the Brompton green area. The greenway will transfer to the southern embankment via the proposed bridge and continue along the southern embankment of the Royal Canal to Granard Bridge.

10.6.50 This route option is proposed along the northern bank of the royal canal, south of the wooded area. A piled concrete boardwalk structure (4m wide) is proposed due to the uneven terrain and to minimise impacts on habitats along the bank of the canal. This would result in less passive surveillance and security for greenway users.

10.6.51 Accessibility to the greenway is restricted between Kirkpatrick Bridge and the proposed pedestrian/cycle bridge (approx. 1km) due to the wooded area on the northern side (along with level difference), thereby preventing permeability and linkages from residential catchments.

10.6.52 The route switches from the northern embankment to the southern side of the Royal Canal at chainage 7100-7200 (before Roselawn Road). A new shared pedestrian/cycleway bridge structure would be installed at the crossing. A significant ramp would be required along the lower northern embankment to achieve the required bridge level over the canal (WI requirement of min 3.5-4m bridge height above the canal).

10.6.53 Paved greenway facilities will be provided on the southern bank of the Royal Canal from the new pedestrian/cycle bridge to Granard Bridge (Ch.7200-7780). See **Figure 10.33** below.

10.6.54 A greenway underpass is proposed at Granard Bridge.



Figure 10.33: Route Option S3b-6

10.6.55 The option S3b-6 proposed cross section A-A is presented in **Figure 10.34** below. Cross-section B-B is presented in the **Figure 10.18** previously provided.

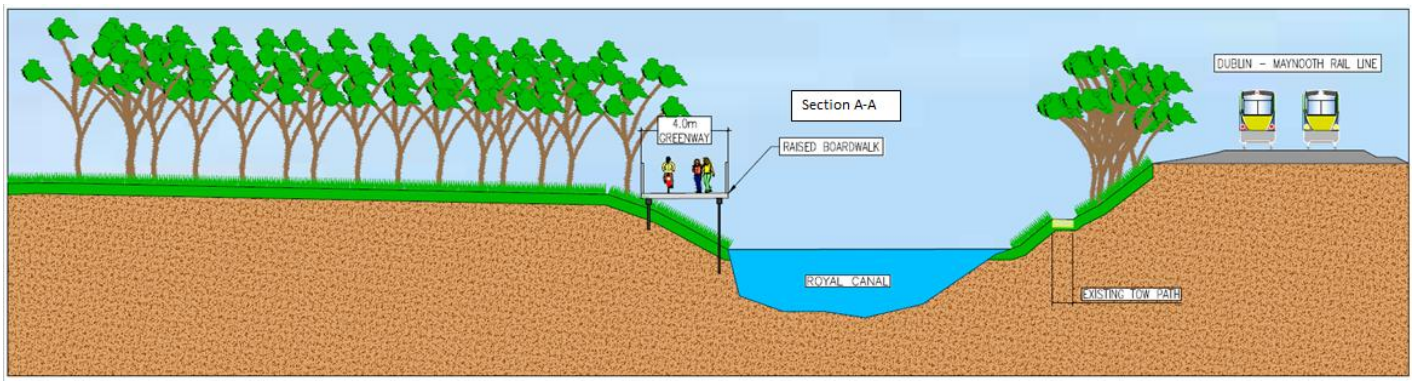


Figure 10.34: Route Option S3b-6: Proposed Cross Section A-A.

10.6.56 The following constraints would need to be considered if this route option is progressed:

- Accessibility to the greenway is restricted between Kirkpatrick Bridge and the proposed pedestrian/cycle bridge (approx. 1km) due to the wooded area on the northern side (along with level difference), thereby preventing permeability and linkages from residential catchments (in accordance with DMURS principles).
- The proposed greenway route from Kirkpatrick Bridge to the proposed pedestrian/cycle bridge (Ch6250-7100) may impact ecology/mammals along the bank of the canal. A piled boardwalk structure is proposed to minimise the impact on habitats.
- Protected bridges (Kirkpatrick Bridge and Granard Bridge);
- The proposed pedestrian/cycle bridge tie-in on the southern towpath is in close proximity to the railway line.
- A significant ramp would be required along the lower northern embankment to achieve the required bridge level over the canal (WI requirement of min 3.5-4m bridge height above the canal). Also, to achieve the required level, the ramp may result in loss of trees.
- Underpass proposed adjacent to the Granard Bridge (protected structure).

Option S3b-7 – Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.

10.6.57 Greenway will be provided on the northern side of the Royal Canal through Delwood Lawn, Delwood Road, Brompton Road and Roselawn Road.

10.6.58 A 4m paved greenway will be provided along the edge of the green area by Delwood Lawn and Delwood Road. East of the green area at Delwood, the greenway will continue along the southern side of Delwood Road to Brompton Road. Cyclists will share the road carriageway with vehicles along Brompton Court (cul-de-sac, low vehicular volumes) to the Brompton green area. A paved 4m wide greenway will be provided along the southern side of the Brompton green area. Cycle tracks will be provided either side of Roselawn Road.

10.6.59 The cycle facilities on Roselawn Road will tie into the proposed cycle facilities on Castleknock Road.



Figure 10.35: Route Option Sb3-7

10.6.60 The option S3b-7 proposed cross sections are presented in **Figure 10.36 – 10.37** below.

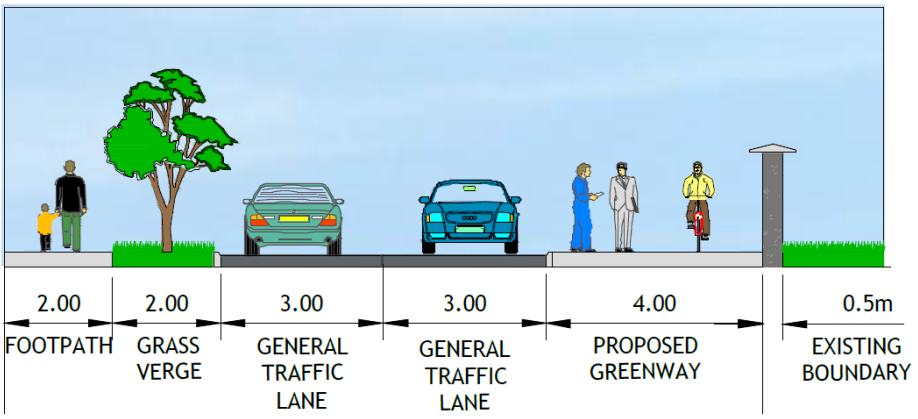


Figure 10.36: Route Option S3b-7: Proposed Cross Section A-A.

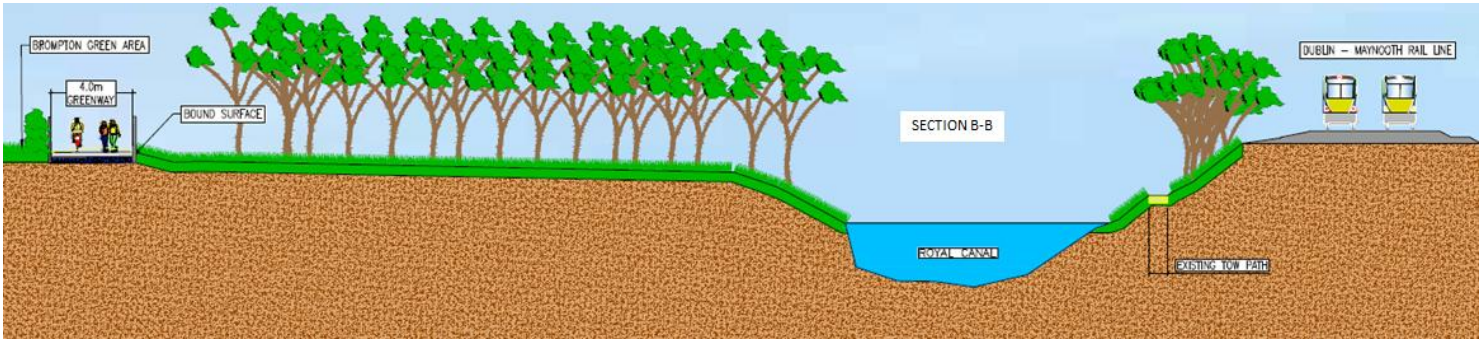


Figure 10.37: Route Option S3b-7: Proposed Cross Section B-B.

10.6.61 The following constraints would need to be considered if this route option is progressed:

- Potential removal of trees along Delwood Road to provide cycle facilities.
- Cyclists will share the road carriageway with vehicles along Brompton Court Lane (low volume of vehicular use).
- Segregated cycle tracks will be provided either side of the carriageway on Roselawn Road. This will remove the possibility to park on the road.
- Providing connection/tie-in between the cycle facilities on Roselawn Road to the proposed cycle facilities on Castleknock Road
- Possible increased parking on surrounding roads which would need to be controlled/managed.

Option S3b-8 - Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.

10.6.62 This option proposes the greenway on the northern side of the Royal Canal from Kirkpatrick Bridge via Delwood Lawn, Delwood Road, Brompton Court and along the southern side of the Brompton green area to the proposed ped/cycle bridge (Ch.7100).

10.6.63 A 4m paved greenway will be provided along the edge of the green area by Delwood Lawn and Delwood Road. East of the green area at Delwood, the greenway will continue along the southern side of Delwood Road to Brompton Court. Cyclists will share the road carriageway with vehicles (cul-de-sac, low vehicular volumes) along Brompton Court to the Brompton green area. A paved 4m wide greenway will be provided along the southern side of the Brompton green area.

10.6.64 A new pedestrian/cycle bridge which will link the greenway from the Brompton green area to the southern embankment of the Canal (Ch.7100-Ch. 7200).

10.6.65 Paved greenway facilities (4m wide) will be provided on the southern bank of the Royal Canal from new ped/cycle bridge to Granard Bridge (Ch.7200-7780).

10.6.66 A greenway underpass is proposed at Granard Bridge.



Figure 10.38: Route Option Sb3-8

10.6.67 The option S3b-8 proposed cross sections are presented in **Figure 10.39 – 10.40** below. Cross-section C-C is presented in the **Figure 10.18** previously provided.

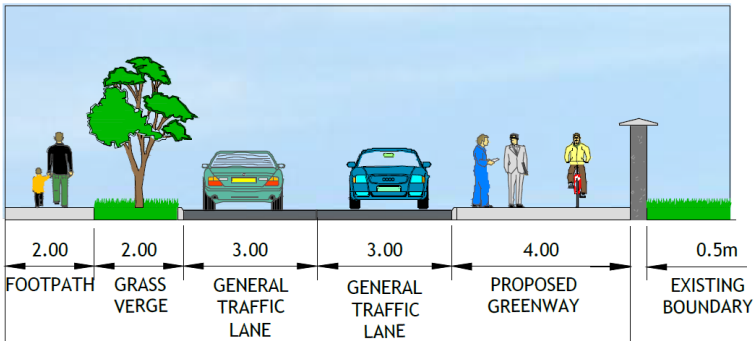


Figure 10.39: Route Option S3b-8: Proposed Cross Section A-A.

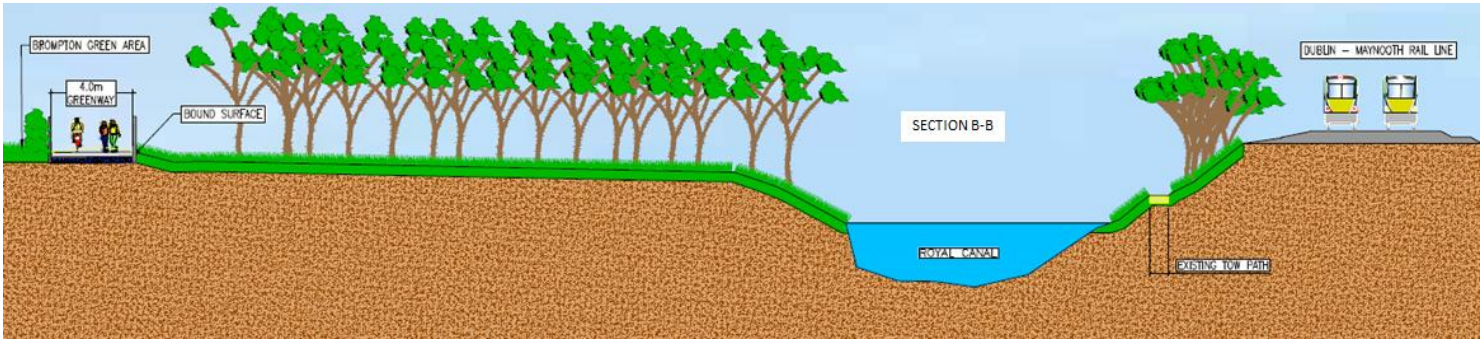


Figure 10.40: Route Option S3b-8: Proposed Cross Section B-B.

10.6.68 The following constraints would need to be considered if this route option is progressed:

- Potential removal of trees along Delwood Road to provide cycle facilities.
- Cyclists will share the road carriageway with vehicles along Brompton Court (low volume of vehicular use).
- Possible increased parking on surrounding roads which would need to be controlled/managed.
- The proposed pedestrian/cycle bridge tie-in on the southern towpath is in close proximity to the railway line.
- Underpass proposed adjacent to the Granard Bridge (protected structure).

Option S3b-9 - Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.

10.6.69 This option proposes the greenway on the northern side of the Royal Canal through Delwood Lawn, Delwood Road, Brompton Road, green area by Brompton and along the northern canal bank by Roselawn.

10.6.70 A 4m paved greenway will be provided along the edge of the green area by Delwood Lawn and Delwood Road. East of the green area at Delwood, the greenway will continue along the southern side of Delwood Road to Brompton Road. Cyclists will share the road carriageway with vehicles (cul-de-sac, low vehicular volumes) along Brompton Court to the Brompton green area. A paved 4m wide greenway will be provided along the southern side of the Brompton green area.

10.6.71 For the section of the route along the northern embankment by Roselawn (Ch. 7100-7800), a piled boardwalk structure is proposed due to the uneven terrain and to minimise impacts on habitats. Along this section a number of the residential back gardens extend to the canal, which results in pinch points/inadequate width. See **Figure 10.41** below.



Figure 10.41: Route Option S3b-9

10.6.72 The option S3b-9 proposed cross sections are presented in **Figure 10.42 – 10.44** below.

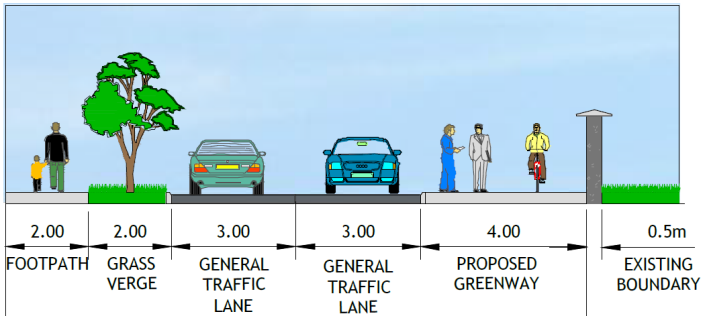


Figure 10.42: Route Option S3b-9: Proposed Cross Section A-A.

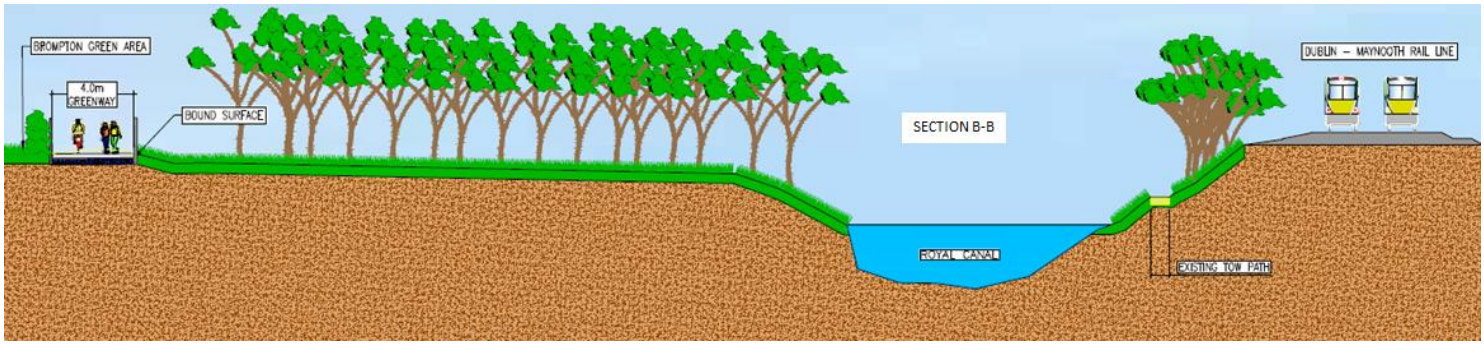


Figure 10.43: Route Option S3b-9: Proposed Cross Section B-B.

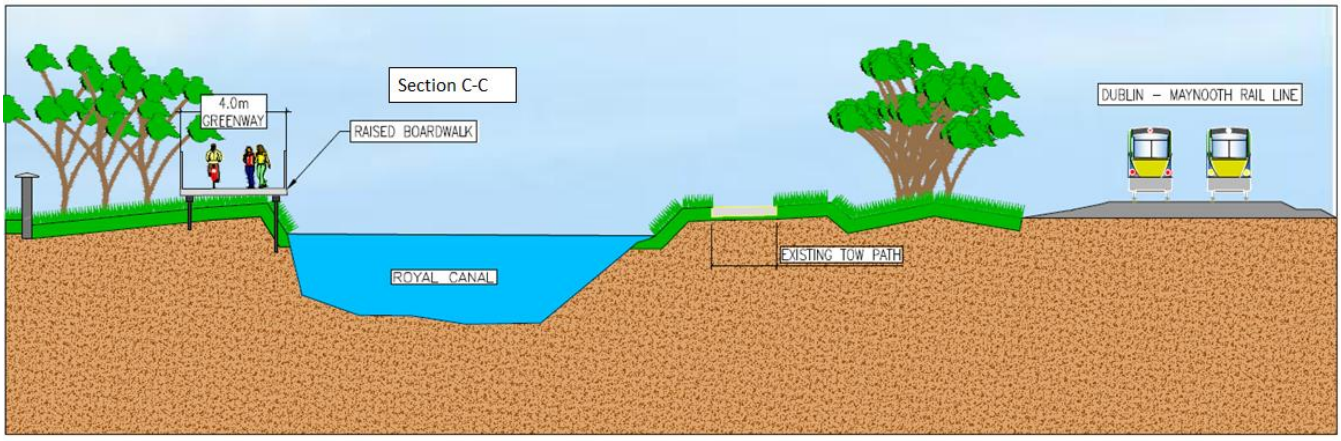


Figure 10.44: Route Option S3b-9: Proposed Cross Section C-C.

10.6.73 The following constraints would need to be considered if this route option is progressed:

- Potential removal of trees along Delwood Road to provide cycle facilities, which may also impact upon the residential Land User Character.
- Cyclists will share the road carriageway with vehicles along Brompton Court (low volume of vehicular use).
- Possible increased parking on surrounding roads which would need to be controlled/managed.
- Behind Roselawn Road, along the northern bank of the canal, a number of the residential back gardens extend to the canal, which has resulted in pinch points/inadequate width along this section of the route.
- The proposed greenway route along the northern embankment by Roselawn (Ch. 7100-7800) may impact on highly sensitive trees and habitats along the bank of the canal (habitats). A piled boardwalk structure is proposed to minimise the impact on habitats
- The boardwalk along the northern bank will more than likely have to be constructed from a barge on the canal.

Option S3b-10 - Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.

10.6.74 This option proposes a 3m two-way cycle facility on the northern side of the Royal Canal from Kirkpatrick Bridge to the proposed pedestrian/cycle bridge at Ch. 6250-7100). The cycle route will follow the same route as S3b-4.

10.6.75 This route option offers total segregation of cyclists to the north of the Royal Canal and pedestrians south of the Royal canal.

10.6.76 The existing towpath on the southern bank of the Royal Canal would be upgraded to accommodate pedestrian traffic only.

10.6.77 A concrete cycle route (3m wide) will be provided from Kirkpatrick to the Brompton green area from Ch. 6250-6850, however, boardwalk/bridge structures will be required to enable the proposed greenway to continue pass steep terrain such as the area of the old quarry.

10.6.78 To minimise the impact on highly sensitive trees, the proposed cycle route would be located in close proximity to the back gardens of the residents of Delwood Park and into the open space (green area).

10.6.79 The route switches from the northern side to the southern side of the Royal Canal at after the Brompton green area (Ch. 7100-7200). A new shared pedestrian/cycleway bridge structure will be installed at the crossing.

10.6.80 Paved greenway facilities (4m wide) will be provided on the southern bank of the Royal Canal from the new pedestrian/cycle bridge to Granard Bridge (Ch.7200-7780). See **Figure 10.45** below.

10.6.81 The existing pedestrian route along the southern towpath from Kirkpatrick Bridge to the proposed pedestrian/cycle bridge would be upgraded to a bound pavement surface. The existing towpath width will be maintained. The minimum existing

towpath width is 1.5m, which is less than the minimum acceptable footway width of 1.8m (according to DMURS).

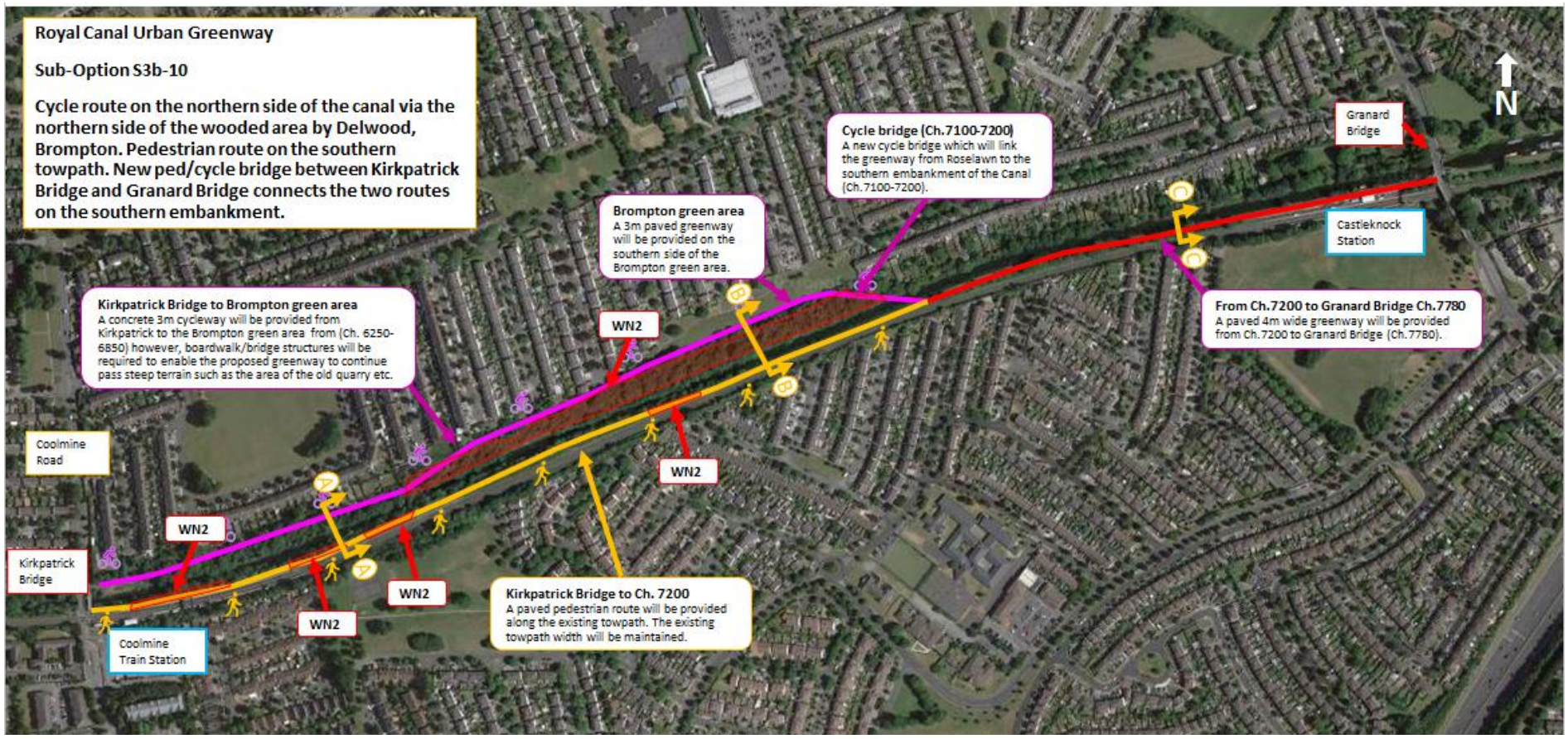


Figure 10.45: Route Option S3b-10

10.6.82 The option S3b-10 proposed cross sections are presented in **Figure 10.46 – 10.47** below. Cross-section C-C is presented in the **Figure 10.18** previously provided.

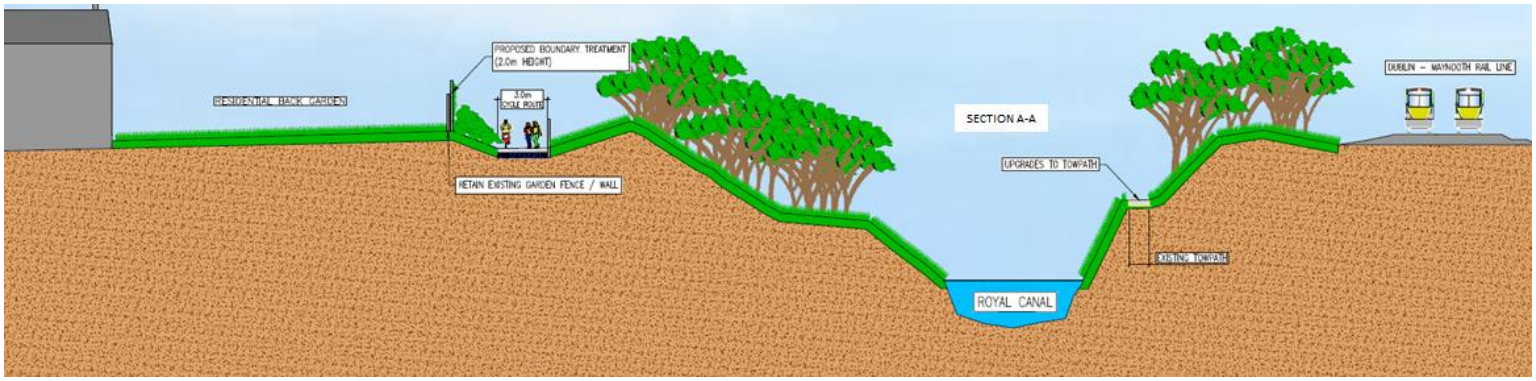


Figure 10.46: Route Option S3b-10: Proposed Cross Section A-A.

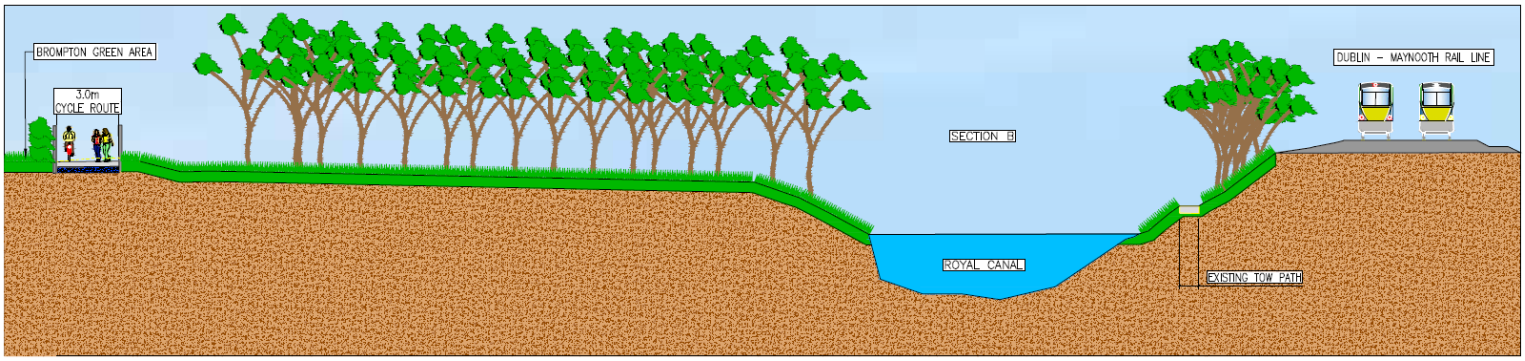


Figure 10.47: Route Option S3b-10: Proposed Cross Section B-B.

10.6.83 The following constraints would need to be considered if this route option is progressed:

- Environmentally sensitive trees on the northern side of the Royal Canal (Oak-Ash-Hazel woodlands (WN2);
- To minimise the impact on highly sensitive trees, the proposed route cycle route would be located on the upper embankment at Delwood Park and into the Brompton open space (green area), which may impact upon the residents Land Use Character. To prevent the cycle route overlooking the back gardens of the residents of Delwood Park, a cutting through the embankments will be undertaken to reduce the proposed level of the

greenway. Also, fencing and landscaping will be provided between the greenway and the back gardens to increase security and deter anti-social behaviour.

- Possible increased parking on surrounding roads which would need to be controlled/managed.
- There are two locations along the northern embankment where rock was originally quarried to create the Royal Canal, resulting in very steep cuttings/terrain at these locations. A boardwalk/bridge structure will be required to enable the proposed cycle route to continue pass these locations.
- The proposed pedestrian/cycle bridge tie-in on the southern towpath is in close proximity to the railway line.
- Upgrades to the existing pedestrian route on the southern towpath adjacent to the railway line from Kirkpatrick Bridge to the proposed pedestrian/cycle route may have a potential impact on the rail network.
- Two-way cycle facility provided on the northern side of the Royal Canal, separated from the pedestrian route does not align with the Royal Canal Greenway in the GDA Cycle Network Plan. Pedestrians & cyclists may continue to use each other's facilities which will not be sufficiently wide to accommodate shared use.
- Accessibility to the pedestrian route along the towpath is restricted between Kirkpatrick Bridge and Granard Bridge (1.5km) due to the railway line on the southern side of the towpath, thereby resulting in a less secure and safe facility for pedestrians and cyclists (in accordance with DMURS).
- The existing towpath width will be maintained. The minimum existing towpath width is 1.5m, which is less than the minimum acceptable footway width of 1.8m (according to DMURS).
- Underpass proposed adjacent to the Granard Bridge (protected structure).

Option S3-11- Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.

10.6.84 The Greenway will be provided on the northern side of the Royal Canal from Kirkpatrick Bridge to Granard Bridge. To minimise any impacts on the wooded area for 850m (Ch. 6250-7100), this route option is proposed through the residential back gardens of Delwood Park.

10.6.85 A concrete greenway will be provided from Kirkpatrick to the start of Delwood Park (Ch. 6250-6370). A paved greenway will be provided through the back gardens of the residential properties (Ch. 6370-6850).

10.6.86 A 4m paved greenway will be provided on the southern side of the Brompton green area (Ch. 6250-7100).

10.6.87 A 4m paved greenway will be provided through the residential back gardens of Roselawn Road, minimising impact on trees and habitats along the northern embankment of the canal (Ch.7150-7780).

10.6.88 The greenway will tie into the proposed pedestrian and cycle facilities on Castleknock Road as part of the Blanchardstown to Phoenix Park cycle scheme. See **Figure 10.48** below.



Figure 10.48: Route Option S3b-11

10.6.89 The option S3b-11 proposed cross sections are presented in **Figure 10.49 – 10.51** below.

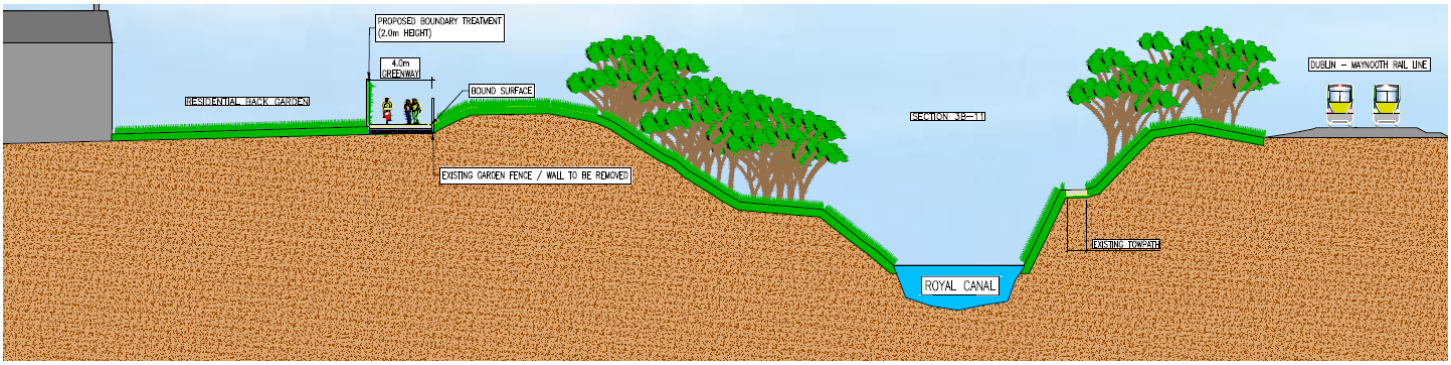


Figure 10.49: Route Option S3b-11: Proposed Cross Section A-A.

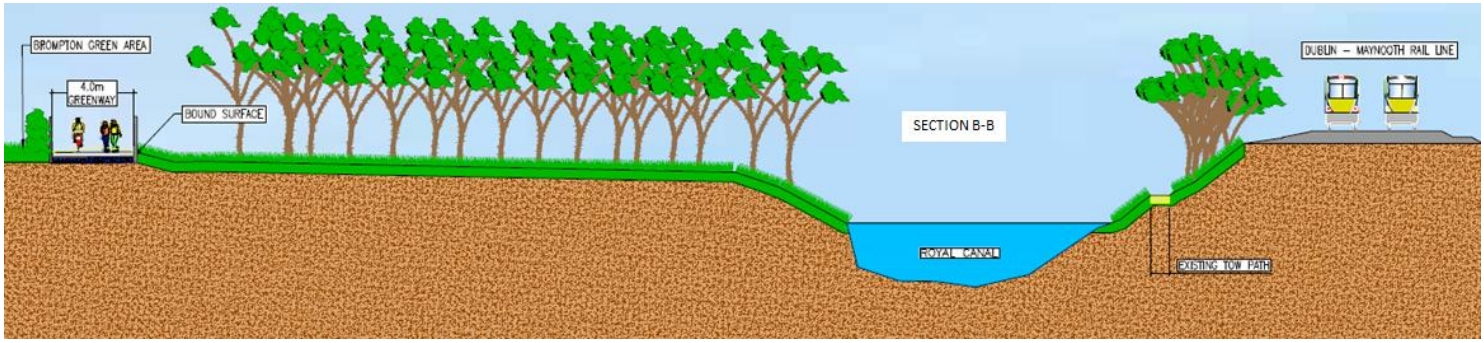


Figure 10.50: Route Option S3b-11: Proposed Cross Section B-B.

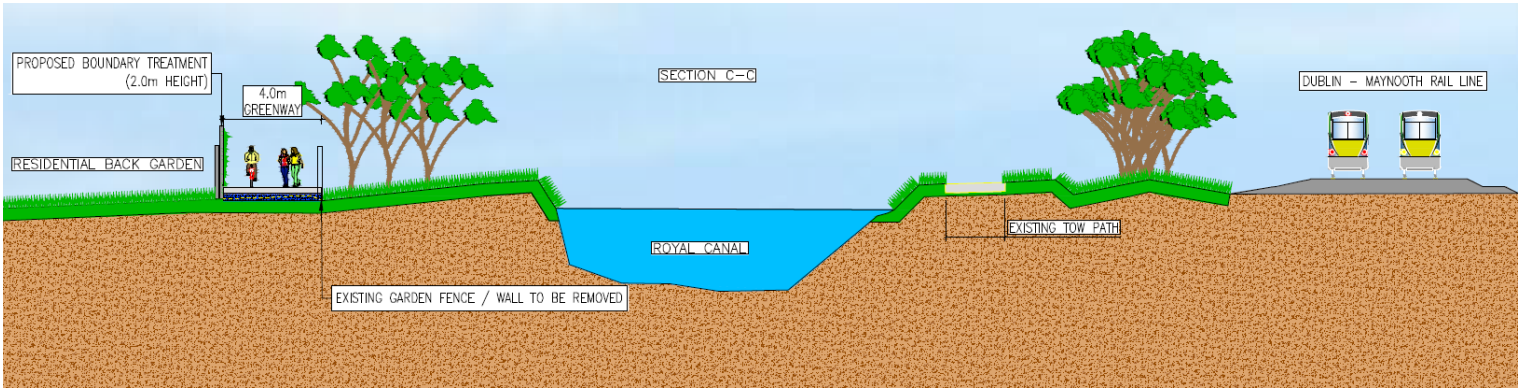


Figure 10.51: Route Option S3b-11: Proposed Cross Section C-C.

10.6.90 The following constraints would need to be considered if this route option is progressed:

- To minimise impact on environmentally sensitive trees and habitats, the proposed greenway will be routed through the back gardens of Delwood Park and Roselawn, which will require land acquisition.
- Possible increased parking on surrounding roads which would need to be controlled/managed.
- Land acquisition/encroachment into the residential back gardens.
- Visual impact of the greenway through the residential back gardens. Boundary fencing and landscaping would be provided, to reduce the impact.

Section 3b Route Options Multi-Criteria Analysis

10.6.91 The Multi-Criteria Analysis route options assessment summary tables for the cycle Route Options for Section 3b are presented in **Appendix E**. The relative ranking of route options against the scheme assessment sub-criteria are summarised in **Table 10.3** below.

Royal Canal Urban Greenway – Sub-Options for Section 3 Kirkpatrick Bridge to Granard Bridge												
Appraisal Criteria	Sub-Criteria	Option S3b-1 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk Option A).	Option S3b-2 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk Option B).	Option S3b-3 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.	Option S3b-4 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-5 Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-6 Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-7 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.	Option S3b-8 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-9 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.	Option S3b-10 Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.	Option S3b-11 Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.
1 Economy	1A Capital Cost											
	1B Constructability											
	1C Quality of Service											
2 Integration	2A Cycle Network Integration											
	2B Traffic Network Integration											
	2C Potential Impact on Rail Network											
	2D Potential Impact on Canal Users											
	2E Potential Impact on Communities/Residents											
3 Safety	3A Road Safety											
	3B Pedestrians Safety											
4 Environment	5A Archaeology and Cultural Heritage											
	5B Architectural Heritage											
	5C Flora & Fauna											
	5D Soils, Geology & Hydrology											
	5E Landscape and Visual											
	5F Land Use Character											

Table 10.3: Principal Route Options MCA Summary (Sub-Criteria)

10.6.92 **Economy** - Option S3b-7 is ranked the most economical. The primary differentiator in terms of 'Capital Costs' between route options is the structural infrastructure required for particular options due to inadequate width along the banks of the canal, steep terrain or proposed new canal crossings etc. Options S3b-11 requires significant land acquisition from residential lands.

10.6.93 **Constructability** - Options S3b-1 and S3b-2 propose to provide cantilevered type boardwalk design along the majority of their route, due to the inadequate width along the canal towpath. These sections have steep banks and are in close proximity to the railway line. This will prove very difficult to construct and will more than likely have to be constructed from a barge on the canal. The cantilever structure would be located at the base of the Iarnród Éireann infrastructure. Measures will need to be undertaken to minimise any effects on the live rail system (e.g. settlement/slope slips). Option 3b-6 proposes to provide a piled boardwalk structure along the northern embankment due to the uneven terrain and to minimise impacts on habitats along the bank of the canal. The boardwalk would more than likely have to be constructed from a barge on the canal.

10.6.94 A detailed technical note outlines the constructability constraints associated with both options north and south of the Royal Canal in Section 3b in greater detail, see **Appendix I**.

10.6.95 **Quality of Service** - Options S3b-1, S3b-2 and S3b-6 are ranked the best. The greenway routes proposed for these options are generally segregated from vehicular traffic for the entire route, runs along the entire bank of the Royal Canal, do not have any detours and the environment along the route is pleasant and interesting. Compared to options S3b-7, S3b-8 and S3b-9 which detour significantly from the Royal Canal and users may interactions with vehicular traffic via Delwood and Brompton.

10.6.96 **Cycle Network Integration** - Options S3b-1, S3b-2 and S3b-6 score highest because they provide Greenway facilities along the Royal Canal which aligns

with the GDA Cycle Network Plan compared to the circuitous route taken by options S3b-7, S3b-8 and S3b-9.

10.6.97 **Traffic Network** - Route option S3b-7 provides cycle facilities along/adjacent to Delwood Road and Roselawn Road which will have a negative impact on the traffic network here.

10.6.98 **Potential Impact on Rail Network** - Options S3b-1 and 3b-2 have the most potential to impact on the Rail Network, the cantilever structure would be located at the base of the Iarnród Éireann infrastructure and measures will need to be undertaken to minimise any effects on the live rail system (e.g. settlement/slope slips).

10.6.99 **Potential Impact on Canal Users** - Options S3b-1 and S3b-2 have the most potential to impact on the Canal Users, the extent of the projected cantilever may impact on the operation of barges along the route. Also, the cantilevered boardwalk will require safety barriers along the towpath for 1km. These barriers may hinder the used of the towpath to tow barges.

10.6.100 **Potential Impact on Communities/Residents** - Options S3b-3, S3b-4, 3b-10 and 3b-11 have the most potential to impact on communities/residents, from the non-statutory public consultation some of the main concerns from residents were proximity of the route to residential properties, security and the opening of cul-de-sacs. All four options above are proposed in close proximity to the back gardens of Delwood Park, however, appropriate mitigation could be put in place in the form of boundary treatment, CCTV etc as well as a parking management regime along affected streets.

10.6.101 **Safety** - Option S3b-7 is ranked the worst. This option routes pedestrians and cycles via the Delwood Road and Roselawn Road, compared to other options that provide the greenway along the Royal Canal segregated from traffic for the majority of the route.

10.6.102 **Architectural Heritage** - Route options S3b-1, S3b-2 & S3b-6 are considered the least attractive, due to the fact that the fabric of the canal itself is a protected structure, and these routes options propose a boardwalk greenway

along the bank of the Royal Canal for the majority of the route which would materially alter the existing environment negatively. They may also potentially directly impact Kirkpatrick Bridge which is a protected structure.

10.6.103 **Flora & Fauna** - Route option S3-7 is the most attractive. It may require the removal of a small area (109m^2) of Environmentally sensitive trees of moderate value (Mixed, broadleaved woodlands). Compared to Options Sb3-1 or Sb3-3 which may require the removal of a significant area of Environmentally sensitive trees of both high value (Oak-ash-hazel woodlands) and moderate value (Mixed, broadleaved woodlands) located along these routes.

10.6.104 **Soil, Geology & Hydrology** - Route options S3b-1 and S3b-2 are ranked the lowest. The cantilevered boardwalk greenway (using tensile rods into rock) along the southern towpath may have an impact on soils & Geology, along with the retaining of the railway embankment by retaining wall or anti-erosion geocell. Option Sb3-5 involves the removal of a significant number of trees through the wooded area would impact on the soil & geology, along with the provision of boardwalk and bridge structures.

10.6.105 **Landscape & Visual** - Options S3b-1 and S3b-6 are the least attractive. They propose boardwalk greenway along the bank of the Royal canal for the majority of the route which may have a visual impact on the Royal Canal. Option S3b-2 proposes a cantilevered boardwalk similar to S3b-1, however, an anti-erosion geo-cell matt is proposed instead of a retaining wall, which would have less impact on the visual landscape as it can be seeded with vegetation. However, each of these options are expected to result in a considerable loss of trees on the southern embankment. Option S3b-3 propose a piled boardwalk along the northern bank of the canal behind the Roselawn Road residential properties, which may have a visual impact on the Royal Canal.

10.6.106 **Land Use Character** - Options S3b-3, S3b-9 and S3b-11 are ranked the lowest. The primary differentiator in terms of "Land Use Character" between route options is level of land acquisition required. Options S3b-3, S3b-9 and S3b-11 require land acquisition from the back gardens of residential properties

that may affect the viability of the properties from being used for their intended use.

10.6.107 A summary of the assessment and relative ranking of route options against the four main assessment criteria is presented in **Table 7.4** below.

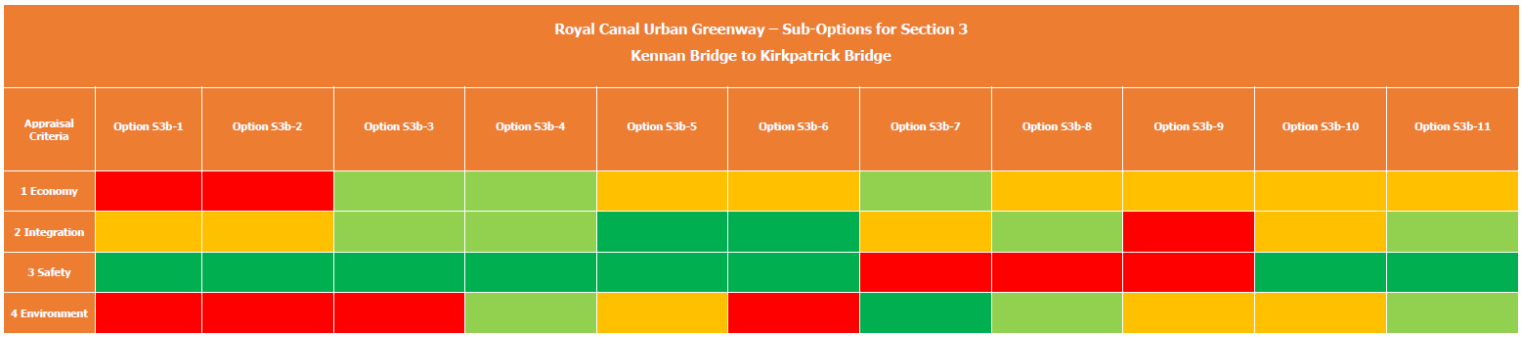


Table 10.4: Principal Route Options MCA Summary (Main Criteria)

10.6.108 Based on the considerable constraints within the 'Deep Sinking' section and the fact that the majority of the submissions received at the initial public consultation process (2019 were based along this Section 3b of the scheme (as summarised in **Chapter 6**), additional field surveys and ground investigation surveys were undertaken to fully understand the constraints and likely constructability of particular options between Coolmine and Castleknock stations. Preliminary designs were developed for the northern and southern side of the canal. A detailed technical note was then prepared which outlines the constraints associated with both options north and south of the Royal Canal, see **Appendix I**. In conclusion, the technical note outlined that the Northern Route Option was the preferred option over the Southern Option for the following reasons:

- The northern route option provides greater access for construction, access which will likely be via Waterways Ireland access gate at Coolmine Road and via the Brompton green area. For the southern option, working widths for tracking equipment (drilling rigs or excavators) on the towpath is limited. It would be required to use the canal with a barge type system for a working platform. There is also a risk of construction workers falling off the embankment (towpath) into the canal and safety concerns due to the proximity of workers adjacent to a live railway line particularly at the

pinch point 400m west of Castleknock Station Ch. 7000-7160 between the canal towpath's edge and masonry retaining wall structure for Irish Rail (1-2m width).

- The northern option will not impact on existing nor proposed Irish Rail infrastructure. The southern option, with the proposed cantilevered boardwalk design along the towpath (particularly where tie-back anchors will protrude under the railway line) will impact on existing Irish Rail operations and future Dart + proposals.
- The northern option will have no appreciable impact on canal users, whereas the cantilevered boardwalk on the southern side may impact on Waterways Ireland maintenance along the canal and the operation of barges due to the extent of the projected cantilever. During construction/installation of the cantilevered boardwalk from a barge, the canal may need to be closed for a period of 8-12 months.
- The northern route option permits permeability and linkages from residential catchments (in accordance with DMURS principles), the southern option is restricted between Kirkpatrick Bridge and Granard Bridge (approx. 1.5km) due to the railway line on the southern side of the towpath. There would be no opportunity to provide additional access points along this section on the southern embankment, which would create considerable security issues for greenway users.
- There will be little visual impact of the northern option on the Royal Canal as the route will be hidden/separated from the northern embankment of the Royal Canal by a large woodland, compared to the proposed cantilevered boardwalk greenway along the southern towpath for 1km, would have a significant visual impact on the Royal Canal (protected structure).
- In terms of Architectural heritage, the northern route option will not directly impact on Kirkpatrick Bridge or result in significant physical and visual alternations to the fabric of the canal (protected structure).

- To minimise the impact on highly sensitive trees, the northern route option is proposed in close proximity to the back gardens of the residents of Delwood Park and into the open space (green area) at Brompton, providing a cantilevered structure along the towpath for the southern option would result in the removal of the treeline/hedgerow between the Railway Line along the towpath (approx. 1km length).
- To mitigate the impacts on security and visual intrusion from the greenway, the northern route option would be lowered to prevent the greenway overlooking the back gardens of the residents of Delwood Park and security fencing and defensive planting will be provided.

10.6.109 Based on the above information and the assessment undertaken for this Route Options Report, route option S3b-4 (Greenway on the northern side of the Royal Canal, north of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge) appears to offer more benefits over the other options.

10.6.110 Option S3b-4 is therefore preferred route option for the following reasons:

- It offers a more direct route along the Royal Canal compared to options such as S3b-7, S3b-8 & S3b-9;
- It one of the safest options;
- It permits permeability and linkages from residential catchments;
- It has very low impact on Architectural Heritage;
- It has very low potential impact on the Traffic and Rail Network compared to other options;
- It has the less Environmental Impacts compared to the majority of other options.
- It has low visual impact upon the Royal Canal.

10.6.111 Based on the multi-criteria assessment undertaken for this section of the Study Area, Option S3b-4 is identified as the preferred route option for Section 3b from Kirkpatrick Bridge to Granard Bridge.

10.6.112 The benefits of the preferred route (Option S3b-4) can be summarised as follows:

i. Continuous and direct greenway provided for the majority of the route.
ii. It provides Greenway facilities in close proximity to the Royal Canal which aligns with the GDA Cycle Network Plan.
iii. Accessibility to the greenway is provided at Delwood and Brompton green area, providing permeability and linkages from residential catchments (in accordance with DMURS principles).

10.7 Section 3c – Introduction

10.7.1 When assessing the route options for section 3c, there are 2 route options (Option S3c-1 and S3c-2) between Granard Bridge (Castleknock Road) and Talbot Bridge (Old Navan Road).

10.7.2 The following two route options were taken forward:

- Option S3c-1 - Greenway on the northern side of the Royal Canal; and
- Option S3c-2 - Greenway along the southern towpath of the Royal Canal.

10.7.3 The route options for Section 3c are illustrated in drawing **170239-2305** in **Appendix J**.

10.7.4 The assessment process has been outlined in **Chapter 7** of this report. In this section of the report it is proposed to set out the assessment procedure and results for the Section 3c between Granard Bridge and Talbot Bridge.

10.7.5 The assessment of the options is discussed further in **Chapter 10.8** below.

10.8 Section 3c – Option Assessment

Option S3c-1 - Greenway on the Northern side of the Royal Canal.

10.8.1 A paved 4m wide greenway will be provided for the majority of the route with the exception of a 35m section at The Mills Apartments and the two bridge sections - Granard Bridge (30m section) and Talbot Bridge (20m section), where a 3-3.5m wide greenway is only achievable

10.8.2 A pedestrian/cycle bridge is proposed on the western side of Granard Bridge to connect cyclists to the northern bank of the Royal Canal.

10.8.3 A 3m wide greenway is proposed on the western side of the Old Navan Road/Talbot Bridge (widen into grass verge) to provide safe connection to the Ashtown Greenway.

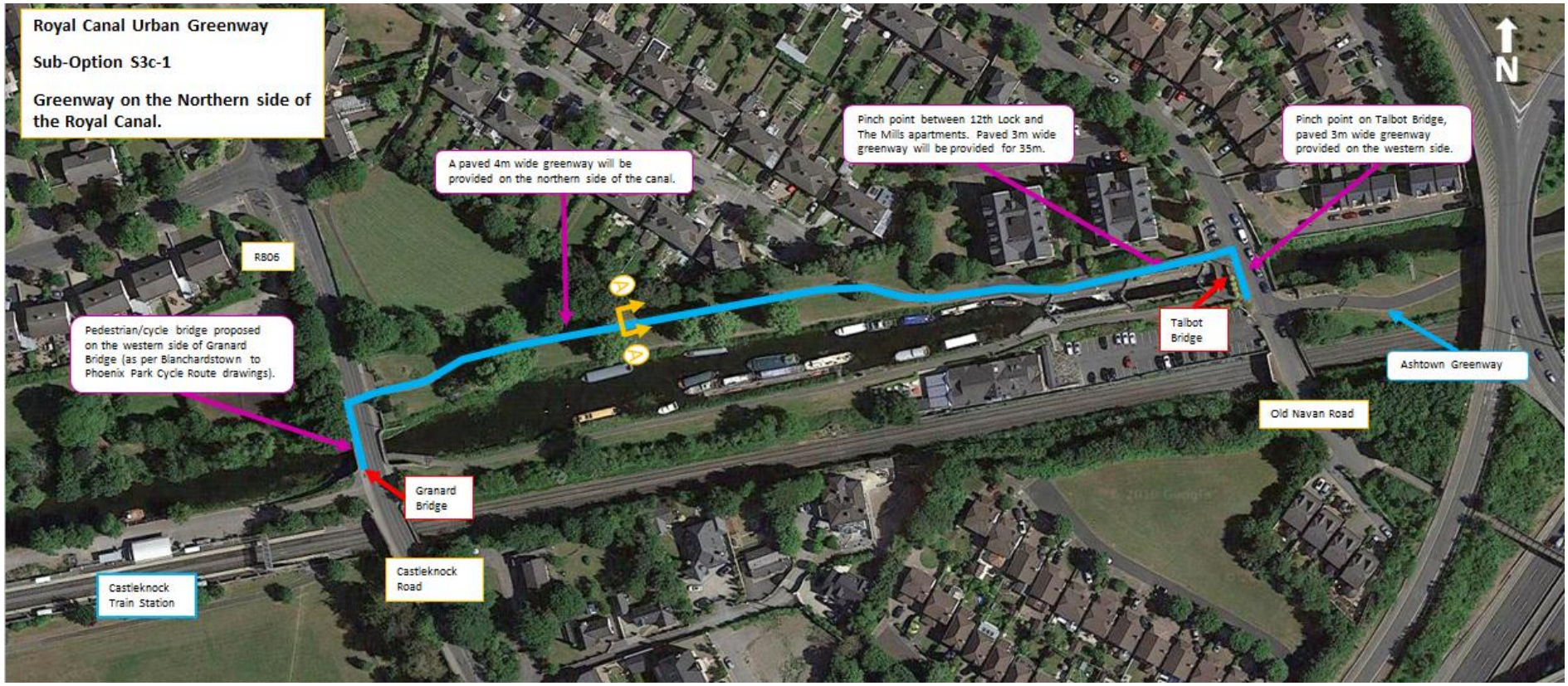


Figure 10.52: Route Option S3b-1

10.8.4 The option S3c-1 proposed cross sections are presented in **Figure 10.53** below.

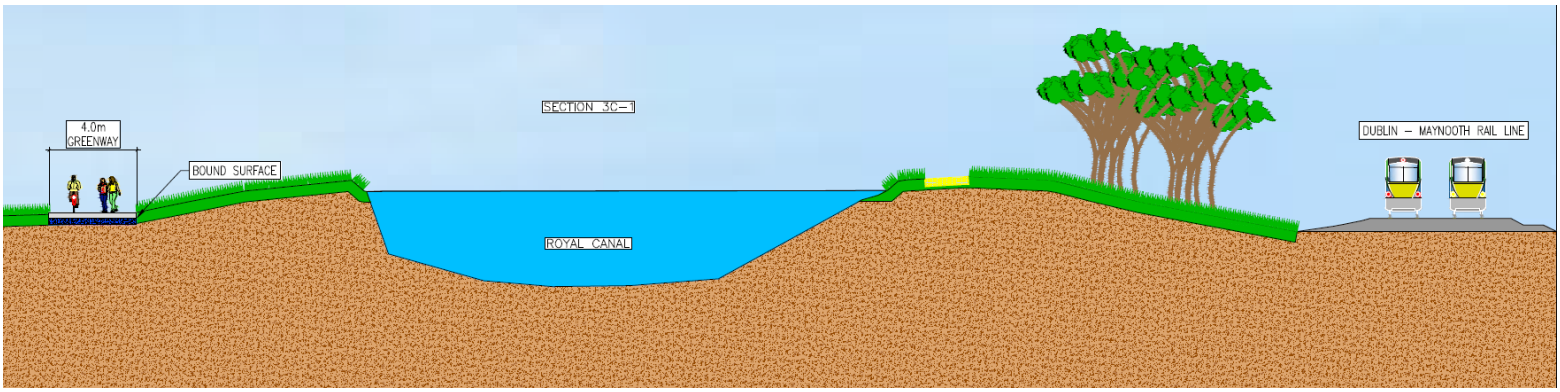


Figure 10.53 Route Option S3c-1: Proposed Cross Section A-A.

10.8.5 The following constraints would need to be considered if this route option is progressed:

- Protected bridges (Granard Bridge and Talbot Bridge), this option has the potential to directly impact Granard Bridge.
- Pinch point at The Mills Apartments.

Option S3c-2 - Greenway on the Southern side of the Royal Canal.

10.8.6 A paved 4m wide greenway will be provided on the southern towpath from Granard Bridge to the 12th Lock Hotel. Due a pinch point between the hotel and the canal a 3m wide greenway is only feasible from the 12th Lock Hotel to Talbot Bridge/Old Navan Road (150m).

10.8.7 Public Lighting will be provided along this section of the route.

10.8.8 An underpass is proposed at Granard Bridge.

10.8.9 A toucan crossing will be provided at Talbot Bridge.



Figure 10.54: Route Option S3b-1

10.8.10 The option S3c-1 proposed cross sections are presented in **Figure 10.55**.

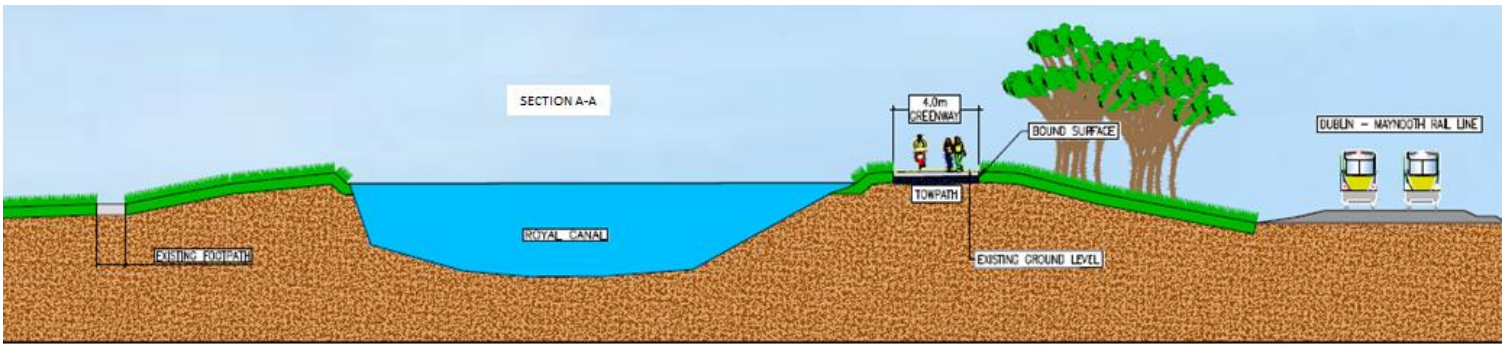


Figure 10.55 Route Option S3c-2: Proposed Cross Section A-A.

10.8.11 The following constraints would need to be considered if this route option is progressed:

- Pinch point at the 12th Lock Hotel.

Section 3c Route Options Multi-Criteria Analysis

10.8.12 The Multi-Criteria Analysis route options assessment summary tables for the cycle Route Options for Section 3c are presented in **Appendix F**. The relative ranking of route options against the scheme assessment sub-criteria are summarised in **Table 10.5** below.

Royal Canal Urban Greenway – Sub-Options for Section 3 Granard Bridge to Talbot Bridge			
Appraisal Criteria	Sub-Criteria	Option S3c-1 Greenway on the northern side of the Royal Canal.	Option S3c-2 Greenway on the southern side of the Royal Canal.
1 Economy	1A Capital Cost		
	1B Constructability		
	1C Quality of Service		
2 Integration	2A Cycle Network Integration		
	2B Traffic Network Integration		
	2C Potential Impact on Rail Network		
	2D Potential Impact on Canal Users		
	2E Potential Impact on Communities/Residents		
3 Safety	3A Road Safety		
	3B Pedestrians Safety		
4 Environment	5A Archaeology and Cultural Heritage		
	5B Architectural Heritage		
	5C Flora & Fauna		
	5D Soils, Geology & Hydrology		
	5E Landscape and Visual		
	5F Land Use Character		

Table 10.5: Principal Route Options MCA Summary (Sub-Criteria)

10.8.13 **Economy** - Option S3c-2 is ranked the most economical. Option S3c-1 requires a pedestrian/cycle bridge adjacent to Granard Bridge, while Option S3c-2 requires a greenway underpass at Granard Bridge. The traffic management associated with the new ped/cycle bridge (Option S3c-1) results in a slightly more expensive option.

10.8.14 **Constructability** - Option S3c-1 is ranked the worst. It proposes to provide a pedestrian/cycle bridge adjacent to Granard Bridge (protected structure), which will prove difficult to construct compared to option S3c-1 which has no bridge structures.

10.8.15 **Quality of Service** - Options S3c-1 scores the lowest. Option S3c-1 detours from the southern towpath at Granard Bridge to the northern towpath and then back to the southern towpath at Talbot Bridge to connect with the Ashtown Greenway. Whereas option S3c-2 runs along the entire bank of the Royal Canal, it does not have any detours. It is a more direct route.

10.8.16 **Traffic Network** - Route option S3c-1 has slightly more of a potential impact on traffic. Option S3c-1 requires a toucan crossing on Castleknock Road which will have an impact on general traffic, while a greenway underpass is provided at Granard Bridge to the southern towpath, as per Preferred Route Option S3b-4 from Section 3b to the west.

10.8.17 **Potential Impact on Rail Network** - Option S3c-2 is ranked slightly lower than option S3c-1, as the greenway route is on the southern towpath adjacent to the railway line, however, there is significant distance from the greenway and the railway line for the entire section (minimum separation approx. 11m).

10.8.18 **Safety** - Option S3c-1 is ranked the lower than option S3c-2 because there are sections of the greenway adjacent Castleknock Road and Old Navan Road and a toucan crossing is provided across Castleknock Road. Whereas S3c-2 is segregated from vehicular traffic on Castleknock Road via an underpass and is not routed adjacent to the Old Navan Road.

10.8.19 **Architectural Heritage** - Route option S3c-1 is considered the least attractive, as the route has the potential to directly impact on Granard Bridge. A pedestrian/cycle bridge is proposed to be built on the western side of the bridge in very close proximity to the bridge wall, protected structure. Also, a 3m section of greenway is proposed on the eastern side of the road carriageway adjacent to Talbot Bridge wall (protected structure).

10.8.20 **Flora & Fauna** - Route option S3c-1 is the least attractive. It may involve the removal of a number of trees due to the provision of a new cycle bridge on the western side of Granard Bridge (67m2)

10.8.21 **Landscape & Visual** - Option S3c-1 is the least attractive. It proposes a pedestrian/cycle bridge on the western side of Granard Bridge to connect cyclists to the northern bank of the Royal Canal which may have a landscape and visual impact on the Royal Canal and Granard Bridge (Protected Structure).

10.8.22 **Land Use Character** - Options S3c-2 is ranked slightly lower than S3c-2. For option S3c-2 may require land acquisition from a small section of the paved area at 12th Lock Hotel & Restaurant to provide a 3m wide greenway at the pinch point.

10.8.23 A summary of the assessment and relative ranking of route options against the four main assessment criteria is presented in **Table 10.6** below.

Royal Canal Urban Greenway – Sub-Options for Section 3 Granard Bridge to Talbot Bridge		
Appraisal Criteria	Option S3c-1 Greenway on the northern side of the Royal Canal.	Option S3c-2 Greenway on the southern side of the Royal Canal.
1 Economy		
2 Integration		
3 Safety		
4 Environment		

Table 10.6: Principal Route Options MCA Summary (Main Criteria)

10.8.24 Based on the assessment undertaken, route option S3c-2 appears to offer more benefits over the other options. Option S3c-2 is therefore preferred route option for the following reasons:

- It offers a more direct route along the Royal Canal compared to option S3c-1;
- It is more economical. The traffic management associated with the new ped/cycle bridge (Option S3c-1) results in a slightly more expensive option.
- It is a safer option;
- It has very low impact on Architectural Heritage;
- It has very low potential impact on the Traffic;
- It has the less Environmental Impacts compared to option S3c-1.
- It has low visual impact upon the Royal Canal.

10.8.25 Based on the multi-criteria assessment undertaken for this section of the Study Area, Option S3c-2 is identified as the preferred route option for Section 3c, from Granard Bridge to Talbot Bridge.

10.8.26 The benefits of the preferred route (Option S3c-2) can be summarised as follows:

i. Continuous and direct greenway provided the route.
ii. It provides Greenway facilities in close proximity to the Royal Canal which aligns with the GDA Cycle Network Plan.
iii. The environmental impact of delivering the scheme would be minimal as the proposed greenway would be provided within the available land along the Royal Canal Towpath.

10.9 Section 3 – Preferred Route

10.9.1 As outlined in **Chapter 10.2**, the preferred route option for each sub-section (Section 3a, 3b and 3c) will be combined to create the preferred route option for Section 3.

10.9.2 The Greenway will be provided on the northern side of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge via Sheepmoor Lane.

10.9.3 To minimise the impact on highly sensitive trees, the proposed route is located north of the wooded area along the northern embankment from Kennan Bridge to Sheepmoor Lane.

10.9.4 Greenway users will be directed onto the pedestrian/cycle facilities proposed as part of the Windmill Court Residential Development.

10.9.5 Through Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use).

10.9.6 The greenway will continue on the northern side of the Royal Canal from Kirkpatrick Bridge to the Brompton green area, from Ch. 6250-6850. Boardwalk/bridge structures will be required to enable the proposed greenway to continue past steep terrain such as the area of the old quarry.

10.9.7 To minimise the impact on highly sensitive trees, the proposed route will be located on the upper embankment at Delwood Park and into the open space (green area) at Brompton.

10.9.8 A 4m paved greenway will be provided on the southern side of the Brompton green area (Ch. 6850-7100).

10.9.9 The route switches from the northern side to the southern side of the Royal Canal at chainage 7100-7200 (before Roselawn Road). A new shared pedestrian/cycleway bridge structure will be installed at the crossing.

10.9.10 Paved greenway facilities will be provided on the southern bank of the Royal Canal from new ped/cycle bridge to Granard Bridge (Ch.7200-7780).

10.9.11 A greenway underpass is proposed at Granard Bridge.

10.9.12 A paved 4m wide greenway will be provided on the southern towpath from Granard Bridge to the 12th Lock Hotel. Due a pinch point between the hotel and the canal a 3m wide greenway is only feasible from the 12th Lock Hotel to Talbot Bridge/Old Navan Road (150m). The greenway will tie into the current Ashtown Greenway at Talbot Bridge.

10.9.13 The preferred route for Section 3 is illustrated in **Figure 10.66** below.

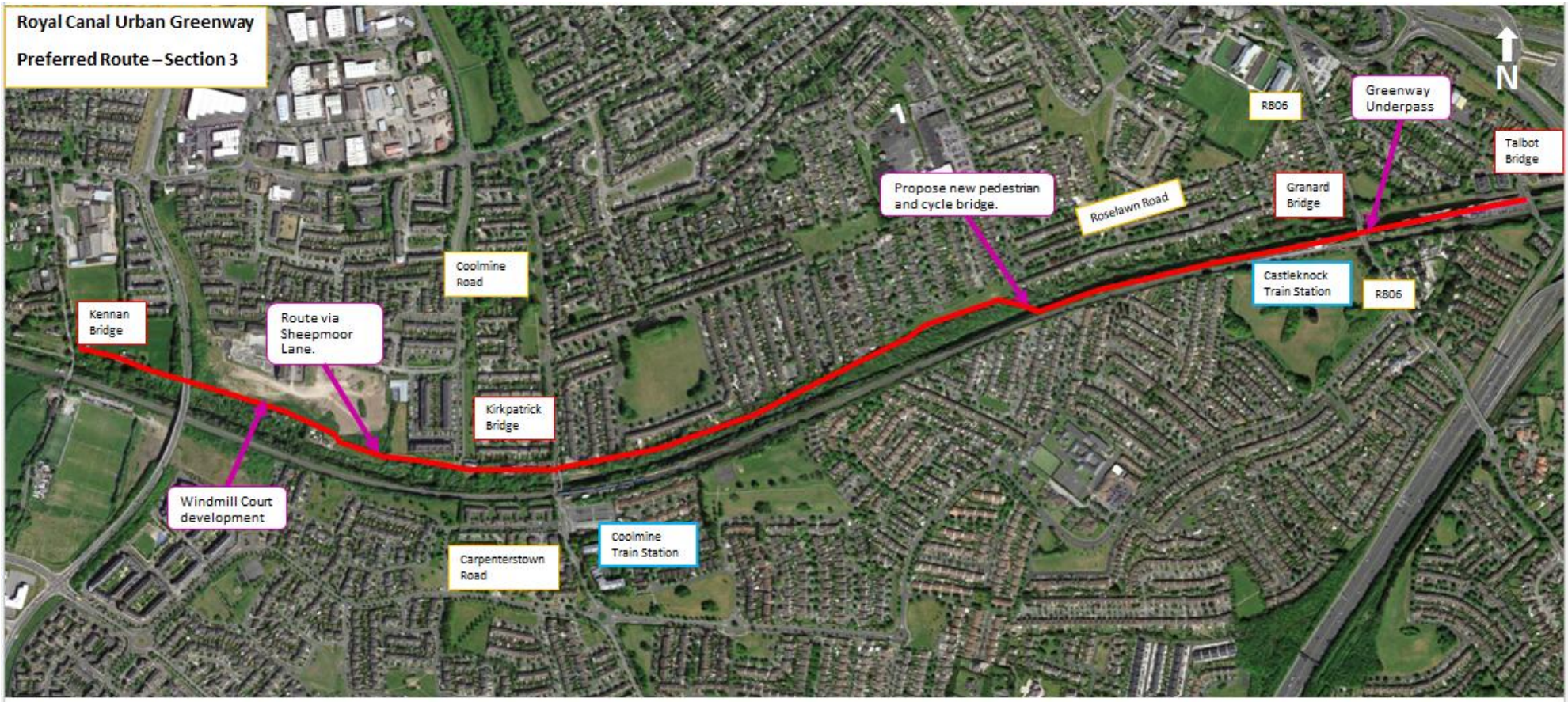


Figure 10.66: Preferred Route for Section 3

11.0 PREFERRED ROUTE

11.1 Introduction

11.1.1 This section of the report presents the final conclusions from the assessment process for the end-to-end route options considered and recommends a preferred route. A description of the preferred route is given together with ancillary measures required and key issues to be addressed through the scheme design development.

11.1.2 Chapters 8,9 and 10 of this report presented an appraisal to each of the potential route options for Sections 1, 2 and 3 of the Study Area respectively. Where a potential route was identified within each section and sub-section, they have been assessed in accordance with the methodology set out in Chapter 7 of this report. This assessment process included Multi-criteria Analysis under the headings of Economy, Integration, Safety and Environment. Following the undertaking of the Multi Criteria Analysis, the preferred routes for each of the Study Area sections were combined to create an end-to-end preferred route for the entire Study Area.

11.2 Recommended Preferred Route

11.2.1 The preferred route for the proposed scheme is presented in **Figure 11.1** below and described in **Section 11.3**. Further detail is provided in the preferred route drawings included within the planning application documentation.



Figure 11.1: Royal Canal Urban Greenway Preferred Route

11.3 Concept Scheme Design

Section 1: Greenway along the northern side of the Royal Canal from the Kildare County Border (Royal Canal Amenity Group) to Hansfield Railway Bridge.

Length of Scheme Section: 3.2km

Indicative Infrastructure Capital Cost: €2.5 - 3.0 million

Indicative Land Acquisition Cost: €0 million

Total Indicative Capital Cost of Scheme Section: €2.5 – 3.0 million

11.3.1 The preferred route will follow the existing towpath along the northern side of the Royal Canal from the Kildare County Council boundary line to Hansfield Railway Bridge. The Greenway will be constructed as a 3-4m wide (where possible within existing embankment widths) unbound surface from the Kildare/Fingal County Council boundary line to Hansfield Bridge (Railway Bridge). The greenway will continue through the existing pedestrian underpass by Hansfield Railway Bridge.

11.3.2 The total construction thickness will range from 0.2m on stiff ground and up to 0.5m on soft ground. Construction of the greenway will involve removal of the topsoil layer to a depth of typically 0.15m and build-up of the gravel thickness to a level of up to 0.35m above surrounding ground level. Drainage of the greenway will be simply over the edge onto the adjoining ground where the rainwater will infiltrate as in the original situation.

Section 2: Greenway along the northern side of the Royal Canal from the Hansfield Railway Bridge to Kennan Bridge via Porterstown School house;

Length of Scheme Section: 2.1km

Indicative Infrastructure Capital Cost: €5.8 – 6.5 million

Indicative Land Acquisition Cost: €6,200,000

Total Indicative Capital Cost of Scheme Section: €12.0 – 13.0 million

11.3.3 The greenway will proceed on the northern side of the Royal Canal from Hansfield to Kennan Bridge via Porterstown School House lands between Callaghan and Kennan bridges.

11.3.4 This involves widening of the existing pedestrian route to 4m along the northern side of Royal Canal from Hansfield Railway bridge to the proposed ramp into the Porterstown Old School House lands. Retaining structures or soil nailing into the embankment may be required on approach (Ch.3900-4100) to Callaghan Bridge from the west and cantilevered structures may be required from Callaghan Bridge along the towpath to the proposed ramp into the Old Schoolhouse lands (Ch. 4150-4560).

11.3.5 A 70m greenway ramp is required to access the Old School House lands. A paved surface along the majority of the route within the School House lands would be the primary design solution.

Section 3: Greenway on the northern side of the Royal Canal from Kennan Bridge to Sheepmoor Lane via the Windmill Court new development. The greenway continues along the northern side of the canal from Sheepmoor lane to the new pedestrian/cycle bridge between Kirkpatrick Bridge and Granard Bridge. Greenway facilities will be provided on the southern bank of the Royal Canal from new pedestrian/cycle bridge to Talbot Bridge.

Length of Scheme Section: 2.8km

Indicative Infrastructure Capital Cost: €7.2 – 8.5 million

Indicative Land Acquisition Cost: €0 million

Total Indicative Capital Cost of Scheme Section: €7.2 – 8.5 million

11.3.6 The Greenway will be provided on the northern side of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge via Sheepmoor Lane.

11.3.7 To minimise the impact on highly sensitive trees, the proposed route is located north of the wooded area along the northern embankment from Kennan Bridge to Sheepmoor Lane.

11.3.8 Greenway users will be directed onto the pedestrian/cycle facilities proposed as part of the Windmill Court Residential Development.

11.3.9 Through Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use).

11.3.10 The Greenway will be situated on the upper level of the northern embankment, from Coolmine Road (Kirkpatrick Bridge) to the Brompton green area (Ch. 6250-6850), to minimise tree removal and the visual impact of the scheme on the Canal.

11.3.11 To minimise the impact on highly sensitive trees (Oak-Ash-Hazel Woodland WN2) and habitats, the Preferred Route is proposed near the top of the northern embankment (adjacent to Delwood Park residential back gardens) and into the open space at Brompton. To prevent the greenway overlooking the back gardens of the residents of Delwood Park and for security reasons, the ground level of

the greenway would be lowered. Also, security fencing and defensive planting will be provided between the greenway and the back gardens to increase security and any visual intrusion.

11.3.12 A bridge structure will be required to enable the proposed greenway to cross an historic quarry area on the northern embankment (Ch. +6500m).

11.3.13 A 4m paved greenway will be provided on the southern side of the Brompton green area (Ch. 6850-7100). Planting and railings will be provided along this section of the greenway. The scheme will provide opportunities for users to access Brompton & Roselawn estates.

11.3.14 The route switches from the northern side to the southern side of the Royal Canal at chainage 7100-7200 (before Roselawn Road). The Greenway will cross the Canal over an architecturally designed pedestrian and cycle bridge. The bridge will respect existing uses along the Canal and existing and future operations on the Dublin to Maynooth rail line.

11.3.15 The greenway will continue on the southern side of the Royal Canal, past Castleknock Station and under Castleknock Road through the proposed greenway underpass.

11.3.16 A paved 4m wide greenway will be provided on the southern towpath from Granard Bridge to the 12th Lock Hotel. Due a pinch point between the hotel and the canal a 3m wide greenway is only feasible from the 12th Lock Hotel to Talbot Bridge/Old Navan Road (150m). The greenway will tie into the current Ashtown section of the Royal Canal Greenway at Talbot Bridge providing continued linkage onwards to Dublin City.

11.4 Route Options Assessment Conclusions

11.4.1 In order to determine the preferable route option for each section, an options appraisal based on a number of criteria as set out in the Department of Transport, Tourism and Sport (DTTAS) Common Appraisal Framework was undertaken.

11.4.2 Within each Study Area section, the route options have been assessed in accordance with the methodology set out in **Chapter 7** including a 'Multi-Criteria Analysis' under the headings of Economy, Integration, Safety and Environment.

11.4.3 An appreciation of constraints and opportunities within the Study Area as well as the defined project objectives and collaborative meetings with key Local Authority Stakeholders, led to the establishment of project-specific route options assessment criteria. These were tailored to have commonality to the Common Appraisal Framework guidelines where practical.

11.5 Next Steps

11.5.1 The Preferred Route identified through the route options assessment has subsequently been developed through preliminary design, environmental assessment, further surveys, stakeholder consultation and the supplementary assessments described above. The Proposed Development is now being advanced for statutory approval under Section 51 of the Roads Act 1993, as amended.

11.5.2 This Route Options Report should be read in conjunction with the EIAR, the EIAR technical appendices and the supporting planning, environmental and technical documentation submitted with the application. Together, these documents set out the route selection process, subsequent design development, assessment of likely environmental effects, and the mitigation, monitoring and enhancement measures incorporated into the Proposed Development.

APPENDIX A – Section 1 Route Options Assessment

Royal Canal Route Options for section 1			
Appraisal Criteria	**Sub-Criteria**	**Option S1-1 Greenway on the Northern side of the Royal Canal.**	**Option S1-2 Greenway on the Northern side of the Royal Canal which then switches to the southern side of the Railway Line.**
1 Economy	1A Capital Cost	**€2,001,000** *Indicative Infrastructure costs €2,001,000 include:* • Greenway will be provided on the northern side of the Royal Canal from the Kildare County Council boundary line to Pakenham Bridge and continue to the existing pedestrian underpass by Hansfield Railway Bridge. • Proposed toucan crossing provided at Collins Bridge (L3005) and Pakenham Bridge (Barberstown Lane North). *Land Acquisition Costs €0*	**€6,455,000** *Indicative Infrastructure costs €2,255,000 include:* • Greenway will be provided on the northern side of the Royal Canal from the Kildare County Council boundary line to Pakenham Bridge. The greenway will then switch to the southern side of the railway line via the proposed Kellystown Bridge (some 150m south of Packenham Bridge). • Proposed toucan crossing provided at Collins Bridge. *Land Acquisition Costs €4,200,000*
	Rank		
	1B Constructability	This route option involves an upgrade of the existing towpath along the northern side of the canal to 3-3.5m unbound surface from the Kildare/Fingal County Council boundary line to Pakenham Bridge (depending on available width on existing embankment). 3.5-4m unbound surface will be provided (where possible within existing embankment widths) from Pakenham Bridge to Hansfield Bridge (Railway Bridge). Proposed toucan crossing provided at Collins Bridge and Pakenham Bridge.	This route option involves an upgrade of the existing towpath along the northern side of the canal to 3-3.5m unbound surface from the Kildare/Fingal County Council boundary line to the proposed Kellystown Bridge (depending on available width). New paved 4m wide bound greenway will be provided on the southern side of the Royal Canal and on the southern side of the Railway Line after the proposed Kellystown Bridge. New paved 4m wide bound greenway will be provided on the southern side of the Royal Canal and on the southern side of the Railway Line after the proposed Kellystown Bridge. Toucan crossings provided at Collins Bridge and proposed Kellystown Bridge.
	1C Quality of Service	Greenway generally segregated from vehicular traffic for the entire route with the exception of bridge crossings The greenway runs along the entire bank of the Royal Canal, it does not have any detours. The environment along the route is pleasant and interesting. The greenway will be 3-4m wide with no excessive gradients.	Cyclist will be adjacent to vehicular traffic along the Kellystown Bridge. The greenway detours from the canal via proposed Kellystown Bridge (700m). The environment along the railway line is not as pleasant or interesting compared to option S1-1 (700m). The greenway will be 3-4m wide with no excessive gradients.
2 Integration	2A Cycling Integration	This route option is identified as the Royal Canal Greenway in the GDA Cycle Network Plan.	This proposed cycle route detours from the Royal Canal Greenway to the southern side of the railway line at the proposed Kellystown bridge, for 700m.
	Rank		
	2B Traffic Network Integration	Proposed toucan crossing provided at Collins Bridge and Pakenham Bridge.	Proposed toucan crossing provided at Collins Bridge and proposed Kellystown Bridge The greenway may impact on vehicular traffic on the proposed Kellystown Bridge.
	Rank		
	2C Potential Impact on Rail Network	No appreciable impacts.	Potential impact on Iarnród Éireann, new Greenway provided on the southern side adjacent to the railway line.
	2D Potential Impact on Canal Users	The proposed greenway will not impact on any of the Angler locations as a 1m riparian strip will be provided between the water's edge and the proposed greenway. Walkers will benefit from the existing towpath being upgraded to 3-4m unbound surface from the Kildare/Fingal County Council boundary line to Pakenham Bridge and 4m bound surface from Pakenham Bridge to Hansfield Railway Bridge (depending on available width). This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route.	The proposed greenway will not impact on any of the Angler locations as a 1m riparian strip will be provided between the water's edge and the proposed greenway. Walkers will benefit from the existing towpath being upgraded to 3-4m unbound surface from the Kildare/Fingal County Council boundary line to the proposed Kellystown Bridge (depending on available width). This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route.

Royal Canal Route Options for section 1			
Appraisal Criteria	**Sub-Criteria**	**Option S1-1 Greenway on the Northern side of the Royal Canal.**	**Option S1-2 Greenway on the Northern side of the Royal Canal which then switches to the southern side of the Railway Line.**
	2E Potential Impact on Communities/Residents	No appreciable impacts.	Land acquisition required from a number of farmlands, approx. 700m in length. Route passes through a farmyard, which may effect the viability of one farm.
3 Safety	3A Road Safety	No. of Junctions: 3 0 turn movements required Fully segregated cycle & pedestrian facilities.	No. of Junctions: 2 1 turn movement required. Cycle and pedestrian facility along/adjacent to the traffic on the proposed Kellystown Bridge.
	Rank		
	3B Pedestrian Safety	Fully segregated greenway facility provided along the bank of the Royal Canal for the entire section of the route. Toucan crossings provided at Collins Bridge and Pakenham Bridge.	Fully segregated greenway facility provided along the bank of the Royal Canal from Kildare County Council boundary line to the proposed Kellystown Bridge. Pedestrian facility provided along/adjacent to the traffic on the proposed Kellystown Bridge. Fully segregated 4m shared greenway facility provided on the southern side of the railway line from Kellystown Bridge to the end of section 1. Toucan crossings provided at Collins Bridge, the proposed Kellystown Bridge and Pakenham Bridge. Pedestrian facility provided along/adjacent to the railway line.
	Rank		
4 Environment	4A Archaeology & Cultural Heritage	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.
	Rank		
	4B Architectural Heritage	Route has the potential to impact on Collins Bridge and Pakenham Bridge. The fabric of the canal itself (also a protected structure) along the entire route may be directly impacted upon (approx. 3.1km).	Route has the potential to impact on Collins Bridge. The fabric of the canal itself (also a protected structure) along the entire route may be directly impacted upon (approx. 2.6km).
	Rank		
4 Environment	4C Flora & Fauna	Possible removal of a small amount of non-sensitive trees.	Possible removal of a small amount of non-sensitive trees.
	Rank		
	4D Soils, Geology & Hydrology	Widen existing canal towpath to a 3-4m Greenway, 3.1km (where achievable).	Widen existing canal towpath to a 3-4m Greenway, 2.6km (where achievable). New greenway provided through greenfield areas (4m width) from the proposed Kellystown bridge to Hansfield Railway Bridge. New Kellystown Bridge may have an impact on Soils and geology.
	Rank		
	4E Landscape & Visual	Possible visual impact on the Royal Canal, route along the northern towpath for 3.1km. Unbound surface used for section 1, which should reduce the potential visual impact.	Possible visual impact on the Royal Canal, route along the northern towpath for 2.6km. Unbound surface used for greenway along the canal towpath, which should reduce the potential visual impact. The new Kellystown Bridge may have a visual impact on the royal canal. New greenway through grass area.
	Rank		

Royal Canal Route Options for section 1			
Appraisal Criteria	**Sub-Criteria**	**Option S1-1 Greenway on the Northern side of the Royal Canal.**	**Option S1-2 Greenway on the Northern side of the Royal Canal which then switches to the southern side of the Railway Line.**
	4F Land Use Character	Possible removal of a number of non-sensitive trees.	Possible removal of a number of non-sensitive trees. Land acquisition required from a number of farmlands, approx. 700m in length. Route passes through a farmyard, which may effect the viability of one farm.
	Rank		

APPENDIX B – Section 2: Sub Section Route Options Assessment

Royal Canal Urban Greenway
Section 2 – Sub-Options

Appraisal Criteria	Sub-Criteria	Option S2-A Greenway via the existing towpath along the Northern embankment of the Royal Canal.	Option S2-B Greenway via two residential ped/cycle routes on the northern side of the Royal Canal.	Option S2-C Greenway along the existing towpath on the northern embankment of the Royal Canal from the Hansfield Railway Bridge for 250m, greenway detours via residential property to Hansfield Road.
1 Economy	1A Capital Cost	**€285,000** *Indicative Infrastructure costs €240,000 include:* • Greenway will be provided on the existing towpath along northern side of the Royal Canal from Hansfield railway underpass to the service access at Hansfield Road. • To prevent impact on the potential Annex 1 'Lowland hay meadows' along the bank of the canal, a 1m riparian strip will be provided between the water's edge and the proposed greenway. Therefore, a cantilevered option for this section is not feasible. • The existing pedestrian route/towpath will be widened towards the northern side of the towpath, possibly requiring the removal of some trees (non-environmentally sensitive). • Possible land acquisition may be required from a residential property due to widening towards the northern side of the towpath. *Land Acquisition Costs €45,000* • Land acquisition for residential property.	**€124,000** *Indicative Infrastructure costs €124,000 include:* • This option proposes to direct the greenway users onto the pedestrian/cycle facilities constructed as part of the Hansfield Residential Development (Alannah Homes) and the Castlethorn Residential Development. • A shared ped/cycle facility will be provided on Hansfield road to tie the Castlethorn residential ped/cycle facility to the extent of this sub-section i.e. service access at Hansfield Road.	**€2,427,000** *Indicative Infrastructure costs €177,000 include:* • Greenway will be provided on the existing towpath along northern side of the Royal Canal from the Hansfield Railway Bridge for 250m. • To prevent impact on the potential Annex 1 'Lowland hay meadows' along the bank of the canal, a 1m riparian strip will be provided between the water's edge and the proposed greenway. Therefore, a cantilevered option for this section is not feasible. • The existing pedestrian route/towpath will be widened towards the northern side of the towpath. • The greenway will detour from the canal towpath through a residential property to Hansfield Road. • Creation of a pocket park, play area or other amenities would be possible within the lands. • A shared ped/cycle facility will be provided on Hansfield road to tie the greenway route to the extent of this sub-section i.e. service access at Hansfield Road. *Land Acquisition Costs €2,250,000* • Land acquisition for residential property.
	Rank			
	1B Constructability	This route option involves widening of the existing towpath to 4m along the northern side of Royal Canal for the entire section (approx. 580m). For this route, a paved greenway will be the primary solution with the standard 4m wide within the existing width of the towpath. Working widths for tracking equipment (drilling rigs or excavators) are limited on the towpath.	This option proposes to direct greenway users onto the pedestrian/cycle facilities as part of the Hansfield Residential Development and the Castlethorn Residential Development. A paved shared ped/cycle facility will be provided on Hansfield road, to tie the Castlethorn residential ped/cycle facility to the extent of this sub-section i.e. the service access to the towpath from Hansfield Road. A new boundary wall treatment will be required for two residential properties on Hansfield Road. Complicated construction works will be required due to the level difference between the residential access and Hansfield Road. Boundary treatment will be required on the existing fence line along Hansfield Road.	This route option involves widening of the existing towpath to 4m along the northern side of Royal Canal for the entire section (approx. 250m). Working widths for tracking equipment (drilling rigs or excavators) is limited on the towpath. The greenway will detour from the canal towpath through a residential property to Hansfield Road (290m). For this route, a paved greenway will be the primary solution with the standard 4m width. A paved shared ped/cycle facility will be provided on Hansfield road to tie the greenway route to the extent of this sub-section i.e. service access at Hansfield Road (35m).
	1C Quality of Service	Greenway segregated from vehicular traffic for the entire section. The greenway runs along the entire bank of the Royal Canal, it does not have any detours (580m). The environment along the route is pleasant and interesting. A surface watermain creates a localised pinch point on the towpath, however, this could be overcome with widening to the north (possible land acquisition).	Greenway segregated from vehicular traffic for the majority of the section. The greenway detours from the canal via the Hansfield Development and the Castlethorn Development Road pedestrian/cycle route (600m). The environment along the busy Hansfield Road is not very pleasant or interesting (approx. 60m). The greenway route will vary from a 2.5m two-way cycle track (substandard) and 2m footpath (Hansfield Development) to a 4.5m width shared pedestrian/cycle route (Castlethorn Development).	Greenway segregated from vehicular traffic for the majority of the section. The greenway runs along the bank of the Royal Canal for 250m. The greenway detours from the canal via the residential property lands (290m). Creation of a pocket park, play area or other amenities would be possible within the lands, which would make it a pleasant environment. The environment along the busy Hansfield Road is not very pleasant or interesting (approx. 35m).
2 Integration	2A Cycling Integration	This route option is identified as the Royal Canal Greenway in the GDA Cycle Network Plan. This route option will offer pedestrian/cycle access into the Hansfield Development (Alannah Homes) and the Castlethorn Residential Development.	This proposed cycle route detours from the Royal Canal Greenway route at the Hansfield Development and Castlethorn Development (600m). Hansfield Road is identified as a Minor Greenway Route in the GDA Cycle Network Plan.	This route option runs along the towpath of the Royal Canal for 250m, which is identified as the Royal Canal Greenway in the GDA Cycle Network Plan. This proposed cycle route detours from the Royal Canal Greenway route at the residential property (290m).
	Rank			

Royal Canal Urban Greenway Section 2 – Sub-Options				
Appraisal Criteria	**Sub-Criteria**	**Option S2-A Greenway via the existing towpath along the Northern embankment of the Royal Canal.**	**Option S2-B Greenway via two residential ped/cycle routes on the northern side of the Royal Canal.**	**Option S2-C Greenway along the existing towpath on the northern embankment of the Royal Canal from the Hansfield Railway Bridge for 250m, greenway detours via residential property to Hansfield Road.**
2 Integration	2B Traffic Network Integration	No appreciable impacts.	Cycle facility along/adjacent to the busy Hansfield Road may have a negative impact on traffic (approx. 60m). Modifications to the existing driveways at the bend on Hansfield Road.	Cycle facility along/adjacent to the busy Hansfield Road may have a negative impact on traffic (approx. 35m).
	Rank			
	2C Potential Impact on Rail	No appreciable impacts.	No appreciable impacts.	No appreciable impacts.
2 Integration	2D Potential Impact on Canal Users	Walkers will benefit from the existing towpath being upgraded to 4m bound surface from Hansfield Railway Bridge to Kennan Bridge. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route. This route option proposes to widen the towpath towards the northern side, there will be no encroaching into the canal which would impact the operation of barges along the canal.	Due to the detour of the greenway route from the canal, cyclist and walkers may choose to use the exiting towpath (more direct route) for the 580m section. This may have a negative impact on walkers and anglers who currently use the towpath as there will be very little room for both cyclists & pedestrians on the existing towpath. This could also result in collisions between cyclists and pedestrians due to the lack of space. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route.	Due to the detour of the greenway route from the canal, cyclist and walkers may choose to use the exiting towpath (more direct route) for the rest of the 300m section. This may have a negative impact on walkers and anglers who currently use the towpath as there will be very little room for both cyclists & pedestrians on the existing towpath. This could also result in collisions between cyclists and pedestrians due to the lack of space. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route
2 Integration	2E Potential Impact on Communities/Residents	A proportion of land acquisition may be required from a residential back garden (approx. 80m length). Access to be provided to/from the greenway to the Hansfield residential development, providing permeability for existing residents.	Land acquisition may be required from the front of two residential properties (boundary walls) on Hansfield Road in order to accommodate access to the properties. Greenway users (potentially non-residents) will be rerouted from the canal towpath through the new residential development. There will be an increase level of use along the facility (which is proposed for residential use) which could lead to greater levels of activity which may not have been envisaged as part of the design. Accessibility to the greenway is provided through the residential developments, providing permeability and linkages from residential catchments	Land acquisition required from a residential property. As part of this route option, amenities such as a pocket park etc are proposed.
3 Safety	3A Road Safety	No. of Junctions: 0 0 turn movements required Greenway segregated from traffic for the entire route.	No. of Junctions: 1 0 turn movement required. Greenway generally segregated from traffic for the majority of the route.	No. of Junctions: 1 0 turn movement required. Greenway generally segregated from traffic for the majority of the route.
	Rank			
	3B Pedestrian Safety	Fully segregated 4m shared greenway facility provided along the bank of the Royal Canal for the entire section of the route.	Segregated footpath provided through Hansfield Development (100m). Shared pedestrian/footpath provided though the Castlethorn Development (440m). This may cause confusion for pedestrians/cycles which may result in ped/cycle conflicts. Due to the detour of the greenway route from the canal, cyclist and walkers may choose to use the exiting towpath (more direct route) for the 580m section. This could also result in collisions between cyclists and pedestrians due to the lack of space. Shared pedestrian/cycle route adjacent to the busy Hansfield Road (60m).	Fully segregated 4m shared greenway facility provided along the bank of the Royal Canal and through the residential development. Shared pedestrian/cycle route adjacent to the busy Hansfield Road (35m).
	Rank			

Royal Canal Urban Greenway Section 2 – Sub-Options				
Appraisal Criteria	**Sub-Criteria**	**Option S2-A Greenway via the existing towpath along the Northern embankment of the Royal Canal.**	**Option S2-B Greenway via two residential ped/cycle routes on the northern side of the Royal Canal.**	**Option S2-C Greenway along the existing towpath on the northern embankment of the Royal Canal from the Hansfield Railway Bridge for 250m, greenway detours via residential property to Hansfield Road.**
4 Environment	4A Archaeology & Cultural Heritage	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.
	Rank			
4 Environment	4B Architectural Heritage	The fabric of the canal itself (also a protected structure) along the entire route may be directly impacted upon (approx. 580m).	The fabric of the canal itself (also a protected structure), the proposed cycle run will not impact on the canal (approx. 580m). An old water mill is in close proximity of the pedestrian/cycle facility through the proposed residential developments.	The fabric of the canal itself (also a protected structure), the proposed cycle run will not impact on the canal (approx. 580m).
	Rank			
4 Environment	4C Flora & Fauna	Possible removal of trees from Hansfield Railway Bridge to the service access at Hansfield Road (approx. 300m^2). Environmentally sensitive trees of low value are located along this route (Dry Meadows & grassy verges). Possible removal of approx. 100m^2 of trees (low value).	No appreciable impacts.	Possible removal of trees to access the private residential property (approx. 150m^2).
	Rank			
4 Environment	4D Soils, Geology & Hydrology	No appreciable impacts.	No appreciable impacts.	No appreciable impacts.
	Rank			
4 Environment	4E Landscape & Visual	Possible removal of trees from Hansfield Railway Bridge to the service access at Hansfield Road (approx. 300m^2). Potential impact on the visual landscape along the canal.	As part of the Castlethorn Development, a large number of trees will be removed to provide the shared pedestrian/cycle route.	Possible removal of trees to access the private residential property (approx. 150m^2).
	Rank			
4 Environment	4F Land Use Character	Possible removal of trees from Hansfield Railway Bridge to the service access at Hansfield Road (approx. 300m^2). A small proportion of land acquisition may be required from a residential back garden. The area is currently overgrown, the boundary wall and fence will be reinstated and regular planting of trees.	No appreciable impacts. Land acquisition may be required from the front of two residential properties (boundary walls) on Hansfield Road in order to accommodate access to the properties.	Land acquisition required from a residential property. Land acquisition may be required from the front of one residential property (boundary walls) on Hansfield Road in order to accommodate access to the properties.
	Rank			

APPENDIX C –Section 2 Route Options Assessment

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway Route Options for section 2						
		Option S2-1 Greenway on the Northern side of the Royal Canal.	**Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.**	**Option S2-3 Greenway Route via Weavers Wood and Clonsilla Road.**	**Option S2-4 Greenway Route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.**	**Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).**	**Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).**	**Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties & Porterstown School house).**
1 Economy	1A Capital Cost	**€10,090,000** *Indicative Infrastructure costs €10,045,000 include:* • Greenway will be provided on the northern embankment/towpath of the Royal Canal from Hansfield railway underpass to Kennan Bridge. • The existing pedestrian route will be widened towards the northern side of the embankment from Hansfield Bridge to Callaghan Bridge, retaining structures or soil nailing into the embankment are likely to be required from the service access at Hansfield Road to Callaghan Bridge. • To prevent the land acquisition from a residential house at Callaghan Bridge, a short term option via the existing towpath under Callaghan (minor alterations on approach to the localised pinch point) may be utilised until Iarnród Éireann's proposals are known. • Cantilevered type boardwalk design required from Callaghan Bridge to Kennan Bridge due to the inadequate width along this section and to protect high value grasslands along the canal embankment whilst avoiding tree removal on the upper	**€6,979,000** *Indicative Infrastructure costs €5,059,000 include:* • Greenway will be provided on the northern side of the Royal Canal from Hansfield railway underpass to the service vehicle access at Hansfield Road. • Existing cycle facilities on Hansfield Road will be upgraded to a two-way facility on the southern side of the road. • Cycle facilities will be provided along Clonsilla Road. • Cycle facilities will be provided through lands zoned as Town & District Centre. • Greenway facilities will be provided on the northern bank of the Royal Canal from the land zoned as Town & District Centre to Kennan Bridge. • Cantilevered type boardwalk design required from Callaghan Bridge to Kennan Bridge due to the inadequate width along this section and to protect high value grasslands along the canal embankment whilst avoiding tree removal on the upper embankment (northern side of the greenway). *Land Acquisition Costs €1,920,000*	**€6,947,000** *Indicative Infrastructure costs €6,902,000 include:* • Greenway will be provided on the northern side of the Royal Canal from Hansfield to the service vehicle access at Hansfield Road. • Existing cycle facilities on Hansfield Road will be upgraded to a two-way facility on the southern side of the road. • Cycle facilities will be provided along Clonsilla Road. • Shared street provided through Weaver Woods (low volume vehicle movements, cul-de-sac). • Greenway facilities will be provided on the northern embankment/towpath of the Royal Canal from Weavers Wood to Kennan Bridge. *Land Acquisition Costs €45,000* • residential property affected	**€5,217,000** *Indicative Infrastructure costs €1,872,000 include:* • Greenway will be provided on the northern side of the Royal Canal from Hansfield to the service vehicle access at Hansfield Road. • Existing cycle facilities on Hansfield Road will be upgraded to a two-way facility on the southern side of the road. • Cycle facilities will be provided along Clonsilla Road. • Shared street provided through Weaver Walks (low volume vehicle movements, cul-de-sac). • Greenway facilities will be provided through both Lambourn Park and The Village green areas (4m wide paved greenway). *Land Acquisition Costs €3,345,00* • 2200 sqm Private Land • residential property affected	**€5,350,000** *Indicative Infrastructure costs €5,305,000 include:* • Greenway will be provided on the northern towpath of the Royal Canal from Hansfield railway underpass to the Old School House Lands. • To prevent the land acquisition from a residential house at Callaghan Bridge, a short term option via the existing towpath under Callaghan (minor alterations on approach to the localised pinch point) may be utilised until Iarnród Éireann's proposals are known. • Cantilevered type boardwalk design required from Callaghan Bridge to Kennan Bridge due to the inadequate width along this section and to protect high value grasslands along the canal embankment whilst avoiding tree removal on the upper embankment (northern side of the greenway). • The greenway will continue through the Old Porterstown School House lands. • This option proposes to direct the greenway users onto the pedestrian/cycle facilities proposed as part of the Residential Development on the Old School House lands. A two-way	**€3,384,000** *Indicative Infrastructure costs €1,839,000 include:* • Greenway will be provided on the northern side of the Royal Canal from Hansfield to the service vehicle access at Hansfield Road. • Existing cycle facilities on Hansfield Road will be upgraded to a two-way facility on the southern side of the road. • Cycle facilities will be provided along Clonsilla Road. • Shared street provided through Weaver Walks (low volume vehicle movements, cul-de-sac). • Greenway facilities will be provided through Porterstown School House land. • This option proposes to direct the greenway users onto the pedestrian/cycle facilities proposed as part of the Residential Development on the Old School House lands. A two-way cycle route (3m wide) is proposed on the southern side of the site while a 2m footpath provide on the southern side of the residential development. *Land Acquisition Costs €1,545,000* • residential properties affected	**€6,341,000** *Indicative Infrastructure costs €3,521,000 include:* • Greenway will be provided on the northern towpath of the Royal Canal from Callaghan Bridge. • The existing pedestrian route will be widened towards the northern side of the embankment from Hansfield Bridge to Callaghan Bridge, retaining structures or soil nailing into the embankment are likely to be required from the service access at Hansfield Road to Callaghan Bridge. • Land acquisition from a residential house at Callaghan Bridge may be required to enable the greenway to ramp down to the canal towpath. • From Callaghan Bridge to Weaver Walk the Greenway will continue through residential back gardens (Larch Grove) on the northern side of the Royal Canal. • The Greenway facilities will continue through Porterstown School House land. • This option proposes to direct the greenway users onto the pedestrian/cycle facilities proposed as part of the Residential Development on the Old School House

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway Route Options for section 2						
		Option S2-1 Greenway on the Northern side of the Royal Canal.	**Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.**	**Option S2-3 Greenway Route via Weavers Wood and Clonsilla Road.**	**Option S2-4 Greenway Route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.**	**Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).**	**Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).**	**Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties & Porterstown School house).**
		embankment (northern side of the greenway). *Land Acquisition Costs €45,000* • residential property affected	• Greenfield site, land zoned as Town & District Centre • residential property affected			cycle route (3m wide) is proposed on the southern side of the site while a 2m footpath provide on the southern side of the residential development. • A 70m pedestrian and cycle ramp is required. *Land Acquisition Costs €45,000* • residential property affected		lands. A two-way cycle route (3m wide) is proposed on the southern side of the site while a 2m footpath provide on the southern side of the residential development. *Land Acquisition Costs €2,820,000* • residential properties affected
	Rank							

1 Economy	1B Constructability	This route option involves widening of the existing pedestrian route to 4m along the northern side of Royal Canal for the entire section. For this route, where possible, a paved greenway will be the primary solution with the standard 4m wide within the existing width of the towpath. The existing pedestrian route will be widened towards the northern side of the embankment from Hansfield Bridge to Callaghan Bridge, retaining structures or soil nailing into the embankment are likely to be required from the service access at Hansfield Road to Callaghan Bridge. This route options proposes a cantilevered type boardwalk design from Callaghan Bridge to Kennan Bridge due to the inadequate width along this section. This would require the installation of a series of anchors to provide structural support to greenway. Anchoring into rock would be the preferred option. Working widths for tracking equipment (drilling rigs or excavators) is limited on the towpath. The precast concrete boardwalk sections would need to be transported and placed into position via a crane on a barge. The service access at Hansfield Road would be the likely location to crane the precast sections onto the barge. Soil nailing into the embankment is likely to be required from the service access at	Greenway will be provided on the northern side of the Royal Canal from Hansfield Railway bridge to Hansfield Road and from Clonsilla Urban Centre to Keenan Bridge. Widening of the existing pedestrian route to 4m required. A paved greenway along majority of the route would be the primary design solution here with the standard 4m wide within the existing width of the towpath. Upgrade existing cycle faculties to two-way facility on the southern side of Hansfield Road. Provide segregated cycle track either side of Clonsilla Road (700m). May require widening of the existing road reservation. Traffic management and lane/road closures will be required. Along the towpath from the land zoned as Town & District Centre to Kennan Bridge, a cantilevered type boardwalk design is proposed due to the inadequate width along this section. This would require the installation of a series of anchors to provide structural support to greenway. Anchoring into rock would be the preferred option. Working widths for tracking equipment (drilling rigs or excavators) is limited on the towpath. The precast concrete boardwalk sections would need to be transported and placed into position via a crane on a barge. The service access at Hansfield	Greenway will be provided on the northern towpath of the Royal Canal from Hansfield Railway Bridge to Hansfield Road and from Weavers Wood to Keenan Bridge. Widening of the existing pedestrian route to 4m required A paved greenway along majority of the route would be the primary design solution here with the standard 4m width within the existing width of the towpath. Upgrade existing cycle faculties to two-way facility on the southern side of Hansfield Road. Provide segregated cycle track either side of Clonsilla Road (250m). May require widening of the existing road reservation. Traffic management and lane/road closures will be required. From the Weavers Wood to Kennan Bridge, a cantilevered type boardwalk design is required due to the inadequate width along this section. This would require the installation of a series of anchors to provide structural support to greenway. Anchoring into rock would be the preferred option. Working widths for tracking equipment (drilling rigs or excavators) is limited on the towpath. The precast concrete boardwalk sections would need to be transported and placed into position via a crane on a barge. The service access at Hansfield Road would be the likely location to crane the precast sections onto the barge.	This route option involves widening of the existing pedestrian route along the northern side of the Royal Canal from Hansfield Railway Bridge to Hansfield Road. A paved greenway along majority of the route would be the primary design solution here with the standard 4m wide. Upgrade existing cycle faculties to two-way facility on the southern side of Hansfield Road. Provide segregated cycle track either side of Clonsilla Road (250m). May require widening of the existing road reservation. Traffic management and lane/road closures will be required.	This route option involves widening of the existing pedestrian route to 4m along the northern side of Royal Canal from Hansfield Railway bridge to the proposed ramp into the Porterstown Old School House. The existing pedestrian route will be widened towards the northern side of the embankment from Hansfield Bridge to Callaghan Bridge, retaining structures or soil nailing into the embankment are likely to be required from the service access at Hansfield Road to Callaghan Bridge. From Callaghan Bridge to the proposed ramp into the Old Porterstown School, a cantilevered type boardwalk design due to the inadequate width along this section. This would require the installation of a series of anchors to provide structural support to greenway. Anchoring into rock would be the preferred option. Working widths for tracking equipment (drilling rigs or excavators) is limited on the towpath. The precast concrete boardwalk sections would need to be transported and placed into position via a crane on a barge. The service access at Hansfield Road would be the likely location to crane the precast sections onto the barge. A 70m pedestrian/cycle ramp is required to the proposed Old School House residential area.	Greenway will be provided on the northern side of the Royal Canal from Hansfield Railway Bridge to the service access at Hansfield Road. Widening of the existing pedestrian route to 4m required A paved greenway along majority of the route would be the primary design solution here with the standard 4m width. Upgrade existing cycle faculties to two-way facility on the southern side of Hansfield Road. Provide segregated cycle track either side of Clonsilla Road (250m). May require widening of the existing road reservation. Traffic management and lane/road closures will be required. This option proposes to direct greenway users onto the pedestrian/cycle facilities proposed as part of the proposed Old School House residential development.	Greenway will be provided on the northern towpath of the Royal Canal from Hansfield Railway Bridge to Callaghan Bridge. Widening of the existing pedestrian route to 4m required. The existing pedestrian route will be widened towards the northern side of the embankment from Hansfield Bridge to Callaghan Bridge, retaining structures or soil nailing into the embankment are likely to be required from the service access at Hansfield Road to Callaghan Bridge. A ped/cycle ramp is required to connect the canal towpath to the road carriageway on Callaghan Bridge (western side). A paved greenway along majority of the route would be the primary design solution here with the standard 4m width. Land acquisition will be required from a residential property to the east of Callaghan Bridge, impact on properties necessary. This option proposes to direct greenway users onto the pedestrian/cycle facilities proposed as part of the Old School House residential development. Soil nailing into the embankment is likely to be required from the service access at Hansfield Road to Callaghan Bridge. This would involve drilling holes for steel bars to be inserted into the slope face which are then grouted in place. A mesh would be applied to the slope

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway Route Options for section 2						
		Option S2-1 Greenway on the Northern side of the Royal Canal.	**Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.**	**Option S2-3 Greenway Route via Weavers Wood and Clonsilla Road.**	**Option S2-4 Greenway Route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.**	**Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).**	**Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).**	**Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties & Porterstown School house).**
1 Economy		Hansfield Road to Callaghan Bridge. This would involve drilling holes for steel bars to be inserted into the slope face which are then grouted in place. A mesh would be applied to the slope face which would be shotcrete and a suitable façade provide.	Road would be the likely location to crane the precast sections onto the barge.			This option proposes to direct greenway users onto the pedestrian/cycle facilities proposed as part of the Old School House residential development. Soil nailing into the embankment is likely to be required from the service access at Hansfield Road to Callaghan Bridge. This would involve drilling holes for steel bars to be inserted into the slope face which are then grouted in place. A mesh would be applied to the slope face which would be shotcrete and a suitable façade provide.		face which would be shotcrete and a suitable façade provide.
	1C Quality of Service	Greenway generally segregated from vehicular traffic for the entire route. The greenway runs along the entire bank of the Royal Canal, it does not have any detours. The environment along the route is pleasant and interesting. The greenway will need to ramp up to Clonsilla Road and back down to the canal towpath, 1:20 gradient.	Greenway segregated from vehicular traffic for 57% of the route. The greenway detours from the canal via Hansfield Road, Clonsilla Road and the site zoned as Town & District Centre.(1.3km). The environment along the busy Clonsilla Road route is not very pleasant or interesting (700m). The greenway will be 4m wide with no excessive gradients.	Greenway segregated from traffic for 75% of the route. The greenway detours from the canal via Hansfield Road, Clonsilla Road and Weavers Wood (700m). The environment along the busy Clonsilla Road route is not very pleasant or interesting (550m). The greenway will be 4m wide with no excessive gradients.	Greenway segregated from traffic for 75% of the route. The greenway detours from the canal via Hansfield Road, Clonsilla Road and Weavers Walk (700m). The environment along the busy Clonsilla Road route is not very pleasant or interesting (550m). The greenway will be 4m wide with no excessive gradients.	Greenway generally segregated from traffic for the entire route. The greenway detours slightly from the Canal's towpath via the Old Schoolhouse Lands (800m). The environment along the route is pleasant and interesting. The greenway will be 4m wide and a ramp will be required to access the Old Schoolhouse lands, 1:20 gradient.	Greenway segregated from traffic for 75% of the route. The greenway detours from the canal via Hansfield Road, Clonsilla Road and Weavers Walk (700m). The environment along the busy Clonsilla Road route is not very pleasant or interesting (550m). The greenway will be 4m wide with no excessive gradients	Greenway generally segregated from traffic for the entire route. The greenway detours slightly from the Canal's towpath via the Old Schoolhouse Lands (800m). The environment along the route is pleasant and interesting. The greenway will need to ramp up to Clonsilla Road and back down to the canal towpath, 1:20 gradient.

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway Route Options for section 2						
		Option S2-1 Greenway on the Northern side of the Royal Canal.	**Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.**	**Option S2-3 Greenway Route via Weavers Wood and Clonsilla Road.**	**Option S2-4 Greenway Route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.**	**Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).**	**Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).**	**Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties & Porterstown School house).**
2 Integration	2A Cycling Integration	This route option is identified as the Royal Canal Greenway in the GDA Cycle Network Plan.	This proposed cycle route detours from the Royal Canal Greenway route at Hansfield Road and continues along Clonsilla Road, for 700m. Clonsilla Road is identified as a Feeder Route in the GDA Cycle Network Plan. The cycle route will connect back to the Royal Canal Greenway via the land zoned as Town & District Centre	This proposed cycle route detours from the Royal Canal Greenway route at Hansfield Road and continues along Clonsilla Road, for 250m. Clonsilla Road is identified as a Feeder Route in the GDA Cycle Network Plan. The cycle route will connect back to the Royal Canal Greenway via the new development off Weavers Walk.	This proposed cycle route detours from the Royal Canal Greenway route at Hansfield Road and contuse along Clonsilla Road, for 250m. Clonsilla Road is identified as a Feeder Route in the GDA Cycle Network Plan. The cycle route will connect back to the Royal Canal Greenway via Weavers Walk.	The proposed cycle route slightly detours from the Royal Canal at Porterstown School House, 500m length	This proposed cycle route detours from the Royal Canal Greenway route at Hansfield Road and continues along Clonsilla Road, for 250m. Clonsilla Road is identified as a Feeder Route in the GDA Cycle Network Plan. The greenway will continue to Kennan Bridge via the Old Porterstown School House lands.	This proposed cycle route detours from the Royal Canal Greenway route, along the existing towpath, at Callaghan Bridge, where the route continues through residential land and the Old Porterstown School House lands to Kennan Bridge.
	Rank							
2 Integration	2B Traffic Network Integration	No appreciable impacts.	Cycle facility along/adjacent to the busy Clonsilla Road may have a negative impact on traffic (700m). New toucan crossing provided on Clonsilla Road via the land zoned as Town & District Centre and Kennan Bridge which may have an impact on general traffic. Increase in the number of pedestrians/cyclists using the existing Toucan crossing at Callaghan Bridge.	Cycle facility along/adjacent to the busy Clonsilla Road may have a negative impact on traffic (250m). New toucan crossing provided on Clonsilla Road via new development at Weavers Wood and Kennan Bridge which may have an impact on general traffic. Increase in the number of pedestrians/cyclists using the existing Toucan crossing at Clonsilla Bridge.	Cycle facility along/adjacent to the busy Clonsilla Road may have a negative impact on traffic (250m). New toucan crossing provided on Clonsilla Road via proposed at Weavers Walk and Kennan Bridge which may have an impact on general traffic. Increase in the number of existing pedestrians/cyclists using the Toucan crossing at Clonsilla Bridge.	No appreciable impacts.	Cycle facility along/adjacent to the busy Clonsilla Road may have a negative impact on traffic (250m). Increase in the number of pedestrians/cyclists using the existing Toucan crossing at Callaghan Bridge.	Increase in the number of pedestrians/cyclists using the existing Toucan crossing at Callaghan Bridge.
	Rank							

		Royal Canal Urban Greenway Route Options for section 2						
Appraisal Criteria	Sub-Criteria	Option S2-1 Greenway on the Northern side of the Royal Canal.	Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.	Option S2-3 Greenway Route via Weavers Wood and Clonsilla Road.	Option S2-4 Greenway Route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.	Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).	Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).	Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties & Porterstown School house).
	2C Potential Impact on Rail Network	No appreciable impacts.	No appreciable impacts.	No appreciable impacts.	No appreciable impacts.	No appreciable impacts.	No appreciable impacts.	No appreciable impacts.

2 Integration	2D Potential Impact on Canal Users	Walkers will benefit from the existing towpath being upgraded to 4m bound surface from Hansfield Railway to Kennan Bridge. The cantilevered boardwalk will require safety barriers along the towpath from Callaghan Bridge to Kennan Bridge for 1.2km. These barriers may hinder the used of the towpath to tow barges. The proposed route option may impact on Waterways Ireland maintenance along the northern bank of the canal due to the proposed cantilevered boardwalk from Callaghan Bridge to Kennan Bridge. The operation of barges along the route may be impacted due to the extent of the projected cantilever. A surface watermain creates a localised pinch point on the towpath, however, this could be overcome with widening to the north (possible land acquisition).	Walkers will benefit from the existing towpath being upgraded to 4m bound surface from Hansfield Railway boundary line to Kennan Bridge. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route. The cantilevered boardwalk will require safety barriers along the towpath from the land zoned as Town & District Centre to Kennan Bridge for 500m. These barriers may hinder the used of the towpath to tow barges. The proposed route option may impact on Waterways Ireland maintenance along the northern bank of the canal due to the proposed cantilevered boardwalk from the via land zoned as Town & District Centre to Kennan Bridge. The operation of barges along the route may be impacted due to the extent of the projected cantilever. A surface watermain creates a localised pinch point on the towpath, however, this could be overcome with widening to the north (possible land acquisition).	Walkers will benefit from the existing towpath being upgraded to 4m bound surface from Hansfield Railway boundary line to Hansfield Road service access and from Weaver Walk to Kennan Bridge. The cantilevered boardwalk will require safety barriers along the towpath from the proposed new development at Weavers Walk to Kennan Bridge for 900m. These barriers may hinder the used of the towpath to tow barges. The proposed route option may impact on Waterways Ireland maintenance along the northern bank of the canal due to the proposed cantilevered boardwalk the new development at Weavers Walk to Kennan Bridge. The operation of barges along the route may be impacted due to the extent of the projected cantilever. A surface watermain creates a localised pinch point on the towpath, however, this could be overcome with widening to the north (possible land acquisition).	Walkers will benefit from the existing towpath being upgraded to 4m bound surface from Hansfield Railway boundary line to Hansfield Road service access. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route. A surface watermain creates a localised pinch point on the towpath, however, this could be overcome with widening to the north (possible land acquisition).	Walkers will benefit from the existing towpath being upgraded to 4m bound surface from Hansfield Railway boundary line to the proposed ramp to the Old Schoolhouse Lands. The cantilevered boardwalk will require safety barriers along the towpath from Callaghan Bridge to the proposed ped/cycle ramp to the Old Porterstown School House Lands, 430m. These barriers may hinder the used of the towpath to tow barges. The proposed route option may impact on Waterways Ireland maintenance along the northern bank of the canal due to the proposed cantilevered boardwalk from Callaghan Bridge to the proposed ped/cycle ramp to the Old Porterstown School House Lands. The operation of barges along the route may be impacted due to the extent of the projected cantilever. A surface watermain creates a localised pinch point on the towpath, however, this could be overcome with widening to the north (possible land acquisition).	Walkers will benefit from the existing towpath being upgraded to 4m bound surface from Hansfield Railway boundary line to Hansfield Road service access. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route. A surface watermain creates a localised pinch point on the towpath, however, this could be overcome with widening to the north (possible land acquisition).	Walkers will benefit from the existing towpath being upgraded to 4m bound surface from Hansfield Railway boundary line to Hansfield Road service access. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route. A surface watermain creates a localised pinch point on the towpath, however, this could be overcome with widening to the north (possible land acquisition).
	2E Potential Impact on	This route option permits permeability and linkages from residential catchments (in accordance with DMURS principles).	This route option permits permeability and linkages from residential catchments (in accordance with DMURS principles).	This route option permits permeability and linkages from residential catchments (in accordance with DMURS principles). Existing residential area, Weavers Wood	Existing residential areas, Weavers Wood (cul-de-sac), Lambourn Park and The Village, may not want non-residents being rerouted through their residential	This route option permits permeability and linkages from residential catchments (in accordance with DMURS principles).	This route option permits permeability and linkages from residential catchments (in accordance with DMURS principles). Existing residential area, Weavers Wood	This route option permits permeability and linkages from residential catchments (in accordance with DMURS principles). Greenway provide through residential

		Royal Canal Urban Greenway Route Options for section 2						
Appraisal Criteria	**Sub-Criteria**	**Option S2-1 Greenway on the Northern side of the Royal Canal.**	**Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.**	**Option S2-3 Greenway Route via Weavers Wood and Clonsilla Road.**	**Option S2-4 Greenway Route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.**	**Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).**	**Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).**	**Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties & Porterstown School house).**
				(cul-de-sac) may not want non-residents being rerouted through their residential community via the greenway.	community via the greenway. From the public consultation some of the main concerns from Lambourn Park residents was the opening of cul-de-sacs. This route option on the northern embankment permits permeability and linkages from residential catchments (in accordance with DMURS principles). The number and location of these potential linkages have to be further assessed.		(cul-de-sac) may not want non-residents being rerouted through their residential community via the greenway. Residents from the proposed residential area in the Old School House lands, may not want non-residents being rerouted through their residential community via the greenway	property at Callaghan Bridge, requires land acquisition. Greenway provided through residential back gardens east of Callaghan Bridge, land acquisition required. Greenway provided through the Old School House lands which will create permeability to the residential zoned land to the west and to the existing residential estates.
3 Safety	**3A Road Safety**	No. of Junctions: 2 0 turn movements required Greenway generally segregated from traffic for the entire route.	No. of Junctions: 3 2 turn movement required. Greenway segregated from traffic for 57% of the route.	No. of Junctions: 3 2 turn movement required. Greenway segregated from traffic for 75% of the route.	No. of Junctions: 3 2 turn movement required. Greenway segregated from traffic for 75% of the route.	No. of Junctions: 2 0 turn movement required. Greenway generally segregated from traffic for the entire route.	No. of Junctions: 3 2 turn movement required. Greenway segregated from traffic for 75% of the route.	No. of Junctions: 2 0 turn movement required. Greenway generally segregated from traffic for the entire route.
	Rank							

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway Route Options for section 2 **Option S2-1 Greenway on the Northern side of the Royal Canal.**	**Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.**	**Option S2-3 Greenway Route via Weavers Wood and Clonsilla Road.**	**Option S2-4 Greenway Route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.**	**Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).**	**Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).**	**Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties & Porterstown School house).**
	3B Pedestrian Safety	Fully segregated 4m shared greenway facility provided along the bank of the Royal Canal for the entire section of the route. Existing toucan crossings provided at Callaghan Bridge.	Footpaths are provided both sides of Clonsilla Road and Hansfield Road. Pedestrian rerouted via Clonsilla Road and Hansfield Road, increases possibility of conflicts with vehicles. Existing toucan crossings provided at Callaghan Bridge. Toucan crossing provided at the land zoned as Town & District Centre.	Footpaths are provided both sides of Clonsilla Road and Hansfield Road. Pedestrian rerouted via Clonsilla Road and Hansfield Road, increases possibility of conflicts with vehicles Toucan crossing provided at Weavers Wood via Clonsilla Road.	Footpaths are provided both sides of Clonsilla Road and Hansfield Road. Pedestrian rerouted via Clonsilla Road and Hansfield Road, increases possibility of conflicts with vehicles Toucan crossing provided at the proposed new development by Weavers Walk via Clonsilla Road.	Fully segregated 4m shared greenway facility provided along the bank of the Royal Canal for the entire section of the route. Existing toucan crossings provided at Callaghan Bridge.	Footpaths are provided both sides of Clonsilla Road and Hansfield Road. Pedestrian rerouted via Clonsilla Road and Hansfield Road, increases possibility of conflicts with vehicles Toucan crossing provided at the proposed new development by Weavers Walk via Clonsilla Road.	Fully segregated 4m shared greenway facility provided along the bank of the Royal Canal for the entire section of the route. Existing toucan crossings provided at Callaghan Bridge.
	Rank							
4 Environment	4A Archaeology & Cultural Heritage	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.
	Rank							

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway Route Options for section 2						
		Option S2-1 Greenway on the Northern side of the Royal Canal.	**Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.**	**Option S2-3 Greenway Route via Weavers Wood and Clonsilla Road.**	**Option S2-4 Greenway Route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.**	**Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).**	**Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).**	**Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties & Porterstown School house).**
4 Environment	4B Architectural Heritage	The fabric of the canal itself (also a protected structure) along the entire route may be directly impacted upon (approx. 2km). Route has the potential to directly impact Callaghan Bridge and Kennan Bridge (protected structures). To prevent impact on Callaghan Bridge, the route is proposed via the existing towpath under Callaghan (localised pinch point).	The fabric of the canal itself (also a protected structure) may be directly impacted upon (approx. 500m). Route has the potential to directly impact Kennan Bridge (a protected structure).	The fabric of the canal itself (also a protected structure) may be directly impacted upon (approx. 950m). Route has the potential to directly impact Callaghan Bridge (a protected structure).	No appreciable impacts.	The fabric of the canal itself (also a protected structure) may be directly impacted upon (approx. 680m). Route has the potential to directly impact Callaghan Bridge (a protected structure). To prevent impact on Callaghan Bridge, the route is proposed via the existing towpath under Callaghan (localised pinch point).	No appreciable impacts.	Route has the potential to directly impact Callaghan Bridge (a protected structure) to provide ramps either side of Callaghan Bridge. The fabric of the canal itself (also a protected structure) may be directly impacted upon (approx. 320m).
	Rank							
4 Environment	4C Flora & Fauna	Possible removal of a number of trees from Hansfield Railway Bridge to Keenan Bridge (approx. 1700m^2). Environmentally sensitive trees of low value are located along this route (Dry Meadows & grassy verges). Possible removal of approx. 350m^2 of trees (low value). Route has the potential to directly impact Callaghan Bridge, which has suitable crevices for bat roosting, however, no bats were recorded during the survey.	Possible removal of a number of trees from Hansfield Railway Bridge to Keenan Bridge (approx. 300m^2). Environmentally sensitive trees of low value are located along this route (Dry Meadows & grassy verges). Possible removal of approx. 60m^2 of trees (low value).	Possible removal of a number of trees from Hansfield Railway Bridge to Keenan Bridge (approx. 600m^2). Environmentally sensitive trees of low value are located along this route (Dry Meadows & grassy verges). Possible removal of approx. 380m^2 of trees (low value).	Possible removal of a number of trees from Hansfield Railway Bridge to Keenan Bridge (approx. 800m^2). Environmentally sensitive trees of low value are located along this route (Dry Meadows & grassy verges). Possible removal of approx. 60m^2 of trees (low value).	Possible removal of a number of trees from Hansfield Railway Bridge to Keenan Bridge (approx. 1700m^2). Environmentally sensitive trees of low value are located along this route (Dry Meadows & grassy verges). Possible removal of 430m^2 of trees (low value).	Possible removal of a number of trees from Hansfield Railway Bridge to Keenan Bridge (approx. 300m^2). Environmentally sensitive trees of low value are located along this route (Dry Meadows & grassy verges). Possible removal of approx. 130m^2 of trees (low value).	Possible removal of a number of trees from Hansfield Railway Bridge to Keenan Bridge (approx. 750m^2). Environmentally sensitive trees of low value are located along this route (Dry Meadows & grassy verges). Possible removal of approx. 130m^2 of trees (low value). Route has the potential to directly impact Callaghan Bridge, which has suitable crevices for bat roosting, however, no bats were recorded during the survey
	Rank							

		Royal Canal Urban Greenway Route Options for section 2						
Appraisal Criteria	**Sub-Criteria**	**Option S2-1 Greenway on the Northern side of the Royal Canal.**	**Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.**	**Option S2-3 Greenway Route via Weavers Wood and Clonsilla Road.**	**Option S2-4 Greenway Route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.**	**Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).**	**Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).**	**Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties & Porterstown School house).**
4 Environment	**4D Soils, Geology & Hydrology**	Retaining structures or soil nailing into the embankment are likely to be required from the service access at Hansfield Road to Callaghan Bridge along the Royal Canal Towpath (300m). Cantilevered type boardwalk design required from Callaghan Bridge to Kennan Bridge due to the inadequate width along this section (1.2km).	Cantilevered boardwalk will be provided along the existing towpath from Callaghan Bridge to Kennan Bridge, with safety barriers (500m).	Cantilevered boardwalk will be provided along the existing towpath from the new development at Weavers Wood to Kennan Bridge, with safety barriers (900m).	No appreciable impacts.	Retaining structures or soil nailing into the embankment are likely to be required from the service access at Hansfield Road to Callaghan Bridge the majority of the route along the Royal Canal Towpath (300m). Cantilevered boardwalk will be provided along the existing towpath from Callaghan Bridge to the proposed ped/cycle ramp to the Old Porterstown School House Lands, with safety barriers (430m).	No appreciable impacts.	Retaining structures or soil nailing into the embankment are likely to be required for 300m of the route.
	Rank							

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway Route Options for section 2						
		Option S2-1 Greenway on the Northern side of the Royal Canal.	**Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.**	**Option S2-3 Greenway Route via Weavers Wood and Clonsilla Road.**	**Option S2-4 Greenway Route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.**	**Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).**	**Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).**	**Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties & Porterstown School house).**
4 Environment	4E Landscape & Visual	Possible removal of a number of trees from Hansfield Railway Bridge to Keenan Bridge (approx. 1700m^2). Retaining structures or soil nailing into the embankment are likely to be required from the service access at Hansfield Road to Callaghan Bridge the majority of the route along the Royal Canal Towpath (300m). Cantilevered boardwalk will be provided along the existing towpath from Callaghan Bridge to Kennan Bridge, with safety barriers (1.2km), would have a significant visual impact on the Royal Canal.	Possible removal of a number of trees from Hansfield Railway Bridge to Keenan Bridge (approx. 300m^2). Cantilevered boardwalk will be provided along the existing towpath from Callaghan Bridge to Kennan Bridge, with safety barriers (500m).	Possible removal of a number of trees for 400m from Hansfield Railway Bridge to Keenan Bridge (approx. 600m^2). Cantilevered boardwalk will be provided along the existing towpath from the new development at Weavers Wood to Kennan Bridge, with safety barriers (900m).	Possible removal of a number of trees for 400m from Hansfield Railway Bridge to Keenan Bridge (approx. 800m^2).	Possible removal of a number of trees for 400m from Hansfield Railway Bridge to Keenan Bridge (approx. 1700m^2). Retaining structures or soil nailing into the embankment are likely to be required from the service access at Hansfield Road to Callaghan Bridge the majority of the route along the Royal Canal Towpath (300m). Cantilevered boardwalk will be provided along the existing towpath from Callaghan Bridge to the proposed ped/cycle ramp to the lands of the Old Porterstown School House, with safety barriers (430m).	Possible removal of a number of trees for 400m from Hansfield Railway Bridge to Keenan Bridge (approx. 300m^2).	Possible removal of a number of trees for 400m from Hansfield Railway Bridge to Keenan Bridge (approx. 750m^2). Retaining structures or soil nailing into the embankment are likely to be required from the service access at Hansfield Road to Callaghan Bridge the majority of the route along the Royal Canal Towpath (300m).
	Rank							

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway Route Options for section 2						
		Option S2-1 Greenway on the Northern side of the Royal Canal.	**Option S2-2 Greenway via land zoned as Town & District Centre and Clonsilla Road.**	**Option S2-3 Greenway Route via Weavers Wood and Clonsilla Road.**	**Option S2-4 Greenway Route via Clonsilla Road, Weavers Walk and through both Lambourn Park & The Village green areas.**	**Option S2-5 Greenway on the Northern side of the Royal Canal (via Porterstown School house).**	**Option S2-6 Greenway on the Northern side of the Royal Canal (via Weavers Walk and Porterstown School house).**	**Option S2-7 Greenway on the Northern side of the Royal Canal (via residential properties & Porterstown School house).**
4 Environment	4F Land Use Character	Possible removal of a number of trees from Hansfield Railway Bridge to Keenan Bridge (approx. 1700m^2).	No appreciable impacts.	Cycle facilities provided through Weaver Wood may impact upon its Land Use Character. Possible removal of a number of trees for 400m from Hansfield Railway Bridge to Keenan Bridge (approx. 600m^2).	Cycle facilities provided through Weaver Walks may impact upon its Land Use Character. Possible removal of a number of trees for 400m from Hansfield Railway Bridge to Keenan Bridge (approx. 800m^2).	Greenway provided through the Old School House lands which will create permeability to the proposed residential zoned land to the west and to the existing residential estates. Possible removal of a number of trees for 400m from Hansfield Railway Bridge to Keenan Bridge (approx. 1700m^2).	Cycle facilities provided through Weavers Walk may impact upon its Land Use Character. Greenway provided through the Old School House lands which will create permeability to the proposed residential zoned land to the west and to the existing residential estates. Possible removal of a number of trees for 400m from Hansfield Railway Bridge to Keenan Bridge (approx. 300m^2).	Greenway provide through residential property at Callaghan Bridge, requires land acquisition. Greenway provided through residential back gardens east of Callaghan Bridge, land acquisition required. Greenway provided through the Old School House lands which will create permeability to the residential zoned land to the west and to the existing residential estates. Possible removal of a number of trees for 400m from Hansfield Railway Bridge to Keenan Bridge (approx. 750m^2).
	Rank							

APPENDIX D – Section 3a Route Options Assessment

		Royal Canal Urban Greenway – Sub-Options for Section 3 Kennan Bridge to Kirkpatrick Bridge					
Appraisal Criteria	**Sub-Criteria**	**Option S3a-1 Greenway on the southern towpath of the Royal Canal.**	**Option S3a-2 Greenway on the on the lower bank on the northern side of the Royal Canal.**	**Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.**	**Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.**	**Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.**	**Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.**
1 Economy	**1A Capital Cost**	**€7,931,000** *Indicative Infrastructure costs €7,931,000 include:* • Greenway will be provided on the southern towpath of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge. • Cantilevered type boardwalk design required from Kennan Bridge to Kirkpatrick Bridge due to width constraints along the towpath. This section has steep banks and is close proximity to the railway line. • Public Lighting will be provided along the entire route.	**€2,923,000** *Indicative Infrastructure costs €2,923,000 include:* • Greenway will be provided on the northern embankment of the Royal Canal from Kennan Bridge to sheepmoor lane where greenway users will share the road carriageway with vehicles (low volume of vehicular use). • For this route, a piled boardwalk structure is required along the northern embankment due to the uneven terrain and to minimise impacts on habitats. • Public Lighting will be provided along the entire route.	**€4,503,000** *Indicative Infrastructure costs €1,615,000 include:* • Greenway will be provided on the southern side of the railway line (Maynooth to Dublin) from Kennan Bridge via St. Mochta's Football Club to Riverwood Hall. • The greenway route will connect with the Dart + West pedestrian/cycle bridge proposal over the railway line at Kennan Bridge. • Greenway users will be rerouted via Riverwood Dale and Riverwood Hall. • For this route, a paved 4m wide greenway will be provided from Keenan Bridge along the southern side of the Railway line, with segregated cycle facilities through Riverwood Dale and shared street through Riverwood Hall (gated cul-de-sac with existing pedestrian access/through route). • Public Lighting will be provided along the entire route. *Land Acquisition Costs €2,888,000* • GAA club affected • residential properties affected	**€1,544,000** *Indicative Infrastructure costs €1,544,000 include:* Greenway will be provided on the northern side of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge via Windmill Court and Sheepmoor Lane. • This option proposes to direct the greenway users onto the pedestrian/cycle facilities constructed/to be delivered as part of the Windmill Court Residential Development. • For this route, where possible, a paved greenway will be the primary solution with the standard 4m wide boardwalk structure utilised as a secondary solution on steep terrain. • Through Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use). • Public Lighting will be provided along the entire route.	**€2,134,000** *Indicative Infrastructure costs €2,133,000 include:* • 3m two-way cycle facility provided on the northern side of the Royal Canal from Kennan Bridge to Kirkpatrick Bridge via Windmill Court and Sheepmoor Lane. • For this cycle route, where possible, a paved greenway will be the primary solution with the standard 3m wide boardwalk structure utilised as a secondary solution on steep terrain. • This option proposes to direct the cycle route users onto the cycle facilities constructed/to be delivered as part of the Windmill Court Residential Development. • Through Sheepmoor cyclists will share the road carriageway with vehicles (low volume of vehicular use). • The existing towpath on the southern bank of the Royal Canal will be upgraded to accommodate pedestrian movements only. A paved walkway will be provided with public lighting. The existing towpath width will be maintained. • Safety barriers will be provided where fall heights are ≥4m.	**€7,659,000** *Indicative Infrastructure costs €7,659,000 include:* • Greenway will be provided on the southern towpath of the Royal Canal from Kennan Bridge to a new ped/cycle bridge located before the train signal/retaining wall. This bridge will connect greenway users to Sheepmoor Lane. • Cantilevered type boardwalk required from Kennan Bridge to the new ped/cycle bridge due to width constraints along the towpath. This section has steep banks and is close proximity to the railway line. • Through Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use). • Public Lighting will be provided along the entire route.
	Rank						

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway – Sub-Options for Section 3 Kennan Bridge to Kirkpatrick Bridge					
		Option S3a-1 Greenway on the southern towpath of the Royal Canal.	**Option S3a-2 Greenway on the on the lower bank on the northern side of the Royal Canal.**	**Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.**	**Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.**	**Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.**	**Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.**
1 Economy	1B Constructability	This route option involves widening of the existing pedestrian route along the southern embankment/towpath of the Royal Canal to 4m for the entire section. This route options proposes a cantilevered type boardwalk design from Kennan Bridge to Kirkpatrick Bridge due to the inadequate width along this section. This would require the installation of a series of anchors to provide structural support to greenway. Anchoring into rock would be the preferred option. For the construction of the cantilevered boardwalk, working widths for tracking equipment (drilling rigs or excavators) is limited. Option to use canal with a barge type system for a working platform could be considered. This will need to be coordinated with Waterways Ireland.	This route option involves creation of a new 4m greenway on the northern side of the Royal Canal from Kennan Bridge to Sheepmoor Lane along the bank of the canal and through heavily wooded areas with steep banks in locations. For this route, a piled boardwalk structure is required along the northern embankment due to the uneven terrain and to minimise impacts on habitats. Through Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use). Some minor local widening may be required. Working widths for tracking equipment (drilling rigs or excavators) is limited. Option to use the canal with a barge type system for a working platform could be considered. This will	For this route, a paved 4m wide greenway will be provided from Keenan Bridge along the southern side of the Railway bridge, with segregated cycle facilities through Riverwood Dale and shared street through Riverwood Hall (gated cul-de-sac with existing pedestrian access/through route). The greenway route will connect with the Dart + West pedestrian/cycle bridge proposal over the railway line at Kennan Bridge. Construction of the greenway under the Dr.Troy bridge in close proximity to bridge piers/abutments.	This route option involves creation of a new 4m greenway on the northern side of the Royal Canal. For this route, where possible, a paved greenway will be the primary solution with the standard 4m wide boardwalk structure utilised as a secondary solution on steep terrain. This option proposes to direct greenway users onto the pedestrian/cycle facilities to be delivered as part of the Windmill Court Residential Development. Through Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use). Some minor local widening may be required. Construction of the greenway under the Dr.Troy bridge in close proximity to bridge piers/abutments.	This route option offers a cycle route to the north of the Royal Canal and a separate pedestrian route to the south of the Royal canal. A 3m two-way cycle route on the northern side of the Royal Canal follows a similar route to S3a-4. The existing tow path on the southern bank of the Royal Canal will be upgraded to accommodate pedestrian movements only. For the cycle route, where possible, a paved greenway will be the primary solution with the standard 3m wide boardwalk structure utilised as a secondary solution on steep terrain. This option proposes to direct cyclists onto the cycle facilities proposed as part of the Windmill Court Residential Development.	This route option involves widening of the existing pedestrian route along the southern side of Royal Canal to 4m from Kennan Bridge to a new ped/cycle bridge connecting the greenway route to Sheepmoor Lane. Cantilevered type boardwalk design required from Kennan Bridge to the next ped/cycle bridge west of Kirkpatrick Bridge due to the inadequate width along this section. This section has steep banks and is close proximity to the railway line. The landspan of the cantilever structure will be located at the base of the Irish rail infrastructure. Measures will need to be undertaken to minimise any effects on the live rail system (e.g. settlement/slope slips). At narrow canal widths, the final extents of the projected cantilever will need to satisfy

		Royal Canal Urban Greenway – Sub-Options for Section 3 Kennan Bridge to Kirkpatrick Bridge					
Appraisal Criteria	**Sub-Criteria**	**Option S3a-1 Greenway on the southern towpath of the Royal Canal.**	**Option S3a-2 Greenway on the on the lower bank on the northern side of the Royal Canal.**	**Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.**	**Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.**	**Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.**	**Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.**
1 Economy	**1B Constructability**	The precast concrete boardwalk sections would need to be transported and placed into position via a crane on a barge. Porterstown Road (Kennan Bridge) Road would be the likely location to crane the precast sections onto the barge if it is proposed to be closed to vehicle traffic in the future. Working widths for tracking equipment (drilling rigs or excavators) is limited on the towpath. As Kennan bridge is proposed to be closed to vehicular traffic in the future, shared pedestrian/cycle route proposed across Kennan Bridge to the southern embankment. The canal and towpath (southern embankment) between Kennan Bridge and Kirkpatrick Bridge will need to be closed during construction. Construction of the greenway under the Dr.Troy bridge in close proximity to bridge piers/abutments.	need to be coordinated with Waterways Ireland. The precast concrete boardwalk sections would need to be transported and placed into position via a crane on a barge. Porterstown Road (Kennan Bridge) Road would be the likely location to crane the precast sections onto the barge if it is proposed to be closed to vehicle traffic in the future. Construction of the greenway under the Dr.Troy bridge in close proximity to bridge piers/abutments.			Through Sheepmoor Lane cyclists will share the road carriageway with vehicles (low volume of vehicular use). Some minor local widening may be required. For the pedestrian route on the southern embankment, a paved walkway will be provided. The existing towpath width will be maintained. Lighting will be provided along with safety barriers where required (Fall height ≥4m). Kennan bridge is proposed to be closed to vehicular traffic in the future, pedestrian route proposed across Kennan Bridge to the southern embankment. Construction of the greenway under the Dr.Troy bridge in close proximity to bridge piers/abutments.	Waterways Ireland minimum navigational widths. Working widths for tracking equipment (drilling rigs or excavators) is limited. Option to use the canal with a barge type system for a working platform could be considered. This will need to be coordinated with recreation users. Construction of a new pedestrian/cycle bridge. Through Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use). Some minor local widening may be required. Construction of the greenway under the Dr.Troy bridge in close proximity to bridge piers/abutments.

		Royal Canal Urban Greenway – Sub-Options for Section 3 Kennan Bridge to Kirkpatrick Bridge					
Appraisal Criteria	**Sub-Criteria**	**Option S3a-1 Greenway on the southern towpath of the Royal Canal.**	**Option S3a-2 Greenway on the on the lower bank on the northern side of the Royal Canal.**	**Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.**	**Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.**	**Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.**	**Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.**
1 Economy	**1C Quality of Service**	Greenway segregated from vehicular traffic for the entire route (approx. 900m). The greenway runs along the entire bank of the Royal Canal, it does not have any detours. The environment along the entire route is pleasant and interesting. The greenway will be 4m wide with no excessive gradients. Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Kirkpatrick Bridge due to the railway line on the southern side of the route, thereby resulting in a less secure and effective facility.	Greenway segregated from traffic for 68% of the route. The greenway detours slightly from the canal via Sheepmoor lane to minimise impacts on environmentally sensitive trees (approx. 280m). For Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use). For the other section of the route the greenway will be 4m wide. The environment along the majority of the route is pleasant and interesting (68%). Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Sheepmoor Lane (approx. 620m) due to the wooded area on the northern side of the route, thereby resulting in a less secure and effective facility.	Greenway segregated from traffic for 38% of the route. The greenway detours from the canal via St. Mochta's Football Club, Riverwood Dale & Riverwood Hall (approx. 1km). The environment along the southern side of the railway line and through the residential estates would not be as pleasant or interesting (approx. 1km) as along the Royal Canal. The greenway will be 4m wide on the southern side of the railway line. Segregated cycle facilities will be provided through Riverwood Dale and shared street through Riverwood Hall (gated cul-de-sac with existing pedestrian access/through route).	Greenway segregated from traffic for 67% of the route. The greenway detours from the canal via Windmill Court and Sheepmoor (900m). The greenway will run through a public open space (possibly a playground) as part of the Windmill Court development, which would be a place of great potential interest. The greenway will be 4m wide with no excessive gradients. For Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use).	Two-way cycle facility provided on the northern side of the Royal Canal, separated from the pedestrian route, which does not align with the requirements of a Greenway. The cycle route detours from the canal via Windmill Court and Sheepmoor Lane canal to minimise impacts on environmentally sensitive trees (900m). The greenway will run through a public open space (possibly a playground) as part of the Windmill Court development, which would be a place of great potential interest. The pedestrian route runs along the southern towpath of the Royal Canal, it does not have any detours. For Sheepmoor Lane cyclists will share the road carriageway with vehicles (low volume of vehicular use).	Greenway segregated from traffic for 79% of the route. The greenway detours slightly from the canal via Sheepmoor lane (approx. 190m). For Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use). For the other section of the route the greenway will be 4m wide. The environment along the majority of the route is pleasant and interesting (79%). Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Kirkpatrick Bridge (approx. 730m) due to the railway line on the southern side of the towpath, thereby resulting in a less secure and effective facility.
2 Integration	**2A Cycling Integration**	This route option is identified as the Royal Canal Greenway in the GDA Cycle Network Plan.	This route option detours from the Royal Canal Greenway (as identified in the GDA Cycle Network Plan) via Sheepmoor Lane (approx. 280m). This route integrates with other cycle routes through residential estates such as Stationcourt, therefore promoting connectivity	This route detours from the Royal Canal Greenway (as identified in the GDA Cycle network Plan) via St. Mochta's Football Club and Riverwood (approx. 1km, entire route).	This route option detours from the Royal Canal Greenway route at Kennan Bridge via Windmill Court (old landfill site) and Sheepmoor Lane (approx. 900m, entire route). This route integrates with other cycle routes through residential estates such as Stationcourt, therefore promoting connectivity	This proposed cycle route detours from the Royal Canal Greenway (as identified in the GDA Cycle network Plan) via Windmill Court (old landfill site) and Sheepmoor Lane (approx. 900m, entire route). Two-way cycle facility provided on the northern side of the Royal Canal, separated from the pedestrian route, which does not align with the requirements of a Greenway. This route integrates with other cycle routes through residential estates such as Stationcourt, therefore promoting connectivity	This route option detours from the Royal Canal Greenway (as identified in the GDA Cycle Network Plan) via Sheepmoor Lane (approx. 190m, entire route). This route integrates with other cycle routes through residential estates such as Stationcourt, therefore promoting connectivity
	Rank						

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway – Sub-Options for Section 3 Kennan Bridge to Kirkpatrick Bridge					
		Option S3a-1 Greenway on the southern towpath of the Royal Canal.	**Option S3a-2 Greenway on the on the lower bank on the northern side of the Royal Canal.**	**Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.**	**Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.**	**Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.**	**Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.**
2 Integration	2B Traffic Network Integration	As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided. No appreciable impacts on traffic.	As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided. Greenway through Sheepmoor lane will have a slight impact on general traffic.	As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided. Cycle facilities through residential areas (Riverwood) may have an impact on traffic.	As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided. Greenway through Sheepmoor lane will have an impact on general traffic.	As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided. Cyclists through Sheepmoor lane will have an impact on general traffic.	As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided. Greenway through Sheepmoor lane will have an impact on general traffic.
	Rank						
2 Integration	2C Potential Impact on Rail Network	Greenway route adjacent to the railway line for the entire section (900m length). Potential impact on the rail network.	No appreciable impacts.	Greenway route adjacent to the railway line for nearly half the route (approx. 410m). Potential impact on the rail network. Greenway crosses the Railway line at Kennan and Kirkpatrick Bridge. Pedestrian/cycle bridges proposed as per DART + West.	No appreciable impacts.	Upgrades to the existing pedestrian route adjacent to the Railway line (900m).	Greenway route adjacent to the railway line 670m section of the route. Potential impact on the rail network. New ped/cycle bridge tie-in on the southern embankment/towpath may have an impact on the rail network.

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway – Sub-Options for Section 3 Kennan Bridge to Kirkpatrick Bridge					
		Option S3a-1 Greenway on the southern towpath of the Royal Canal.	**Option S3a-2 Greenway on the on the lower bank on the northern side of the Royal Canal.**	**Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.**	**Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.**	**Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.**	**Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.**
2 Integration	2D Potential Impact on Canal Users	Walkers will benefit from the existing towpath being upgraded to a paved 4m surface with public lighting from Kennan Bridge to Kirkpatrick Bridge. The proposed route option may impact on Waterways Ireland maintenance along the southern bank of the canal due to the proposed cantilevered boardwalk for the majority of the route. The operation of barges along the route may be impacted due to the extent of the projected cantilever. Safety barriers will be provided on the cantilevered for the entire route (approx. 900m). These barriers may hinder the used of the towpath to tow barges.	The proposed route option may impact on Waterways Ireland maintenance along the northern bank of the canal due to the proposed piled boardwalk for approx. 560m of the route.	This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route.	This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route	Walkers will benefit from the existing towpath being upgraded to a bound surface with public lighting from Kennan Bridge to Kirkpatrick Bridge. Safety barriers may be required along the towpath for half of the route, some 450m (required where there is an effective fall height ≥ 4m). These barriers may hinder the used of the towpath to tow barges. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks.	Walkers will benefit from the existing towpath being upgraded to 4m bound surface from Kennan Bridge to the proposed pedestrian/cycle bridge (approx. 670m). The proposed route option may impact on Waterways Ireland maintenance along the southern bank of the canal due to the proposed cantilevered boardwalk for 670m of the route. The operation of barges along the route may be impacted due to the extent of the projected cantilever. The proposed pedestrian/cycle bridge will be constructed as per Waterways Ireland clearance requirements, therefore, it should not impact on the operation of barges along the canal. The bridge landing on the southern embankment will be sited and designed so as to maintain a continuous route along the southern towpath for canal users. Safety barriers will be provided on the cantilevered for the entire route (approx. 670m). These barriers may hinder the used of the towpath to tow barges.

		Royal Canal Urban Greenway – Sub-Options for Section 3 Kennan Bridge to Kirkpatrick Bridge					
Appraisal Criteria	**Sub-Criteria**	**Option S3a-1 Greenway on the southern towpath of the Royal Canal.**	**Option S3a-2 Greenway on the on the lower bank on the northern side of the Royal Canal.**	**Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.**	**Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.**	**Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.**	**Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.**
2 Integration	**2E Potential Impact on Communities/Residents**	Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Kirkpatrick Bridge (approx. 900m) due to the railway line on the southern side of the towpath, thereby preventing permeability and linkages from residential catchments (in accordance with DMURS principles).	Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Sheepmoor Lane (approx. 620m) due to the wooded area on the northern side of the route, thereby preventing permeability and linkages from residential catchments (in accordance with DMURS principles). At Sheepmoor Lane, the route option permits permeability and linkages from residential catchments (in accordance with DMURS principles).	This route option permits permeability and linkages from residential catchments (in accordance with DMURS principles). Existing gated private residential area (Riverwood Hall) may not want non-residents being rerouted through their residential community via the greenway.	To minimise impact on highly sensitive trees, the proposed greenway will be routed adjacent to a laneway access which is in close proximity to two residential properties between Kennan Bridge and Dr. Troy Bridge. This route option permits permeability and linkages from existing and proposed residential catchments (in accordance with DMURS principles). Access to be provided to/from the greenway to the Windmill Court area, providing permeability for existing residents. Greenway users will be rerouted from the canal towpath through the Sheepmoor Lane. There will be an increase level of pedestrian/cycle activity along the road, which may have an impact on the residents that have access onto Sheepmoor Lane	To minimise impact on highly sensitive trees, the proposed greenway will be routed adjacent to a laneway access which is in close proximity to two residential properties between Kennan Bridge and Dr. Troy Bridge. This cycle route option permits permeability and linkages from existing and proposed residential catchments (in accordance with DMURS principles). Cyclists will be rerouted from the canal towpath through the Sheepmoor Lane. There will be an increase level of cycle activity along the road, which may have an impact on the residents that have access onto Sheepmoor Lane Accessibility to the pedestrian route on the southern embankment is restricted between Kennan Bridge and Kirkpatrick Bridge (approx. 900m) due to the railway line on the southern side of the towpath, thereby resulting in a less secure and effective facility.	Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Kirkpatrick Bridge (approx. 730m) due to the railway line on the southern side of the towpath, thereby preventing permeability and linkages from residential catchments (in accordance with DMURS principles). At Sheepmoor Lane, the route option permits permeability and linkages from residential catchments (in accordance with DMURS principles). Greenway users will be rerouted from the canal towpath through the Sheepmoor Lane. There will be an increase level of pedestrian/cycle activity along the road, which may have an impact on the residents that have access onto Sheepmoor Lane.
3 Safety	**3A Road Safety**	No. of Junctions: 1 2 turn movements required at Kennan Bridge. Greenway segregated from traffic for the entire route.	No. of Junctions: 1 2 turn movements required at the proposed pedestrian/cycle bridge. Greenway segregated from traffic for 68% of the route. For Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use).	No. of Junctions: 5 6 turn movements required. Section of route through residential area (Riverwood Dale) increases the possibility of conflicts with vehicles. Greenway segregated from traffic for 38% of the route.	No. of Junctions: 1 0 turn movements required. Greenway segregated from traffic for 67% of the route. For Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use).	No. of Junctions: 1 0 turn movements required. For Sheepmoor Lane cyclists will share the road carriageway with vehicles (low volume of vehicular use).	No. of Junctions: 1 4 turn movements required (Kennan Bridge and ped/cycle bridge). Greenway segregated from traffic for 79% of the route. For Sheepmoor Lane greenway users will share the road carriageway with vehicles (low volume of vehicular use).
	Rank						

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway – Sub-Options for Section 3 Kennan Bridge to Kirkpatrick Bridge					
		Option S3a-1 Greenway on the southern towpath of the Royal Canal.	**Option S3a-2 Greenway on the on the lower bank on the northern side of the Royal Canal.**	**Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.**	**Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.**	**Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.**	**Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.**
3 Safety	3B Pedestrian Safety	4m shared greenway facility provided along the bank of the Royal Canal for the entire section of the route. Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Sheepmoor Lane due to the railway line on the southern side of the route, thereby resulting in a less secure and safe facility for pedestrians. As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided.	4m shared greenway facility provided along the bank of the Royal Canal for the majority of the route (68%). For Sheepmoor Lane greenway users will share the road carriageway with vehicles for approx. 280m (low volume of vehicular use). Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Sheepmoor Lane (approx. 620m) due to the wooded area on the northern side of the route, thereby resulting in a less secure and safe facility for pedestrians. As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided.	Pedestrian facilities provided through residential areas Riverwood Dale and Riverwood Hall, increased possibility of conflicts with vehicles (approx. 600m). 4m shared greenway facility provided along the bank of the Royal Canal from Kennan Bridge to Riverwood Dale. As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided.	4m shared greenway facility provided from Kennan Bridge to Kirkpatrick bridge via Sheepmoor Lane. For Sheepmoor Lane greenway users will share the road carriageway with vehicles for approx. 280m (low volume of vehicular use). As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided.	Upgrade to the existing pedestrian facilities on the southern side of the Royal canal. Pedestrian facilities segregated from vehicular traffic for the entire route. Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Sheepmoor Lane due to the railway line on the southern side of the route, thereby resulting in a less secure and safe facility for pedestrians As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided.	4m shared greenway facility provided along the bank of the Royal Canal for the majority of the route (79%). For Sheepmoor Lane greenway users will share the road carriageway with vehicles for approx. 190m (low volume of vehicular use). Accessibility to the greenway on the southern embankment is restricted between Kennan Bridge and Kirkpatrick Bridge (approx. 730m) due to the railway line on the southern side of the towpath, thereby resulting in a less secure and safe facility for pedestrians. As part of DART + West proposals, Kennan Bridge and Kirkpatrick bridge will be closed to vehicular traffic and ped/cycle bridges provided.
	Rank						
4 Environment	4A Archaeology & Cultural Heritage	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.
	Rank						
4 Environment	4B Architectural Heritage	Route has the potential to directly impact Kennan Bridge and Kirkpatrick Bridge, all protected structures. The fabric of the canal itself (also a protected structure) along the entire route may be directly impacted upon by the man made structure being proposed along the towpath i.e. a cantilevered boardwalk structure (potential visual impact).	The fabric of the canal itself (also a protected structure) along the majority of the route may be directly impacted upon by the man made structure being proposed along the northern bank i.e. a boardwalk structure (62% of the route, potential visual impact).	No appreciable impacts.	No appreciable impacts.	Route has the potential to directly impact Kennan Bridge and Kirkpatrick Bridge, all protected structures. The fabric of the canal itself (also a protected structure) along the entire route may be directly impacted upon by the man made structure being proposed along the towpath i.e. upgrades to the pedestrian route (potential visual impact).	Route has the potential to directly impact Kennan Bridge, a protected structure. The fabric of the canal itself (also a protected structure) along the majority of the route may be directly impacted upon by the man made structure being proposed along the towpath i.e. a cantilevered boardwalk structure (72% of the route, potential visual impact). The proposed pedestrian/cycle bridge across the canal may also have a potential visual impact on the canal (protected structure).
	Rank						

		Royal Canal Urban Greenway – Sub-Options for Section 3 Kennan Bridge to Kirkpatrick Bridge					
Appraisal Criteria	**Sub-Criteria**	**Option S3a-1 Greenway on the southern towpath of the Royal Canal.**	**Option S3a-2 Greenway on the on the lower bank on the northern side of the Royal Canal.**	**Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.**	**Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.**	**Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.**	**Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.**
4 Environment	**4C Flora & Fauna**	Possible removal of a number of trees along the complete section due to the widening of existing pedestrian route (approx. 800m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 250m^2 of trees (high value). Route has the potential to directly impact Kirkpatrick Bridge, which has suitable crevice's which have been recorded as a bat roost.	Possible removal of a significant number of trees along the northern banks of the Royal Canal to provide the Greenway (approx. 1900m^2). Possible removal of a significant number of trees when the greenway route ramps up to Sheepmoor Lane. Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 1700m^2 of trees (high value).	Possible removal of a number of trees on the southern side of the railway line north of St. Mochtas Football Club (approx. 250m^2).	Possible removal of a number of trees along the complete section due to the widening of existing pedestrian route (approx. 950m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 700m^2 of trees (high value).	Possible removal of a number of trees along the complete section due to the widening of existing pedestrian route (approx. 850m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 600m^2 of trees (high value).	Possible removal of a number of trees along the complete section due to the widening of existing pedestrian route (approx. 700m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 400m^2 of trees (high value).
	Rank						
4 Environment	**4D Soils, Geology & Hydrology**	The cantilevered boardwalk greenway (using tensile rods into rock) along the southern towpath would have an impact on soils & Geology.	Impact on soil through piling along the northern side of the Royal Canal to provide a boardwalk facility.	No appreciable impacts.	This option proposes to direct the greenway users onto the pedestrian/cycle facilities constructed/to be delivered as part of the Windmill Court Residential Development. This location use to be an old landfill site, however, this risk will be borne by the Windmill Court development.	This option proposes to direct the cycle users onto the pedestrian/cycle facilities constructed/to be delivered as part of the Windmill Court Residential Development. This location use to be an old landfill site, however, this risk will be borne by the Windmill Court development.	The cantilevered boardwalk greenway (using tensile rods into rock) along the southern towpath would have an impact on soils & Geology.
	Rank						
4 Environment	**4E Landscape & Visual**	Provision of a cantilevered boardwalk greenway along the southern towpath would have a visual impact on the Royal Canal. However, artificial floating structures can be used for growing bankside vegetation and reducing the impact (approx. 900m).	The provision of boardwalk along the northern towpath of the Royal Canal would have a significant visual impact on the Royal Canal (approx. 560m).	No appreciable impacts.	No appreciable impacts.	The provision of bound surface along the existing southern towpath (upgrades to the pedestrian route) accompanied by public lighting may have a visual impact on the Royal Canal (approx. 900m). Safety barriers may be required along the towpath for half of the route, some 450m (required where there is an effective fall height ≥ 4m). This may have a visual impact on the Royal Canal.	Provision of a cantilevered boardwalk greenway along the southern towpath would have a visual impact on the Royal Canal. However, artificial floating structures can be used for growing bankside vegetation and reducing the impact (approx. 670m). New ped & cycle bridge provided crossing the Royal Canal between Kennan Bridge and Kirkpatrick Bridge, may have a visual impact on the Royal Canal.
	Rank						

		Royal Canal Urban Greenway – Sub-Options for Section 3 Kennan Bridge to Kirkpatrick Bridge					
Appraisal Criteria	**Sub-Criteria**	**Option S3a-1 Greenway on the southern towpath of the Royal Canal.**	**Option S3a-2 Greenway on the on the lower bank on the northern side of the Royal Canal.**	**Option S3a-3 Greenway via St.Mochta's Football Club, Riverwood Dale & Riverwood Hall.**	**Option S3a-4 Greenway via Windmill Court and Sheepmoor lane.**	**Option S3a-5 Option Cycle route on the northern side of the Royal Canal (via Windmill Court and Sheepmoor Lane) and upgrades to the existing pedestrian facilities on the existing southern towpath.**	**Option S3a-6 Greenway on the southern embankment from Kennan Bridge to new ped/cycle bridge. Greenway on the northern side from Sheepmoor Lane to Kirkpatrick Bridge.**
4 Environment	**4F Land Use Character**	No appreciable impacts.	No appreciable impacts.	Creating a Greenway through Riverwood Hall (gated cul-de-sac with existing pedestrian access/through route) may impact upon its Land Use Character.	The proposed greenway will be routed adjacent to a laneway access which is in close proximity to two residential properties between Kennan Bridge and Dr. Troy Bridge.	The proposed cycle route will be routed adjacent to a laneway access which is in close proximity to two residential properties between Kennan Bridge and Dr. Troy Bridge.	No appreciable impacts.
	Rank						

APPENDIX E – Section 3b Route Options Assessment

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway – Sub-Options Section 3b Kirkpatrick Bridge to Granard Bridge										
		Option S3b-1 **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment).**	**Option S3b-2** **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).**	**Option S3b-3** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.**	**Option S3b-4** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-5** **Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-6** **Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-7** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.**	**Option S3b-8** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-9** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.**	**Option S3b-10** **Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.**	**Option S3b-11** **Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.**
1 Economy	1A Capital Cost	**€8,096,000** *Indicative Infrastructure costs €8,096,000 include:* • Greenway will be provided on the southern embankment/towpath of the Royal Canal from Kirkpatrick Bridge to Granard Bridge. • The existing pedestrian bridge adjacent to Kirkpatrick bridge will be (i) widen to 4m to cater for the greenway users or (ii) removed and a new 4m wide ped/cycle bridge provided. • Due to width constraints along the towpath, this option proposes a cantilevered type boardwalk design 4m wide from Kirkpatrick Bridge east towards Granard Bridge for 950m (Ch.6250-Ch.7200). This section has steep banks and is close proximity to the railway line. • To prevent any settlement/slope slips on the railway embankment and to minimise any effects on the live rail system, a	**€6,392,000** *Indicative Infrastructure costs €6,392,000 include:* • Greenway will be provided on the southern embankment/towpath of the Royal Canal from Kirkpatrick Bridge to Granard Bridge. • The existing pedestrian bridge adjacent to Kirkpatrick bridge will be (i) widen to 4m to cater for the greenway users or (ii) removed and a new 4m wide ped/cycle bridge provided. • Due to width constraints along the towpath, this option proposes widening into the railway embankment, providing a paved 4m wide greenway, from Kirkpatrick Bridge east towards Granard Bridge for 950m (Ch.6250-Ch.7200). This section has steep banks and is close proximity to the railway line. • To prevent any settlement/slope slips on the railway embankment an anti-	**€5,301,000** *Indicative Infrastructure costs €5,301,000 include:* • Greenway will be provided on the northern side of the Royal Canal from Kirkpatrick Bridge to Granard Bridge. • To minimise impacts on environmentally sensitive trees for 850m (Ch. 6250-7100), this route option is proposed via northern side of the wooded area by Delwood and Brompton. • A concrete greenway will be provided from Kirkpatrick to the Brompton green area from (Ch. 6250-6850) however, boardwalk/bridge structures will be required to enable the proposed greenway to continue pass steep terrain such as the area of the old quarry etc. • A 4m paved greenway will be provided on the southern side of the Brompton green area. • For the section of the route along the northern embankment	**€4,865,000** *Indicative Infrastructure costs €4,865,000 include:* • Greenway will be provided on the northern side of the Royal Canal from Kirkpatrick Bridge to the proposed ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge. • To minimise impacts on environmentally sensitive trees for 850m (Ch. 6250-7100), this route option is proposed via northern side of the wooded area by Delwood and Brompton. • A concrete greenway will be provided from Kirkpatrick to the Brompton green area from (Ch. 6250-7100) however, boardwalk/bridge structures will be required to enable the proposed greenway to continue pass steep terrain such as the area of the old quarry etc. A 4m paved greenway will be provided on the southern side of the Brompton green area.	**€4,830,000** *Indicative Infrastructure costs €4,830,000 include:* • Greenway will be provided on the northern side of the Royal Canal from Kirkpatrick Bridge to the proposed ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge. • This route option is proposed via the middle of the wooded area by Delwood and Brompton. • A concrete greenway will be provided from Kirkpatrick to the Brompton green area from (Ch. 6250-7100) however, boardwalk structures will be required to enable the proposed greenway to continue pass steep terrain. • A 4m paved greenway will be provided on the southern side of the Brompton green area. • A new pedestrian/cycle bridge which will link the greenway from Roselawn to the	**€5,409,000** *Indicative Infrastructure costs €5,409,000 include:* • Greenway will be provided on the northern embankment of the Royal Canal (south of the wooded area) from Kirkpatrick Bridge to the proposed ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge. • A piled boardwalk structure is proposed along the northern embankment due to the uneven terrain and to minimise impacts on habitats along the bank of the canal. • A new pedestrian/cycle bridge which will link the greenway from Roselawn to the southern embankment of the Canal (Ch.7200). • Paved greenway facilities will be provided on the southern bank of the Royal Canal from new ped/cycle bridge to Granard Bridge (Ch.7200-7780).	**€2,707,000** *Indicative Infrastructure costs €2,707,000 include:* • Greenway will be provided on the northern side of the Royal Canal through Delwood Lawn, Delwood Road, Brompton Court and Roselawn Road. • A 4m paved greenway will be provided within the green area by Delwood Lawn and Delwood Road. • East of the green area, cycle tracks will be provided either side of Delwood Road. • For Brompton Court, cyclists will share the road carriageway with vehicles (cul-de-sac, low vehicular volumes). • Paved 4m wide greenway through the green area by Brompton. • Cycle tracks will be provided either side of Roselawn Road.	**€2,875,000** *Indicative Infrastructure costs €2,875,000 include:* • Greenway will be provided on the northern side of the Royal Canal from Kirkpatrick Bridge via Delwood Lawn, Delwood Road, Brompton Court and through the green area to the proposed ped/cycle bridge (Ch.7100). • A 4m paved greenway will be provided within the green area by Delwood Lawn and Delwood Road. • East of the above mentioned green area, cycle tracks will be provided either side of Delwood Road. • For Brompton Court, cyclists will share the road carriageway with vehicles (cul-de-sac, low vehicular volumes). • Paved 4m wide greenway through the green area by Brompton. • A new pedestrian/cycle bridge which will link the greenway from	**€3,276,000** *Indicative Infrastructure costs €3,276,000 include:* • Greenway will be provided on the northern side of the Royal Canal through Delwood Lawn, Delwood Road, Brompton Court, green area by Brompton and along the northern canal bank by Roselawn. • A 4m paved greenway will be provided within the green area by Delwood Lawn and Delwood Road. • East of the green area, cycle tracks will be provided either side of Delwood Road. • For Brompton Court, cyclists will share the road carriageway with vehicles (cul-de-sac, low vehicular volumes). • Paved 4m wide greenway through the green area by Brompton. • A piled boardwalk structure is required along the northern embankment by Roselawn due to the uneven terrain and to	**€5,539,000** *Indicative Infrastructure costs €5,539,000 include:* • 3m two-way cycle facility will be provided on the northern side of the Royal Canal from Kirkpatrick Bridge to the proposed ped/cycle bridge (Ch. 6250-7100). The route will follow the same route as 3b-4. • A new cycle bridge which will link the cycle route from Roselawn to the southern embankment of the Canal (Ch.7100-7200). • Pedestrian facilities will be provided on the southern embankment/towpath of the Royal Canal from Kirkpatrick Bridge to the new ped/cycle bridge (Ch. 6250-7200). • Paved 4m wide greenway facilities will be provided on the southern bank of the Royal Canal from the new ped/cycle bridge to Granard Bridge (Ch.7200-7780). • Public Lighting will be provided along the entire route.	**€7,146,000** *Indicative Infrastructure costs €996,000 include:* • Greenway will be provided on the northern side of the Royal Canal from Kirkpatrick Bridge to Granard Bridge. • To minimise any impacts on the wooded area for 850m (Ch. 6250-7100), this route option is proposed through the residential back gardens of Delwood Park. • A concrete greenway will be provided from Kirkpatrick to Delwood Park (Ch. 6250-6370). A paved greenway will be provided through the back gardens of the residential properties. • A 4m paved greenway will be provided on the southern side of the Brompton green area. within the green area. • A 4m paved greenway will be provided through the residential back gardens of Roselawn Road. • Public Lighting will be provided along the entire route.

Royal Canal Urban Greenway – Sub-Options Section 3b
Kirkpatrick Bridge to Granard Bridge

Appraisal Criteria	Sub-Criteria	Option S3b-1 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment).	Option S3b-2 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).	Option S3b-3 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.	Option S3b-4 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-5 Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-6 Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-7 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.	Option S3b-8 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-9 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.	Option S3b-10 Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.	Option S3b-11 Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.
		retaining structure will be provided halfway up the railway embankment (providing a green belt of planting below the wall). • At the pinch point, created by the railway masonry retaining wall and the towpath (Ch.7000-7200) the cantilevered boardwalk will be continued along this section and the existing masonry gravity retaining wall will be reinforced by providing a structural facing to overlie the face of the existing wall and secured by anchors below the retained ground level (railway embankment) at the 2m high wall face. • For the remainder of the route, a paved 4m wide greenway will be provided to Granard Bridge. • Public Lighting will be provided along the entire route. • Upgrades to the existing pedestrian bridge adjacent to Kirkpatrick Bridge will be required to convert it to a 4m wide pedestrian/cycle bridge,	erosion geocell will be installed. To place the geocell anti-erosion net, a mojority of the existing vegetation will have to be removed with the geocell to span between mature trees that are deemed to be in an acceptable condition. Once the geocell anti-erosion mat is laid and seeded, it will act to stabilise the slope in the permanent condition and will bring the stability of the slope within the requirements of the current geotechnical design codes. • At the pinch point, created by the railway masonry retaining wall and the towpath (Ch.7000-7200) the cantilevered boardwalk will be continued along this section and the existing masonry gravity retaining wall will be reinforced by providing a structural facing to overlie the face of the existing wall and secured by anchors below the retained ground level (railway embankment) at the 2m high wall face.	by Roselawn, a piled boardwalk structure is proposed due to the uneven terrain and to minimise impacts on habitats. • Public Lighting will be provided along the entire route.	• A new pedestrian/cycle bridge which will link the greenway from Roselawn to the southern embankment of the Canal (Ch.7200). • Paved greenway facilities will be provided on the southern bank of the Royal Canal from new ped/cycle bridge to Granard Bridge (Ch.7200-7780). • Public Lighting will be provided along the entire route. • A greenway underpass is proposed at Granard Bridge	southern embankment of the Canal (Ch.7200). • Paved greenway facilities will be provided on the southern bank of the Royal Canal from new ped/cycle bridge to Granard Bridge (Ch.7200-7780). • Public Lighting will be provided along the entire route. • A greenway underpass is proposed at Granard Bridge	• Public Lighting will be provided along the entire route. • A greenway underpass is proposed at Granard Bridge		Roselawn to the southern embankment of the Canal (Ch.7100-Ch. 7200). • Paved greenway facilities will be provided on the southern bank of the Royal Canal from new ped/cycle bridge to Granard Bridge (Ch.7200-7780). • Public Lighting will be provided along the entire route. • A greenway underpass is proposed at Granard Bridge	minimise impacts on habitats along the bank of the canal (Ch. 7150-7780). • Public Lighting will be provided along the entire route.	• The greenway will tie into the proposed underpass at Granard Bridge, as part of the Blanchardstown to Phoenix Park cycle scheme.	*Land Acquisition Costs €6,150,000* • Residential properties affected.

		Royal Canal Urban Greenway – Sub-Options Section 3b Kirkpatrick Bridge to Granard Bridge										
Appraisal Criteria	**Sub-Criteria**	**Option S3b-1** **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment).**	**Option S3b-2** **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).**	**Option S3b-3** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.**	**Option S3b-4** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-5** **Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-6** **Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-7** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.**	**Option S3b-8** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-9** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.**	**Option S3b-10** **Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.**	**Option S3b-11** **Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.**
		a new pedestrian bridge may be the only feasible option. • A greenway underpass is proposed at Granard Bridge	• For the remainder of the route, a paved 4m wide greenway will be provided to Granard Bridge. • Public Lighting will be provided along the entire route. • Upgrades to the existing pedestrian bridge adjacent to Kirkpatrick Bridge will be required to convert it to a 4m wide pedestrian/cycle bridge, a new pedestrian bridge may be the only feasible option. • A greenway underpass is proposed at Granard Bridge									
	Rank											

1 Economy	1B Constructability	This route option involves widening of the existing pedestrian route along the southern side of Royal Canal to 4m for the entire section. This route options proposes a cantilevered type boardwalk design due to the inadequate width along this section. This would require the installation of a series of anchors to provide structural support to greenway. Anchoring into rock would be the preferred option (approx.950m). The landspan of the cantilever structure will be located at the base of the Irish rail embankment. To prevent any settlement/slope slips on the railway embankment, minimising any effects on the live rail system, a retaining structure will be provided halfway up the railway embankment (providing a green belt of planting below the wall). Rock is at towpath level, therefore it is not possible to sheet pile, rotary bore retaining wall required. A number of options to construct the retaining wall via the canal were examined, however, these would compromise the bed of the canal and would not be deemed acceptable by Waterways Ireland. The most feasible option to gain access and construct the retaining wall is via the railway line. The construction of such a	This route option involves widening of the existing pedestrian route along the southern side of Royal Canal to 4m for the entire section. This route options proposes a cantilevered type boardwalk design due to the inadequate width along this section. This would require the installation of a series of anchors to provide structural support to greenway. Anchoring into rock would be the preferred option (approx.950m). The landspan of the cantilever structure will be located at the base of the Irish rail embankment. To prevent any settlement/slope slips on the railway embankment an anti-erosion geocell will be installed. To place the geocell anti-erosion net, majority of the existing vegetation will have to be removed with the geocell to span between mature trees that are deemed to be in an acceptable condition. Once the geocell anti-erosion mat is laid and seeded, it will act to stabilise the slope in the permanent condition and will bring the stability of the slope within the requirements of the current geotechnical design codes. For the construction of the cantilevered boardwalk, working widths for tracking equipment (drilling rigs or excavators) is limited. Option to use canal with a barge type system for	This route option involves creation of a 4m greenway on the northern side of the Royal Canal from Kennan Bridge to Granard Bridge north of a heavily wooded area with steep banks in locations. The route option proposes the Greenway on the northern side of the Royal Canal from Kirkpatrick Bridge, in close proximity to the back gardens of the residents of Delwood Park and into the open space (green area) at Brompton (to minimise the impact on sensitive trees). For this route, where possible, a concrete greenway will be the primary solution with the standard 4m wide boardwalk or Bridging structures utilised as a secondary solution on steep terrain such as around the area of the old quarry. To prevent the greenway overlooking the back gardens of the residents of Delwood Park, a cutting through these embankments would need to be undertaken to reduce the proposed level of the greenway, accompanied with the provision of a retaining structure or slope stability. Also, fencing and landscaping will be provided between the greenway and the back gardens to increase security and deter anti-social behaviour. There are two locations along the northern embankment where rock was originally	This route option involves creation of a 4m greenway on the northern side of the Royal Canal from Kennan Bridge to the proposed ped/cycle bridge (Ch.7100-Ch. 7200) north of a heavily wooded area with steep banks in locations. The route option proposes the Greenway on the northern side of the Royal Canal from Kirkpatrick Bridge, in close proximity to the back gardens of the residents of Delwood Park and into the open space (green area) at Brompton (to minimise the impact on sensitive trees). For this route, where possible, a concrete greenway will be the primary solution with the standard 4m wide boardwalk or Bridging structures utilised as a secondary solution on steep terrain such as around the area of the old quarry. To prevent the greenway overlooking the back gardens of the residents of Delwood Park, a cutting through these embankments would need to be undertaken to reduce the proposed level of the greenway, accompanied with the provision of a retaining structure or slope stability. Also, fencing and landscaping will be provided between the greenway and the back gardens to increase security and deter anti-social behaviour. There are two locations along the northern embankment where steep terrain such as	This route option involves creation of a 4m greenway on the northern side of the Royal Canal from Kennan Bridge to the proposed ped/cycle bridge (Ch.7100-Ch. 7200) through a heavily wooded area with steep banks in locations. For this route, where possible, a concrete greenway will be the primary solution with the standard 4m wide boardwalk as a secondary solution on steep terrain. This route option would involve the removal of a significant number of trees. A new curved steel pedestrian/cycle bridge will link the greenway between Roselawn and the southern embankment of the Canal. Similar to the bridge at the quarry, the greenway will be constructed either side of the canal, therefore, providing access to construct the abutments and to crane the steel beams into position. Alternatively, the steel beams could be transported and craned into position from a barge. For the remainder of the route to Granard Bridge, a paved greenway will be the primary solution on the southern side of the Royal Canal, with the standard 4m wide. A precast 4m wide greenway underpass is proposed at Granard Bridge (as per	This route option involves creation of a 4m greenway on the bank of the Royal Canal from Kennan Bridge to Granard Bridge through a heavily wooded area with steep banks in locations. A piled boardwalk structure is proposed along the northern embankment from Kirkpatrick Bridge to the proposed ped/cycle bridge due to the uneven terrain and to minimise impacts on habitats along the bank of the canal. The boardwalk can by constructed from the northern bank or from a barge on the canal. A new curved steel pedestrian/cycle bridge will link the greenway between Roselawn and the southern embankment of the Canal. The greenway will be constructed either side of the canal, therefore, providing access to construct the abutments and to crane the steel beams into position. Alternatively, the steel beams could be transported and craned into position from a barge. For the remainder of the route to Granard Bridge, a paved greenway will be the primary solution on the southern side of the Royal Canal, with the standard 4m wide. A precast 4m wide greenway underpass is proposed at Granard Bridge (as per Blanchardstown to Phoenix Park cycle scheme).	This route option involves the creation of a 4m wide greenway on the northern side of the Royal Canal through Delwood Lawn, Delwood Road, Brompton Court and Roselawn Road. A 4m paved greenway will be provided through the green areas by Delwood Lawn/Delwood Road and Brompton Court. Segregated cycle track (1.75m wide) will be provided either side of Delwood Road and Roselawn Road. Widening into the tress on Delwood Road may be required to provide segregated cycle tracks (1.75m wide) either side of the road.	This route option involves the creation of a 4m wide greenway on the northern side of the Royal Canal through Delwood Lawn, Delwood Road and Brompton Court. A 4m paved greenway will be provided through the green areas by Delwood Lawn/Delwood Road and Brompton Court. Segregated cycle track (1.75m wide) will be provided either side of Delwood Road. Widening into the tress on Delwood Road may be required to provide segregated cycle tracks either side of the road. A new curved steel pedestrian/cycle bridge will link the greenway between Roselawn and the southern embankment of the Canal. The greenway will be constructed either side of the canal, therefore, providing access to construct the abutments and to crane the steel beams into position. Alternatively, the steel beams could be transported and craned into position from a barge. For the remainder of the route to Granard Bridge, a paved greenway will be the primary solution on the southern side of the Royal Canal, with the standard 4m wide. A precast 4m wide greenway underpass is proposed at Granard Bridge (as per Blanchardstown to	This route option involves the creation of a 4m wide greenway on the northern side of the Royal Canal through Delwood Lawn, Delwood Road and Brompton Court. A 4m paved greenway will be provided through the green areas by Delwood Lawn/Delwood Road and Brompton Court. Segregated cycle track (1.75m wide) will be provided either side of Delwood Road. Widening into the tress on Delwood Road may be required to provide segregated cycle tracks either side of the road. For the section of the route along the northern bank of the Royal Canal by Roselawn, a piled boardwalk structure is proposed due to the uneven terrain and to minimise impacts on habitats. The boardwalk can by constructed from the northern bank or from a barge on the canal.	This route option involves creation of a 3m cycle route on the northern side of the Royal Canal from Kennan Bridge to the proposed ped/cycle bridge (Ch.7100-Ch. 7200) north of a heavily wooded area with steep banks in locations. The route option proposes the cycle route on the northern side of the Royal Canal from Kirkpatrick Bridge, is in close proximity to the back gardens of the residents of Delwood Park and into the open space (green area) at Brompton (to minimise the impact on sensitive trees). For this route, where possible, a concrete greenway will be the primary solution with the standard 4m wide boardwalk or Bridging structures utilised as a secondary solution on steep terrain such as around the area of the old quarry. To prevent the cycle route overlooking the back gardens of the residents of Delwood Park, a cutting through these embankments would need to be undertaken to reduce the proposed level of the greenway, accompanied with the provision of a retaining structure or slope stability. Also, fencing and landscaping will be provided between the greenway and the back gardens to increase security and deter anti-social behaviour. There are two locations along the northern embankment where	This route option involves creation of a 4m greenway on the northern side of the Royal Canal from Kennan Bridge to Granard Bridge north of a heavily wooded area with steep banks in locations. The route option proposes a paved Greenway on the northern side of the Royal Canal from Kirkpatrick Bridge, through the residential back gardens of Delwood Park and into the open space (green area) at Brompton (to minimise the impact on sensitive trees). For this route, where possible, a paved greenway will be the primary solution with the standard 4m wide concrete greenway utilised as a secondary solution on steep terrain such as around the area of the old quarry. To prevent the greenway overlooking the back gardens of the residents of Delwood Park, fencing and landscaping will be provided between the greenway and the back gardens to increase security and deter anti-social behaviour. For the section of route from Ch. 7100 to Granard Bridge, the route option proposes a paved Greenway on the northern side of the Royal Canal through the residential back gardens of Roselawn Road to minimise the impact on trees.

1 Economy	1B Constructability	wall would necessitate the closure of the rail line. Irish Rail have advised that there would likely be time restraints, night time works for 5 hours per day. For the construction of the cantilevered boardwalk, working widths for tracking equipment (drilling rigs or excavators) is limited. Option to use canal with a barge type system for a working platform could be considered. This will need to be coordinated with Waterways Ireland. The precast concrete boardwalk sections would need to be transported and placed into position via a crane on a barge. Castleknock Train Station access point would (Granard Bridge) would be the likely location to crane the precast sections onto the barge. The canal and towpath (southern embankment) between Kirkpatrick Bridge and Granard Bridge will need to be closed during construction. Irish Rail advised that if there is any proposed works adjacent to or impacts on the existing masonry retaining wall, that the entire wall would need to be rebuilt. Irish Rail have also advised that there would likely be time and methodology restraints placed on the construction of the such a structure. The construction of such a wall would necessitate the closure of the rail line. This would result in night works, piling during the night would create noise and nuisance. At the pinch point, created by the railway masonry retaining wall and the towpath (Ch.7000-7200) the cantilevered boardwalk	a working platform could be considered. This will need to be coordinated with Waterways Ireland. The precast concrete boardwalk sections would need to be transported and placed into position via a crane on a barge. Castleknock Train Station access point would (Granard Bridge) would be the likely location to crane the precast sections onto the barge. The canal and towpath (southern embankment) between Kirkpatrick Bridge and Granard Bridge will need to be closed during construction. Irish Rail advised that if there is any proposed works adjacent to or impacts on the existing masonry retaining wall, that the entire wall would need to be rebuilt. Irish Rail have also advised that there would likely be time and methodology restraints placed on the construction of the such a structure. The construction of such a wall would necessitate the closure of the rail line. At the pinch point, created by the railway masonry retaining wall and the towpath (Ch.7000-7200) the cantilevered boardwalk will be continued along this section and the existing masonry gravity retaining wall will be reinforced by providing a structural facing to overlie the face of the existing wall and secured by anchors below the retained ground level (railway embankment) at the 2m high wall face. Approaching Kirkpatrick Bridge (from the east) there is approximately 1.2m width between the retaining wall (Irish Rail) and the pedestrian	quarried to create the Royal Canal, resulting in very steep cuttings/terrain at these locations. A boardwalk/bridge structure will be required to enable the proposed greenway to continue pass these locations. The bridge over the quarry section will be constructed with steel beams and concrete decking. The greenway will be constructed from either side of the quarry, therefore, providing access to construct the abutments and to roll or crane the steel beams into position and then to pump the concrete deck. For the section of the route along the northern bank of the Royal Canal by Roselawn, a piled boardwalk structure is proposed due to the uneven terrain and to minimise impacts on habitats. The boardwalk can by constructed from the northern bank or from a barge on the canal.	rock was originally quarried to create the Royal Canal, resulting in very steep cuttings/terrain at these locations. A boardwalk/bridge structure will be required to enable the proposed greenway to continue pass these locations. The bridge over the quarry section will be constructed with steel beams and concrete decking. The greenway will be constructed from either side of the quarry, therefore, providing access to roll or crane the steel beams into position and then to pump the concrete deck. A new curved steel pedestrian/cycle bridge will link the greenway between Roselawn and the southern embankment of the Canal. Similar to the bridge at the quarry, the greenway will be constructed either side of the canal, therefore, providing access to construct the abutments and to crane the steel beams into position. Alternatively, the steel beams could be transported and craned into position from a barge. For the remainder of the route to Granard Bridge, a paved greenway will be the primary solution on the southern side of the Royal Canal, with the standard 4m wide. A precast 4m wide greenway underpass is proposed at Granard Bridge (as per Blanchardstown to Phoenix Park cycle scheme).	Blanchardstown to Phoenix Park cycle scheme).			Phoenix Park cycle scheme).		rock was originally quarried to create the Royal Canal, resulting in very steep cuttings/terrain at these locations. A boardwalk/bridge structure will be required to enable the proposed greenway to continue pass these locations. The bridge over the quarry section will be constructed with steel beams and concrete decking. The greenway will be constructed from either side of the quarry, therefore, providing access to construct the abutments and to roll or crane the steel beams into position and then to pump the concrete deck. For the remainder of the route to Granard Bridge, a paved greenway will be the primary solution on the southern side of the Royal Canal, with the standard 4m wide. For the pedestrian route on the southern embankment, a paved walkway will be provided. The existing towpath width will be maintained. Lighting will be provided along with safety barriers where required (Fall height ≥4m). A precast 4m wide greenway underpass is proposed at Granard Bridge (as per Blanchardstown to Phoenix Park cycle scheme).	

		will be continued along this section and the existing masonry gravity retaining wall will be reinforced by providing a structural facing to overlie the face of the existing wall and secured by anchors below the retained ground level (railway embankment) at the 2m high wall face. Approaching Kirkpatrick Bridge (from the east) there is approximately 1.2m width between the retaining wall (Irish Rail) and the pedestrian bridge pier, to provide a 4m greenway on approach to Kirkpatrick bridge (pinch point between the pedestrian bridge and the retaining wall) would require land acquisition from Irish Rail at the pedestrian entrance to the eastbound platform of Coolmine Station. However, Irish Rail have stated that this access would likely be retained and enhanced as part of the electrification works. As such the suggested land acquisition would not be feasible. Widening to the north, would impact on the existing pedestrian bridge piers. The existing pedestrian bridge on the eastern side of Kirkpatrick Bridge is 3m wide. Widening the bridge to 4m to cater for the Greenway users from the northern side of the canal (preferred option 3a-4) may not be feasible and a new pedestrian/cycle bridge may be required. For the remainder of the route from chainage 7200 to Granard Bridge, a paved greenway will be the primary solution on the southern side of the Royal Canal, with the standard 4m wide. A precast 4m wide greenway underpass is proposed at Granard Bridge (as per	bridge pier, to provide a 4m greenway on approach to Kirkpatrick bridge (pinch point between the pedestrian bridge and the retaining wall) would require land acquisition from Irish Rail at the pedestrian entrance to the eastbound platform of Coolmine Station. However, Irish Rail have stated that this access would likely be retained and enhanced as part of the electrification works. As such the suggested land acquisition would not be feasible. Widening to the north, would impact on the existing pedestrian bridge pier. The existing pedestrian bridge on the eastern side of Kirkpatrick Bridge is 3m wide. Widening the bridge to 4m to cater for the Greenway users from the northern side of the canal (preferred option 3a-4) may not be feasible and a new pedestrian/cycle bridge may be required For the remainder of the route to Granard Bridge, a paved greenway will be the primary solution on the southern side of the Royal Canal, with the standard 4m wide. A precast 4m wide greenway underpass is proposed at Granard Bridge									

		Royal Canal Urban Greenway – Sub-Options Section 3b Kirkpatrick Bridge to Granard Bridge										
Appraisal Criteria	Sub-Criteria	Option S3b-1 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment).	Option S3b-2 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).	Option S3b-3 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.	Option S3b-4 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-5 Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-6 Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-7 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.	Option S3b-8 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-9 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.	Option S3b-10 Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.	Option S3b-11 Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.
		Blanchardstown to Phoenix Park cycle scheme).										

1 Economy	1C Quality of Service	Greenway segregated from vehicular traffic for the entire route (approx. 1.5km). The greenway runs along the entire bank of the Royal Canal, it does not have any detours. The environment along the route is pleasant and interesting. However, due to the lack of accessibility/connectivity (1.5km), this option would result in a less secure and safe environment for greenway users. The greenway will be 4m wide with no excessive gradients.	Greenway segregated from vehicular traffic for the entire route (approx. 1.5km). The greenway runs along the entire bank of the Royal Canal, it does not have any detours. The environment along the route is pleasant and interesting. The greenway will be 4m wide with no excessive gradients. The environment along the route is pleasant and interesting. However, due to the lack of accessibility/connectivity (1.5km), this option would result in a less secure and safe environment for greenway users.	Greenway segregated from vehicular traffic for the entire route. The greenway detours slightly from the canal via the northern side of the wooded area (in close proximity to the back gardens of the residents of Delwood Park) to minimise the impact on sensitive trees for approx. 600m (Ch. 6250-6850). The greenway runs through the Delwood green area to minimise impacts on environmentally sensitive trees for appox 250m (Ch. 6850-7100). The greenway runs along the northern bank of the Royal Canal from Ch. 7150-7780 to Granard Bridge. The environment along the canal is pleasant and interesting. This option also maximises connectivity and permeability, providing greater passive surveillance and security for greenway users. The greenway will be 4m wide with no excessive gradients.	Greenway segregated from vehicular traffic for the entire route. The greenway detours slightly from the canal via the northern side of the wooded area (in close proximity to the back gardens of the residents of Delwood Park) to minimise the impact on sensitive trees for approx. 600m (Ch. 6250-6850). The greenway runs through the Delwood green area to minimise impacts on environmentally sensitive trees for appox 250m (Ch. 6850-7100). The greenway runs along the southern bank/towpath of the Royal Canal from Ch. 7200-7780 to Granard Bridge. The environment along the canal is pleasant and interesting. This option also maximises connectivity and permeability, providing greater passive surveillance and security for greenway users. The greenway will be 4m wide with no excessive gradients.	Greenway segregated from vehicular traffic for the entire route. The greenway detours slightly from the canal via through the wooded area to the north of the canal (Ch. 6250-7100). The greenway runs along the southern bank/towpath of the Royal Canal from Ch. 7200-7780 to Granard Bridge. The greenway will be 4m wide with no excessive gradients.	Greenway segregated from vehicular traffic for the entire route. The greenway runs along the northern bank of the canal from Kirkpatrick Bridge to the proposed ped/cycle bridge (Ch. 6250-7100). The greenway runs along the southern bank/towpath from the proposed ped/cycle route to Granard Bridge (Ch. 7200-7780). The greenway will be 4m wide with no excessive gradients	Greenway segregated from traffic for 20% of the route. The greenway detours from the canal for the entire route via Delwood Lawn, Delwood Road, Brompton Court and Roselawn (approx. 2km). The environment through the residential area would not be as pleasant or interesting (2km) as along the Royal Canal. The pedestrian/cycle routes through the residential areas will have no excessive gradients. This option maximises connectivity and permeability, providing greater passive surveillance and security for greenway users.	Greenway segregated from traffic for 45% of the route. The greenway detours from the canal via Delwood Lawn, Delwood Road and Brompton Court (approx. 1.2km). The greenway runs along the southern bank/towpath from the proposed ped/cycle route to Granard Bridge (Ch. 7200-7780). The pedestrian/cycle routes through the residential areas will have no excessive gradients. The greenway section along the southern bank/towpath of the canal will be 4m wide with no excessive gradients. This option maximises connectivity and permeability, providing greater passive surveillance and security for greenway users	Greenway segregated from traffic for 45% of the route. The greenway detours from the canal via Delwood Lawn, Delwood Road and Brompton Court (approx. 1.2km). The greenway runs along the northern bank from the proposed ped/cycle route to Granard Bridge (Ch. 7150-7780). The pedestrian/cycle routes through the residential areas will have no excessive gradients. The greenway section along the southern bank/towpath of the canal will be 4m wide with no excessive gradients. This option maximises connectivity and permeability, providing greater passive surveillance and security for greenway users	Two-way cycle facility provided on the northern side of the Royal Canal, separated from the pedestrian route, which does not align with the requirements of a Greenway. The cycle route detours slightly from the canal via the northern side of the wooded area (in close proximity to the back gardens of the residents of Delwood Park) to minimise the impact on sensitive trees for approx. 600m (Ch. 6250-6850). The cycle route runs through the Delwood green area to minimise impacts on environmentally sensitive trees for appox 250m (Ch. 6850-7100). The pedestrian route runs along the bank/towpath of the Royal Canal from Kirkpatrick Bridge to the proposed ped/cycle bridge (Ch. 6250-7100). The greenway section along the southern bank/towpath of the canal will be 4m wide with no excessive gradients (Ch. 7200-7780).	Greenway segregated from vehicular traffic for the entire route. The greenway detours slightly from the canal via the northern side of the wooded area (through the residential back gardens of Delowood Park) to minimise the impact on sensitive trees for approx. 600m (Ch. 6250-6850). The greenway runs through the Delwood green area to minimise impacts on environmentally sensitive trees for appox 250m (Ch. 6850-7100). The greenway detours slightly from the canal via the northern side of the wooded area (through the residential back gardens of Delowwod Park) to minimise the impact on sensitive trees for approx. 600m (Ch. 6250-6850). The greenway runs through the residential back gardens of Roselawn Road to minimise the impact on trees (Ch. 7150-7780). This option maximises connectivity and permeability, providing greater passive surveillance and security for greenway users. The greenway will be 4m wide with no excessive gradients.
2 Integration	2A Cycling Integration	This route option is identified as the Royal Canal Greenway in the GDA Cycle Network Plan.	This route option is identified as the Royal Canal Greenway in the GDA Cycle Network Plan.	The greenway detours slightly from the canal via the northern side of the wooded area (in close proximity to the back gardens of the residents of Delwood Park) and Brompton green, to minimise the impact on sensitive trees for approx. 850m (Ch. 6250-7100).	The greenway detours slightly from the canal via the northern side of the wooded area (in close proximity to the back gardens of the residents of Delwood Park) and Brompton green, to minimise the impact on sensitive trees for approx. 850m (Ch. 6250-7100).	The greenway detours slightly from the canal through the wooded area on the northern bank of the Royal Canal (Ch. 6250-7100).	This route option is identified as the Royal Canal Greenway in the GDA Cycle Network Plan.	This proposed cycle route detours from the Royal Canal Greenway route for the entire route (2km). Delwood Road and Roselawn Road are identified as Secondary Routes in the GDA Cycle Network Plan.	This proposed cycle route detours from the Royal Canal Greenway via Delwood and Brompton (1.2km). Delwood Road is identified as a Secondary Route in the GDA Cycle Network Plan The greenway route will run along the northern bank of the Royal Canal from Ch. 7150-7780, identified as the Royal	This proposed cycle route detours from the Royal Canal Greenway via Delwood and Brompton (1.2km). Delwood Road is identified as a Secondary Route in the GDA Cycle Network Plan The greenway will connect back to the Royal Canal Greenway via a proposed	Two-way cycle facility provided on the northern side of the Royal Canal, separated from the pedestrian route, this does not align with the Royal Canal Greenway in the GDA Cycle Network Plan. The greenway detours slightly from the canal via the northern side of the wooded area (in close proximity to the	The greenway detours slightly from the canal via the northern side of the wooded area (in close proximity to the back gardens of the residents of Delwood Park) and Brompton green, to minimise the impact on sensitive trees for approx. 850m (Ch. 6250-7100).

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway – Sub-Options Section 3b Kirkpatrick Bridge to Granard Bridge										
		Option S3b-1 **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment).**	**Option S3b-2** **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).**	**Option S3b-3** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.**	**Option S3b-4** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-5** **Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-6** **Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-7** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.**	**Option S3b-8** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-9** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.**	**Option S3b-10** **Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.**	**Option S3b-11** **Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.**
									Canal Greenway in the GDA Cycle Network Plan.	ped/cycle bridge (Ch 7200-7780).	back gardens of the residents of Delwood Park) and Brompton green, to minimise the impact on sensitive trees for approx. 850m (Ch. 6250-7100). The greenway will connect back to the Royal Canal Greenway via a proposed ped/cycle bridge (Ch 7200-7780).	
	Rank											

Royal Canal Urban Greenway – Sub-Options Section 3b
Kirkpatrick Bridge to Granard Bridge

Appraisal Criteria	Sub-Criteria	Option S3b-1 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment).	Option S3b-2 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).	Option S3b-3 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.	Option S3b-4 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-5 Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-6 Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-7 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.	Option S3b-8 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.	Option S3b-9 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.	Option S3b-10 Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.	Option S3b-11 Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.
2 Integration	2B Traffic Network Integration	New toucan crossing provided on Kirkpatrick Bridge which will have an impact on general traffic. The greenway will tie into the proposed underpass at Granard Bridge, Therefore, it will not have an impact with traffic at Granard Bridge.	New toucan crossing provided on Kirkpatrick Bridge which will have an impact on general traffic. The greenway will tie into the proposed underpass at Granard Bridge. Therefore, it will not have an impact with traffic at Granard Bridge.	New toucan crossing provided on Kirkpatrick Bridge and Granard Bridge which will have an impact on general traffic.	New toucan crossing provided on Kirkpatrick Bridge which will have an impact on general traffic. The greenway will tie into the proposed underpass at Granard Bridge. Therefore, it will not have an impact with traffic at Granard Bridge.	New toucan crossing provided on Kirkpatrick Bridge which will have an impact on general traffic. The greenway will tie into the proposed underpass at Granard Bridge. Therefore, it will not have an impact with traffic at Granard Bridge.	New toucan crossing provided on Kirkpatrick Bridge which will have an impact on general traffic. The greenway will tie into the proposed underpass at Granard Bridge,. Therefore, it will not have an impact with traffic at Granard Bridge.	New toucan crossing provided on Kirkpatrick Bridge which will have an impact on general traffic. Cycle facilities through residential areas (Delwood Lawn, Delwood Road, Brompton Court & Roselawn Road) may have an impact on traffic. Cycle facilities on Castleknock Road may have an impact on traffic.	New toucan crossing provided on Kirkpatrick Bridge which will have an impact on general traffic. Cycle facilities through residential areas (Delwood Road) may have an impact on traffic. The greenway will tie into the proposed underpass at Granard Bridge. Therefore, it will not have an impact with traffic at Granard Bridge.	New toucan crossing provided on Kirkpatrick Bridge and Granard Bridge which will have an impact on general traffic. Cycle facilities through residential areas (Delwood Road) may have an impact on traffic.	New toucan crossing provided on Kirkpatrick Bridge which will have an impact on general traffic. The greenway will tie into the proposed underpass at Granard Bridge. Therefore, it will not have an impact with traffic at Granard Bridge.	New toucan crossing provided on Kirkpatrick Bridge and Granard Bridge which will have an impact on general traffic.
	Rank											

2 Integration	2C Potential Impact on Rail Network	Greenway route adjacent to the railway line for the entire section (approx. 1.5km). Potential impact on the rail network. The landspan of the cantilever structure will be located at the base of the Irish rail embankment. To prevent any settlement/slope slips on the railway embankment, minimising any effects on the live rail system, a retaining structure will be provided halfway up the railway embankment (providing a green belt of planting below the wall). The most feasibility option to gain access and construct the retain wall is via the railway line. The construction of such a wall would necessitate the closure of the rail line. Irish Rail advised that if there is any proposed works adjacent to or impacts on the existing masonry retaining wall, that the entire wall would need to be rebuilt. Irish Rail have also advised that there would likely be time and methodology restraints placed on the construction of the such a structure. The construction of such a wall would necessitate the closure of the rail line. Irish Rail have also advised that construction restrictions for the final Greenway Scheme will depend on how the proposed structure along the towpath will be constructed, whether it will be constructed on or off the embankment (possible use of a barge along the canal) etc. IÉ would have a preference for construction from the canal rather than from the embankment	Greenway route adjacent to the railway line for the entire section (approx. 1.5km). Potential impact on the rail network. The landspan of the cantilever structure will be located at the base of the Irish rail embankment. As a precaution, the vegetation will be scaled back and anti-erosion geocell installed. Once the geocell anti-erosion mat is laid and seeded, it will act to stabilise the railway embankment. Irish Rail advised that if there is any proposed works adjacent to or impacts on the existing masonry retaining wall, that the entire wall would need to be rebuilt. Irish Rail have also advised that there would likely be time and methodology restraints placed on the construction of the such a structure. The construction of such a wall would necessitate the closure of the rail line. Irish Rail have also advised that construction restrictions for the final Greenway Scheme will depend on how the proposed structure along the towpath will be constructed, whether it will be constructed on or off the embankment (possible use of a barge along the canal) etc. IÉ would have a preference for construction from the canal rather than from the embankment.	No appreciable impacts.	Greenway route is on the southern towpath adjacent to the railway line from Ch. 7200 to Granard Bridge, however, there is sufficient distance from the greenway and the railway line for the section of route (approx. 580m length). Paved 4m wide greenway proposed. The proposed ped/cycle bridge tie-in on the southern towpath has been chosen due to the width constraints along the towpath particularly at the pinch point at Castleknock Ch. 7000-7160 (created by the railway masonry retaining wall and the towpath). The towpath begins to widen from Ch.7220 eastwards towards Granard Bridge, which provides sufficient available width for the bridge abutment and greenway, while maintaining at least 4.5m (minimum) separation from Irish Rail assets (Irish Rail Requirement).	Greenway route is on the southern towpath adjacent to the railway line from Ch. 7200 to Granard Bridge, however, there is sufficient distance from the greenway and the railway line for the section of route (approx. 580m length). Paved 4m wide greenway proposed. The proposed ped/cycle bridge tie-in on the southern towpath has been chosen due to the width constraints along the towpath particularly at the pinch point at Castleknock Ch. 7000-7160 (created by the railway masonry retaining wall and the towpath). The towpath begins to widen from Ch.7220 eastwards towards Granard Bridge, which provides sufficient available width for the bridge abutment and greenway, while maintaining at least 4.5m (minimum) separation from Irish Rail assets (Irish Rail Requirement).	Greenway route is on the southern towpath adjacent to the railway line from Ch. 7200 to Granard Bridge, however, there is sufficient distance from the greenway and the railway line for the section of route (approx. 580m length). Paved 4m wide greenway proposed. The proposed ped/cycle bridge tie-in on the southern towpath has been chosen due to the width constraints along the towpath particularly at the pinch point at Castleknock Ch. 7000-7160 (created by the railway masonry retaining wall and the towpath). The towpath begins to widen from Ch.7220 eastwards towards Granard Bridge, which provides sufficient available width for the bridge abutment and greenway, while maintaining at least 4.5m (minimum) separation from Irish Rail assets (Irish Rail Requirement).	No appreciable impacts.	No appreciable impacts. The proposed ped/cycle bridge tie-in on the southern towpath has been chosen due to the width constraints along the towpath particularly at the pinch point at Castleknock Ch. 7000-7160 (created by the railway masonry retaining wall and the towpath). The towpath begins to widen from Ch.7220 eastwards towards Granard Bridge, which provides sufficient available width for the bridge abutment and greenway, while maintaining at least 4.5m (minimum) separation from Irish Rail assets (Irish Rail Requirement).	No appreciable impacts.	Greenway route is on the southern towpath adjacent to the railway line from Ch. 7200 to Granard Bridge, however, there is sufficient distance from the greenway and the railway line for the section of route (approx. 580m length). Paved 4m wide greenway proposed. For the pedestrian route on the southern embankment, a paved walkway will be provided. The existing towpath width will be maintained. Lighting will be provided along with safety barriers where required (Fall height ≥4m). Potential minor impact on the rail network. Irish Rail have advised that construction restrictions for the final Greenway Scheme will depend on how the proposed structure along the towpath will be constructed, whether it will be constructed on or off the embankment (possible use of a barge along the canal) etc. IÉ would have a preference for construction from the canal rather than from the embankment. The proposed cycle bridge tie-in on the southern towpath has been chosen due to the width constraints along the towpath particularly at the pinch point at Castleknock Ch. 7000-7160 (created by the railway masonry retaining wall and the towpath). The towpath begins to widen from Ch.7220 eastwards towards Granard Bridge, which provides sufficient available width for the bridge abutment and greenway, while maintaining at least 4.5m (minimum) separation from Irish Rail assets (Irish Rail Requirement).	No appreciable impacts.

2 Integration	2D Potential Impact on Canal Users	Walkers will benefit from the existing towpath being upgraded to 4m wide greenway from Kirkpatrick Bridge to Granard Bridge. The proposed route option may impact on Waterways Ireland maintenance along the southern bank of the canal due to the proposed cantilevered boardwalk for the majority of the route. A number of options to construct the retaining wall along the southern towpath via the canal were examined, however, these would compromise the bed of the canal and would not be deemed acceptable by Waterways Ireland. The operation of barges along the route may be impacted due to the extent of the projected cantilever. At narrow canal widths, the final extents of the projected cantilever will need to satisfy Waterways Ireland's minimum navigational widths. Safety barriers may be required along the towpath for the majority of the route (based on the use of cantilevered boardwalk and an effective fall height ≥ 4m). These barriers may hinder the used of the towpath to tow barges.	Walkers will benefit from the existing towpath being upgraded to 4m wide greenway from Kirkpatrick Bridge to Granard Bridge. The proposed route option may impact on Waterways Ireland maintenance along the southern bank of the canal due to the proposed cantilevered boardwalk for the majority of the route. A number of options to construct the retaining wall along the southern towpath via the canal were examined, however, these would compromise the bed of the canal and would not be deemed acceptable by Waterways Ireland. The operation of barges along the route may be impacted due to the extent of the projected cantilever. At narrow canal widths, the final extents of the projected cantilever will need to satisfy Waterways Ireland's minimum navigational widths. Safety barriers may be required along the towpath for the majority of the route (based on the use of cantilevered boardwalk and an effective fall height ≥ 4m). These barriers may hinder the used of the towpath to tow barges.	The proposed route option may impact on Waterways Ireland maintenance along the northern bank of the canal due to the proposed piled boardwalk from Ch. 7150-7780.	This route option will have no appreciable impact on canal users. The proposed pedestrian/cycle bridge will be constructed as per Waterways Ireland clearance requirements, therefore, it should not impact on the operation of barges along the canal. The bridge landing on the southern embankment will be sited and designed so as to maintain a continuous route along the southern towpath for canal users.	This route option will have no appreciable impact on canal users. The proposed pedestrian/cycle bridge will be constructed as per Waterways Ireland clearance requirements, therefore, it should not impact on the operation of barges along the canal. The bridge landing on the southern embankment will be sited and designed so as to maintain a continuous route along the southern towpath for canal users.	The proposed route option may impact on Waterways Ireland maintenance along the northern bank of the canal due to the proposed piled boardwalk from Ch. 6250-7150.	This route option will have no appreciable impact on canal users.	This route option will have no appreciable impact on canal users. The proposed pedestrian/cycle bridge will be constructed as per Waterways Ireland clearance requirements, therefore, it should not impact on the operation of barges along the canal. The bridge landing on the southern embankment will be sited and designed so as to maintain a continuous route along the southern towpath for canal users.	The proposed route option may impact on Waterways Ireland maintenance along the northern bank of the canal due to the proposed piled boardwalk from Ch. 7150-7780.	Walkers will benefit from the existing towpath being upgraded to 2m bound surface from Kennan Bridge to Talbot (pedestrian traffic only). However, safety barriers may be required along the towpath for 1km of section 3 due to upgrades of the existing towpath (an effective fall height ≥ 4m). These barriers may hinder the used of the towpath to tow barges. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route. Safety barriers may be required along the towpath for a section of the pedestrian route (based on an effective fall height ≥ 4m). These barriers may hinder the used of the towpath to tow barges.	This route option will have no appreciable impact on canal users. The proposed pedestrian/cycle bridge will be constructed as per Waterways Ireland clearance requirements, therefore, it should not impact on the operation of barges along the canal. The bridge landing on the southern embankment will be sited and designed so as to maintain a continuous route along the southern towpath for canal users.
	2E Potential Impact on Communities/Residents	Accessibility to the greenway on the southern embankment is restricted between Kirkpatrick Bridge and Granard Bridge (approx. 1.5km) due to the railway line on the southern side of the towpath, thereby preventing permeability and linkages from residential catchments (in accordance with DMURS principles).	Accessibility to the greenway on the southern embankment is restricted between Kirkpatrick Bridge and Granard Bridge (approx. 1.5km) due to the railway line on the southern side of the towpath, thereby preventing permeability and linkages from residential catchments (in accordance with DMURS principles).	From the non-statutory public consultation some of the main concerns from residents were proximity of the route to residential properties, security and the opening of cul-de-sacs. **Proximity** To minimise impact on highly sensitive trees, the proposed route will be located in close proximity to the back gardens of the residents of Delwood Park, which may impact upon the	From the non-statutory public consultation some of the main concerns from residents were proximity of the route to residential properties, security and the opening of cul-de-sacs. **Proximity** To minimise impact on highly sensitive trees, the proposed route will be located in close proximity to the back gardens of the residents of Delwood Park, which may impact upon the	This route option on the northern embankment permits permeability and linkages from residential catchments. The number and location of these potential linkages have to be further assessed. There is a possibility that the cul-de-sacs won't be opened and the potential linkages to the greenway will be via the open green space area at Delwood. Accessibility to the greenway on the	Accessibility to the greenway is restricted between Kirkpatrick Bridge and the proposed pedestrian/cycle bridge (approx. 1km) due to the wooded area on the northern side, thereby preventing permeability and linkages from residential catchments (in accordance with DMURS principles).	This route option through the residential areas of Delwood, Brompton and Roselawn permits permeability and linkages from residential catchments. Segregated cycle tracks will be provided either side of the carriageway on Roselawn Road. This will remove the possibility to park on the road. **Car Parking** Possible increased parking on surrounding	This route option through the residential areas of Delwood and Brompton permits permeability and linkages from residential catchments. **Car Parking** Possible increased parking on surrounding roads which would need to be controlled /managed.	This route option through the residential areas of Delwood and Brompton permits permeability and linkages from residential catchments. Along the northern bank of the canal (Ch. 7150-7780), a number of Roselawn Road residents have extended their gardens to the canal (title still remains with Waterways Ireland). As a result, this route may impact	From the non-statutory public consultation some of the main concerns from residents were proximity of the route to residential properties, security and the opening of cul-de-sacs. **Proximity** To minimise impact on highly sensitive trees, the proposed route will be located in close proximity to the back gardens of the residents of Delwood Park, which may impact upon the	From the non-statutory public consultation some of the main concerns from residents were proximity of the route to residential properties, security and the opening of cul-de-sacs. **Proximity** To minimise impact on sensitive trees, the proposed route will be located through the back gardens of the residents of Delwood Park and Roselawn

				residents. However, to prevent the greenway overlooking the back gardens of the residents of Delwood Park, a cutting through these embankments will be undertaken to reduce the proposed level of the greenway, accompanied with the provision of a retaining structure or slope stability. Along the northern bank of the canal (Ch. 7150-7780), a number of Roselawn Road residents have extended their gardens to the canal (title still remains with Waterways Ireland). As a result, this route may impact on those extended gardens. **Security** Fencing and landscaping will be provided between the greenway and the back gardens to increase security, CCTV surveillance will also be placed along the greenway route to deter anti-social behaviour. **Opening up cul-de-sacs** This route option on the northern embankment permits permeability and linkages from residential catchments (in accordance with DMURS principles). It is proposed to create a linkage via Delwood Close and the Brompton green area. **Car Parking** Possible increased parking on surrounding roads which would need to be controlled /managed.	residents. However, to prevent the greenway overlooking the back gardens of the residents of Delwood Park, a cutting through these embankments will be undertaken to reduce the proposed level of the greenway, accompanied with the provision of a retaining structure or slope stability. **Security** Fencing and landscaping will be provided between the greenway and the back gardens to increase security, CCTV surveillance will also be placed along the greenway route to deter anti-social behaviour. **Opening up cul-de-sacs** This route option on the northern embankment permits permeability and linkages from residential catchments (in accordance with DMURS principles). It is proposed to create a linkage via Delwood Close and the Brompton green area. **Car Parking** Possible increased parking on surrounding roads which would need to be controlled /managed.	through the wooded area is restricted between Kirkpatrick Bridge and the proposed pedestrian/cycle bridge (approx. 1km) due to the wooded area on the northern side, thereby preventing permeability and linkages from residential catchments (in accordance with DMURS principles). **Car Parking** Possible increased parking on surrounding roads which would need to be controlled /managed.		roads which would need to be controlled /managed.		on those extended gardens **Car Parking** Possible increased parking on surrounding roads which would need to be controlled /managed.	residents. However, to prevent the greenway overlooking the back gardens of the residents of Delwood Park, a cutting through these embankments will be undertaken to reduce the proposed level of the greenway, accompanied with the provision of a retaining structure or slope stability. **Security** Fencing and landscaping will be provided between the greenway and the back gardens to increase security, CCTV surveillance will also be placed along the greenway route to deter anti-social behaviour. **Opening up cul-de-sacs** This route option on the northern embankment permits permeability and linkages from residential catchments (in accordance with DMURS principles). It is proposed to create a linkage via Delwood Close and the Brompton green area. **Car Parking** Possible increased parking on surrounding roads which would need to be controlled /managed.	Road, which will impact upon the residents. **Security** Fencing and landscaping will be provided between the greenway and the back gardens to increase security, CCTV surveillance will also be placed along the greenway route to deter anti-social behaviour. **Opening up cul-de-sacs** This route option on the northern embankment permits permeability and linkages from residential catchments (in accordance with DMURS principles). It is proposed to create a linkage via Delwood Close and the Brompton green area. **Car Parking** Possible increased parking on surrounding roads which would need to be controlled /managed.
3 Safety	**3A Road Safety**	No. of Junctions: 1 0 turn movements required Greenway segregated from traffic for the entire route (approx. 1.5km).	No. of Junctions: 1 0 turn movements required Greenway segregated from traffic for the entire route (approx. 1.5km).	No. of Junctions: 1 2 turn movements required Greenway segregated from traffic for the entire route (approx. 1.5km).	No. of Junctions: 1 2 turn movements required Greenway segregated from traffic for the entire route (approx. 1.5km).	No. of Junctions: 1 2 turn movements required Greenway segregated from traffic for the entire route (approx. 1.5km).	No. of Junctions: 1 2 turn movements required Greenway segregated from traffic for the entire route (approx. 1.5km).	No. of Junctions: 6 6 turn movement required. Greenway segregated from traffic for 20% of the route. Section of route through residential areas	No. of Junctions: 5 6 turn movement required. Greenway segregated from traffic for 45% of the route. Section of route through residential areas	No. of Junctions: 5 6 turn movement required. Greenway segregated from traffic for 45% of the route. Section of route through residential areas	No. of Junctions: 3 2 turn movements required Greenway segregated from traffic for the entire route (approx. 1.5km).	No. of Junctions: 1 2 turn movements required Greenway segregated from traffic for the entire route (approx. 1.5km).

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway – Sub-Options Section 3b Kirkpatrick Bridge to Granard Bridge										
		Option S3b-1 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment).	**Option S3b-2 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).**	**Option S3b-3 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.**	**Option S3b-4 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-5 Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-6 Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-7 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.**	**Option S3b-8 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-9 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.**	**Option S3b-10 Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.**	**Option S3b-11 Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.**
								Delwood Lawn, Delwood Road, Brompton Court & Roselawn Road increases the possibility of conflicts with vehicles. Section of the route along Castleknock Road which is a busy regional Road. For Brompton Court cyclists will share the road carriageway with vehicles (low volume of vehicular use).	Delwood Lawn, Delwood Road and Brompton Court increases the possibility of conflicts with vehicles.	Delwood Lawn, Delwood Road and Brompton Court increases the possibility of conflicts with vehicles. Greenway segregated from traffic for 45% of the route.	Greenway segregated from traffic for the entire route (approx. 1.5km).	
	Rank											

3 Safety	3B Pedestrian Safety	4m shared greenway facility provided along the bank of the Royal Canal for the entire section of the route. Safety barriers will be provided along the cantilevered boardwalk and where required along the towpath (Fall height ≥4m). Toucan crossing at Kirkpatrick Bridge. Accessibility to the greenway on the southern embankment is restricted between Kirkpatrick Bridge and Granard Bridge (1.5km) due to the railway line on the southern side of the route, thereby resulting in a less secure and safe facility for pedestrians.	4m shared greenway facility provided along the bank of the Royal Canal for the entire section of the route. Safety barriers will be provided along the cantilevered boardwalk and where required along the towpath (Fall height ≥4m). Toucan crossing at Kirkpatrick Bridge. Accessibility to the greenway on the southern embankment is restricted between Kirkpatrick Bridge and Granard Bridge (1.5km) due to the railway line on the southern side of the route, thereby resulting in a less secure and safe facility for pedestrians.	4m shared greenway facility provided along the northern embankment of the Royal Canal. Safety barriers will be provided along boardwalk/bridge section and where required along the greenway (Fall height ≥4m). Toucan crossing at Kirkpatrick Bridge.	4m shared greenway facility provided along the northern embankment of the Royal Canal from Kirkpatrick Bridge to the proposed ped/cycle bridge (6250-7100) The greenway runs along the southern bank/towpath of the Royal Canal from Ch. 7200-7780 to Granard Bridge. Toucan crossing at Kirkpatrick Bridge.	4m shared greenway facility provided along the northern embankment of the Royal Canal from Kirkpatrick Bridge to the proposed ped/cycle bridge (6250-7100) The greenway runs along the southern bank/towpath of the Royal Canal from Ch. 7200-7780 to Granard Bridge. Safety barriers will be provided along boardwalk/bridge section and where required along the greenway (Fall height ≥4m). Toucan crossing at Kirkpatrick Bridge. Accessibility to the greenway on the northern embankment is restricted by the wooded area to the north, while on the southern embankment the greenway is restricted due to the railway line on the southern side of the route, thereby resulting in a less secure and safe facility for pedestrians.	4m shared greenway facility provided along the northern bank of the Royal Canal from Kirkpatrick Bridge to the proposed ped/cycle bridge (6250-7100) The greenway runs along the southern bank/towpath of the Royal Canal from Ch. 7200-7780 to Granard Bridge. Safety barriers will be provided along boardwalk/bridge section and where required along the greenway (Fall height ≥4m). Toucan crossing at Kirkpatrick Bridge. Accessibility to the greenway on the northern embankment is restricted by the wooded area to the north, while on the southern embankment the greenway is restricted due to the railway line on the southern side of the route, thereby resulting in a less secure and safe facility for pedestrians.	Pedestrian facilities provided through residential areas Delwood Lawn, Delwood Road, Brompton Court and Roselawn Road, increased possibility of conflicts with vehicles. Pedestrian facilities provided along Castleknock Road (R806), increased possibility of conflicts with vehicles. Toucan crossing at Kirkpatrick Bridge.	Pedestrian facilities provided through residential areas Delwood Lawn, Delwood Road and Brompton Court, increased possibility of conflicts with vehicles Toucan crossing at Kirkpatrick Bridge.	Pedestrian facilities provided through residential areas Delwood Lawn, Delwood Road and Brompton Court, increased possibility of conflicts with vehicles Toucan crossing at Kirkpatrick Bridge	Upgrade to the existing pedestrian facilities on the southern embankment/towpath of the Royal canal. The greenway runs along the southern bank/towpath of the Royal Canal from Ch. 7200-7780 to Granard Bridge. Accessibility to the pedestrian route on the southern embankment is restricted between Kirkpatrick Bridge and Granard Bridge (1.5km) due to the railway line on the southern side of the route, thereby resulting in a less secure and safe facility for pedestrians.	4m shared greenway facility provided along the northern side of the Royal Canal. Toucan crossing at Kirkpatrick Bridge.
	Rank											
4 Environment	4A Archaeology & Cultural Heritage	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.
	Rank											
4 Environment	4B Architectural Heritage	Route has the potential to directly impact Kirkpatrick Bridge, Granard Bridge, which are protected structures. Widening of the existing bridge adjacent to Kirkpatrick Bridge is required. If not feasible a new pedestrian bridge will have to be constructed. A greenway underpass is proposed at Granard bridge.	Route has the potential to directly impact Kirkpatrick Bridge, Granard Bridge, which is a protected structure. Widening of the existing bridge adjacent to Kirkpatrick Bridge is required. If not feasible a new pedestrian bridge will have to be constructed. A greenway underpass is proposed at Granard bridge.	The fabric of the canal itself is a protected structure, which may be directly impacted upon by the piled boardwalk along the northern embankment behind Roselawn (approx. 580m).	The fabric of the canal itself is a protected structure, which may be slightly impacted by the paved greenway along the towpath (approx. 580m). Route has the potential to directly impact Granard Bridge. A greenway underpass is proposed at Granard bridge.	The fabric of the canal itself is a protected structure, which may be slightly impacted by the paved greenway along the towpath (approx. 580m). Route has the potential to directly impact Granard Bridge. A greenway underpass is proposed at Granard bridge.	The fabric of the canal itself is a protected structure, which may be directly impacted upon by the piled boardwalk along the northern embankment for approx. 1km. Route has the potential to directly impact Granard Bridge. A greenway underpass is proposed at Granard bridge.	No appreciable impact.	The fabric of the canal itself is a protected structure, which may be slightly impacted by the paved greenway along the towpath (approx. 580m). Route has the potential to directly impact Granard Bridge. A greenway underpass is proposed at Granard bridge.	The fabric of the canal itself is a protected structure, which may be directly impacted upon by the piled boardwalk along the northern embankment behind Roselawn (approx. 580m).	The fabric of the canal itself is a protected structure, which may be slightly impacted by the paved greenway along the towpath (approx. 1.5km). Route has the potential to directly impact Granard Bridge. A greenway underpass is proposed at Granard bridge.	No appreciable impact.

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway – Sub-Options Section 3b Kirkpatrick Bridge to Granard Bridge										
		Option S3b-1 **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment).**	**Option S3b-2** **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).**	**Option S3b-3** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.**	**Option S3b-4** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-5** **Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-6** **Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-7** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.**	**Option S3b-8** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-9** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.**	**Option S3b-10** **Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.**	**Option S3b-11** **Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.**
		The fabric of the canal itself is a protected structure, which may be directly impacted upon by the cantilevered structure for approx. 950m.	The fabric of the canal itself is a protected structure, which may be directly impacted upon by the cantilevered structure for approx. 950m.									
	Rank											

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway – Sub-Options Section 3b Kirkpatrick Bridge to Granard Bridge										
		Option S3b-1 **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment).**	**Option S3b-2** **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).**	**Option S3b-3** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.**	**Option S3b-4** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-5** **Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-6** **Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-7** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.**	**Option S3b-8** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-9** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.**	**Option S3b-10** **Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.**	**Option S3b-11** **Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.**
4 Environment	4C Flora & Fauna	Possible removal of a number of trees along the complete section due to the widening of existing pedestrian route (approx. 2100m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 1300m^2 of trees (high value). Route has the potential to directly impact Kirkpatrick Bridge, which has suitable crevice's which have been recorded as a bat roost. Route has the potential to directly impact Kirkpatrick Bridge, which has suitable crevice's which have been recorded as a bat roost.	Possible removal of a number of trees along the complete section due to the widening of existing pedestrian route (approx. 2100m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 1300m^2 of trees (high value). Route has the potential to directly impact Kirkpatrick Bridge, which has suitable crevice's which have been recorded as a bat roost. Route has the potential to directly impact Kirkpatrick Bridge, which has suitable crevice's which have been recorded as a bat roost.	Possible removal of a significant number of trees along the northern banks of the Royal Canal to provide the Greenway (approx. 2600m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 700m^2 of trees (high value). Environmentally sensitive trees of moderate value are located along this route (Mixed, broadleaved woodlands.) Possible removal of approx. 400m^2 of trees (moderate value). Potential impact on habitats (badgers, otters) along the northern bank of the Royal Canal for approx. 850m (Ch7100-7780). Piled boardwalk proposed, to minimise the impact on habitats.	Possible removal of a number of trees along the northern side of the Royal Canal to provide the Greenway (approx. 1100m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 700m^2 of trees (high value). Environmentally sensitive trees of moderate value are located along this route (Mixed, broadleaved woodlands.) Possible removal of approx. 400m^2 of trees (moderate value).	Possible removal of a number of trees along the northern side of the Royal Canal to provide the Greenway (approx. 2300m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 1400m^2 of trees (high value). Environmentally sensitive trees of moderate value are located along this route (Mixed, broadleaved woodlands.) Possible removal of approx. 800m^2 of trees (moderate value).	Possible removal of a number of trees along the northern side of the Royal Canal to provide the Greenway (approx. 2300m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 1500m^2 of trees (high value). Environmentally sensitive trees of moderate value are located along this route (Mixed, broadleaved woodlands.) Possible removal of approx. 700m^2 of trees (moderate value). Potential impact on habitats (badgers, otters) along the northern bank of the Royal Canal for approx. 850m (Ch6250-7100). Piled boardwalk propose, to minimise the impact on habitats	Possible removal of some trees along the northern side of the Royal Canal to provide the Greenway (approx. 150m^2). Environmentally sensitive trees of moderate value are located along this route (Mixed, broadleaved woodlands.) Possible removal of approx. 150m^2 of trees (moderate value).	Possible removal of some trees along the northern side of the Royal Canal to provide the Greenway (approx. 450m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 250m^2 of trees (high value). Environmentally sensitive trees of moderate value are located along this route (Mixed, broadleaved woodlands.) Possible removal of approx. 150m^2 of trees (moderate value). Widening into the tress on Delwood Road may be required to provide segregated cycle tracks (1.75m wide) either side of the road.	Possible removal of a number of trees along the northern side of the Royal Canal to provide the Greenway (approx. 2000m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 350m^2 of trees (high value). Environmentally sensitive trees of moderate value are located along this route (Mixed, broadleaved woodlands.) Possible removal of approx. 150m^2 of trees (moderate value). Potential impact on habitats (badgers, otters) along the northern bank of the Royal Canal for approx. 850m (Ch7100-7780). Piled boardwalk proposed, to minimise the impact on habitats.	Possible removal of a number of trees along the northern side of the Royal Canal to provide the cycle route (approx. 700m^2). Environmentally sensitive trees of high value are located along this route (Oak-ash-hazel woodlands). Possible removal of approx. 400m^2 of trees (high value). Environmentally sensitive trees of moderate value are located along this route (Mixed, broadleaved woodlands.) Possible removal of approx. 250m^2 of trees (moderate value). Public lighting provided on both sides of the Royal Canal, potential impact on bats.	Minimal impact on trees as the greenway route is proposed through the residential back gardens. Possible removal of a few trees at the start of the route (approx. 200m^2).
	Rank											

		Royal Canal Urban Greenway – Sub-Options Section 3b Kirkpatrick Bridge to Granard Bridge										
Appraisal Criteria	**Sub-Criteria**	**Option S3b-1** **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment).**	**Option S3b-2** **Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).**	**Option S3b-3** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.**	**Option S3b-4** **Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-5** **Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-6** **Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-7** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.**	**Option S3b-8** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-9** **Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.**	**Option S3b-10** **Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.**	**Option S3b-11** **Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.**
4 Environment	**4D Soils, Geology & Hydrology**	The cantilevered boardwalk greenway (using tensile rods into rock) along the southern towpath would have an impact on soils & Geology. To prevent any settlement/slope slips on the railway embankment and to minimise any effects on the live rail system, a retaining structure will be provided halfway up the railway embankment, this would have an impact on soils & Geology.	The cantilevered boardwalk greenway (using tensile rods into rock) along the southern towpath would have an impact on soils & Geology. To prevent any settlement/slope slips on the railway embankment and to minimise any effects on the live rail system, the vegetation on the embankment will be scaled back and anti-erosion geocell installed. Once the geocell anti-erosion mat is laid and seeded, it will act to stabilise the railway embankment	Impact on soil through piling along the northern bank of the Royal Canal to provide a boardwalk facility from Ch. 7100-7780.	Provision of boardwalk/bridge structures may be required to enable the proposed greenway to continue pass steep terrain such as the area of the old quarry etc. These may have an impact on soils & Geology. Impact on sol through the construction of the Landmark Bridge abutments from Ch. 7100-7200.	Provision of boardwalk/bridge structures may be require to enable the proposed greenway to continue pass steep terrain. These may have an impact on soils & Geology. Removal of a significant number of trees through the wooded area would impact on the geology. Impact on sol through the construction of the Landmark Bridge abutments from Ch. 7100-7200.	Impact on soil through piling along the northern bank of the Royal Canal to provide a boardwalk facility from Ch. 6250-7100. Impact on sol through the construction of the Landmark Bridge abutments from Ch. 7100-7200.	No appreciable impacts.	Impact on soil through the construction of the Landmark Bridge abutments from Ch. 7100-7200.	Impact on soil through piling along the northern bank of the Royal Canal to provide a boardwalk facility from Ch. 7100-7780.	Provision of boardwalk/bridge structures may be require to enable the proposed cycle route to continue pass steep terrain such as the area of the old quarry etc. These may have an impact on soils & Geology. Impact on sol through the construction of the Landmark Bridge abutments from Ch. 7100-7200.	No appreciable impacts.
	Rank											

4 Environment	4E Landscape & Visual	The Conservation Department in Fingal County Council advised that the provision of a 4m wide cantilevered boardwalk greenway (concrete or steel) along the southern towpath for 1km, would have a significant visual impact on the Royal Canal (protected structure). Artificial floating structures can be used for growing bankside vegetation and reducing the impact The retaining structure (sheet piled wall) will have a visual impact on the Royal Canal (approx. 1km). The retaining structure will be piled halfway up the railway embankment, enabling the provision of a green belt of planting below the wall.	The Conservation Department in Fingal County Council advised that the provision of a 4m wide cantilevered boardwalk greenway (concrete or steel) along the southern towpath for 1km, would have a significant visual impact on the Royal Canal (protected structure). Artificial floating structures can be used for growing bankside vegetation and reducing the impact This option does not require a retaining wall, however, the vegetation on the embankment will have to be scaled back and anti-erosion geocell installed. Once the geocell anti-erosion mat is laid and seeded, it will act to stabilise the railway embankment. The geocell matt allows for vegetation to be seeded on top, creating a green belt.	This route option will be hidden/separated from the northern embankment of the Royal Canal by a large woodland. There will be limited visual impact on the Royal Canal (protected structure). To prevent the greenway overlooking the back gardens of the residents of Delwood Park, a cutting through these embankments would need to be undertaken to reduce the proposed level of the greenway, therefore reducing the potential visual impact on the residents in close proximity. The piled boardwalk on the northern bank of the Royal Canal from Ch. 7110-7780 may have a visual impact on the Royal Canal.	This route option will be hidden/separated from the northern embankment of the Royal Canal by a large woodland. There will be limited visual impact on the Royal Canal (protected structure). To prevent the greenway overlooking the back gardens of the residents of Delwood Park, a cutting through these embankments would need to be undertaken to reduce the proposed level of the greenway, therefore reducing the potential visual impact on the residents in close proximity. The proposed new pedestrian & cycle bridge crossing from the northern side of the canal at Roselawn to the southern towpath may have a visual impact on the Roselawn Residents and on the Royal Canal. However, it will be obscured from view by the trees and will be architecturally designed to complement and potentially enhance the existing Royal Canal landscape.	This route option will be hidden/separated from the northern embankment of the Royal Canal by a large woodland. There will be limited visual impact on the Royal Canal (protected structure). The proposed new pedestrian & cycle bridge crossing from the northern side of the canal at Roselawn to the southern towpath may have a visual impact on the Roselawn Residents and on the Royal Canal. However, it will be obscured from view by the trees and will be architecturally designed to complement and potentially enhance the existing Royal Canal landscape.	The Conservation Department in Fingal County Council advised that the provision of a 4m wide boardwalk greenway (concrete or steel) along the northern embankment for approx. 1km (Ch.6250-7200), would have a significant visual impact on the Royal Canal (protected structure). Artificial floating structures can be used for growing bankside vegetation and reducing the impact. The proposed new pedestrian & cycle bridge crossing from the northern side of the canal at Roselawn to the southern towpath may have a visual impact on the Roselawn Residents and on the Royal Canal. However, it will be obscured from view by the trees and will be architecturally designed to complement and potentially enhance the existing Royal Canal landscape.	Potential removal of some trees along Delwood Road to provide the greenway on the southern side of the carriageway which may have an impact on the residential landscape (approx. 250m)	The proposed new pedestrian & cycle bridge crossing from the northern side of the canal at Roselawn to the southern towpath may have a visual impact on the Roselawn Residents and on the Royal Canal. However, it will be obscured from view by the trees and will be architecturally designed to complement and potentially enhance the existing Royal Canal landscape. Potential removal of some trees along Delwood Road to provide the greenway on the southern side of the carriageway which may have an impact on the residential landscape (approx. 250m)	The proposed new pedestrian & cycle bridge crossing from the northern side of the canal at Roselawn to the southern towpath may have a visual impact on the Roselawn Residents and on the Royal Canal. However, it will be obscured from view by the trees and will be architecturally designed to complement and potentially enhance the existing Royal Canal landscape. Potential removal of some trees along Delwood Road to provide the greenway on the southern side of the carriageway which may have an impact on the residential landscape (approx. 250m)	This cycle route option will be hidden/separated from the northern embankment of the Royal Canal by a large woodland. There will be no visual impact on the Royal Canal (protected structure). To prevent the cycle route overlooking the back gardens of the residents of Delwood Park, a cutting through these embankments would need to be undertaken to reduce the proposed level of the greenway, therefore reducing the potential visual impact on the residents in close proximity. The proposed new pedestrian & cycle bridge crossing from the northern side of the canal at Roselawn to the southern towpath may have a visual impact on the Roselawn Residents and on the Royal Canal. However, it will be obscured from view by the trees and will be architecturally designed to complement and potentially enhance the existing Royal Canal landscape. For the pedestrian route on the southern embankment, a paved walkway will be provided. The existing towpath width will be maintained. Lighting will be provided along with safety barriers where required (Fall height ≥4m).	This route option will be hidden/separated from the northern embankment of the Royal Canal by a large woodland. There will be no visual impact on the Royal Canal (protected structure). To prevent the greenway overlooking the back gardens of the residents of Delwood Park, fencing and landscaping will be provided between the greenway and the back gardens to increase security and deter anti-social behaviour.
	Rank											
4 Environment	4F Land Use Character	No appreciable impacts.	No appreciable impacts.	Land take required along the northern bank of the canal(Ch. 7150-7780), where Roselawn Road residents have extended their back gardens (title still remains with Waterways Ireland). This may have an impact on their back gardens. Land take required on the northern embankment of the	Land take required on the northern embankment of the canal, where three Delwood Road residents have extended their back gardens (title still remains with Waterways Ireland). This option may have an impact on their back gardens. This option proposes a 4m paved greenway on the southern edge of	No appreciable impacts.	No appreciable impacts.	Segregated cycle tracks will be provided either side of the carriageway on Roselawn Road. This will remove the possibility to park on the road carriageway, which may impact upon its Land User Character.	No appreciable impacts	Land take required along the northern bank of the canal, where Roselawn Road residents have extended their back gardens may have an impact on their back gardens. Along the northern bank of the canal (Ch. 7150-7780), a number of Roselawn Road residents have extended their gardens to the	Land take required on the northern embankment of the canal, where three Delwood Road residents have extended their back gardens (title still remains with Waterways Ireland). This option may have an impact on their back gardens.	The level of land take required through the residential back gardens of Delwood Park will have a significant impact on their back gardens (Ch. 6850-7100). The level of land take required through the residential back gardens of Roselawn Road will have a significant impact on their back

Appraisal Criteria	Sub-Criteria	Royal Canal Urban Greenway – Sub-Options Section 3b Kirkpatrick Bridge to Granard Bridge										
		Option S3b-1 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with retaining structure provided halfway up the railway embankment).	**Option S3b-2 Greenway on the Southern side of the Royal Canal (Cantilevered Boardwalk with anti-erosion geocell on the railway embankment).**	**Option S3b-3 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the northern canal bank via Roselawn.**	**Option S3b-4 Greenway on the northern side of the Royal Canal via the northern side of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-5 Greenway on the northern side of the Royal Canal through the middle of the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-6 Greenway on the northern bank of the Royal Canal below the wooded area by Delwood, Brompton and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-7 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and Roselawn.**	**Option S3b-8 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the southern canal bank via proposed new pedestrian/cycle bridge.**	**Option S3b-9 Greenway on the northern side of the Royal Canal via Delwood Lawn, Delwood Road, Brompton Court and along the northern bank of the Royal Canal by Roselawn.**	**Option S3b-10 Cycle route on the northern side of the canal via the northern side of the wooded area by Delwood, Brompton. Pedestrian route on the southern towpath. New ped/cycle bridge between Kirkpatrick Bridge and Granard Bridge connects the two routes on the southern embankment.**	**Option S3b-11 Greenway on the northern side of the Royal Canal through the residential back gardens of both Delwood Park and Roselawn Road.**
				canal, where three Delwood Road residents have extended their back gardens (title still remains with Waterways Ireland). This option may have an impact on their back gardens. This option proposes a 4m paved greenway on the southern edge of the Brompton green area, this may have an impact on the children play area.	the Brompton green area, this may have an impact on the green open space.					canal (annexed). As a result, this route may impact on those extended gardens. Cycle facilities provided through Brompton Court may impact upon its residential Land User Character.		gardens (Ch. 7150-7780).
	Rank											

APPENDIX F – Section 3c Route Options Assessment

Royal Canal Urban Greenway – Sub-Options for Section 3
Kirkpatrick Bridge to Kennan Bridge

Appraisal Criteria	Sub-Criteria	Option S3c-1 Greenway on the northern side of the Royal Canal.	Option S3c-2 Greenway on the southern side of the Royal Canal.
1 Economy	1A Capital Cost	**€936,000** *Indicative Infrastructure costs €936,000 include:* • A paved 4m wide greenway will be provided for the majority of the route on the northern towpath of the Royal Canal from Granard Bridge to Talbot Bridge Bridge. • Public Lighting will be provided along this section of the route. • A pedestrian/cycle bridge is proposed on the western side of Granard Bridge to connect cyclists to the northern bank of the Royal Canal (as per Blanchardstown to Phoenix Park Cycle Route drawings). • 3m wide greenway provided on the western side of Talbot Bridge (widen into grass verge). • Toucan crossings provided at Granard Bridge and Talbot Bridge.	**€711,000** *Indicative Infrastructure costs €180,000 include:* • A paved 4m wide greenway will be provided for a significant section of the route on the northern towpath of the Royal Canal from Granard Bridge to Talbot Bridge Bridge. • A paved 3m wide greenway will be provided from the 12th Lock Hotel to Talbot bridge due to pinch points. • A ped/cycle ramp will be constructed east of Granard Bridge the towpath, the existing pedestrian steps will have to be removed. • Public Lighting will be provided along this section of the route. • Toucan crossings provided at Granard Bridge and Talbot Bridge.
	Rank		
1 Economy	1B Constructability	This route option involves widening of the existing pedestrian route along the northern bank of the Royal Canal to 4m for the majority of the section (260m). Pinch point between the 12th Lock and a boundary wall to the north, 3m wide greenway for 35m to Old Navan Road. 3m wide greenway provided on the western side of Talbot Bridge (widen into grass verge). A cycle bridge is proposed on the western side of Granard Bridge to connect cyclists to the northern bank of the Royal Canal (as per Blanchardstown to Phoenix Park Cycle Route drawings). Toucan crossing provided Old Navan Road to tie-in with Ashtown Greenway.	This route option involves widening of the existing pedestrian route along the northern bank of the Royal Canal to 4m for the majority of the section (180m). Pinch points between the 12th Lock Hotel & Restaurant and the Royal Canal along with significant level difference between the car park and the towpath, 3m wide greenway for 115m to Old Navan Road. A ped/cycle ramp will be constructed east of Granard Bridge the towpath, the existing pedestrian steps will have to be removed. Toucan crossing provided Old Navan Road to tie-in with Ashtown Greenway.
1 Economy	1C Quality of Service	Greenway segregated from vehicular traffic for the entire route (approx. 300m). The greenway detours from the southern towpath/embankment (preferred route 3b-4) at Granard Bridge to the northern embankment. The greenway has to detour from the northern towpath/embankment at Talbot Bridge to the southern embankment to connect with the Ashtown Greenway. The environment along the entire route is pleasant and interesting. The greenway will be 4m wide for the majority of the route with the exception of a 15m section at 12th Lock and the two bridge sections, Granard Bridge (30m section) and Talbot Bridge (20m section) where a 3m wide greenway is only achievable.	Greenway segregated from vehicular traffic for the entire route (approx. 300m). The greenway runs along the entire bank of the Royal Canal, it does not have any detours. It is the most direct route. The environment along the entire route is pleasant and interesting. The greenway will be 4m wide from Granard Bridge to the 12th Lock Hotel & Restaurant (180m), however, due a pinch point between the hotel and the canal a 3m wide greenway is only feasible from the Hotel to the Old Navan Road (150m).
2 Integration	2A Cycling Integration	This route option is identified as the Royal Canal Greenway in the GDA Cycle Network Plan.	This route option is identified as the Royal Canal Greenway in the GDA Cycle Network Plan.
	Rank		
2 Integration	2B Traffic Network Integration	New toucan crossings provided on Granard Bridge and Talbot Bridge which will have an impact on general traffic.	New toucan crossings provided on Talbot Bridge which will have an impact on general traffic. Underpass proposed at Granard bridge (as per Blanchardstown to Phoenix Park Cycle Route drawings).
	Rank		
2 Integration	2C Potential Impact on Rail Network	No appreciable impacts.	Greenway route is on the southern towpath adjacent to the railway line, however, there is significant distance from the greenway and the railway line for the entire section (approx. 300m length). Paved 4m wide greenway proposed.
2 Integration	2D Potential Impact on Canal Users	Walkers will benefit from the existing towpath being upgraded to a paved 4m surface with public lighting from Granard Bridge to Talbot Bridge. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route.	Walkers will benefit from the existing towpath being upgraded to a paved 4m surface with public lighting from Granard Bridge to Talbot Bridge. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route.

Royal Canal Urban Greenway – Sub-Options for Section 3 Kirkpatrick Bridge to Kennan Bridge			
Appraisal Criteria	**Sub-Criteria**	**Option S3c-1 Greenway on the northern side of the Royal Canal.**	**Option S3c-2 Greenway on the southern side of the Royal Canal.**
2 Integration	2E Potential Impact on Communities/Residents	No appreciable impacts.	No appreciable impacts.
3 Safety	3A Road Safety	No. of Junctions: 2 4 turn movements required at Granard Bridge and Talbot Bridge. Greenway segregated from traffic for the majority of the route.	No. of Junctions: 2 0 turn movements required. Greenway segregated from traffic for the entire route.
	Rank		
3 Safety	3B Pedestrian Safety	4m shared greenway facility provided along the northern side of the Royal Canal from Granard Bridge to Talbot Bridge. Toucan crossing provided at Granard Bridge and Talbot Bridge. Greenway provided adjacent to the busy Castleknock Road (as per Blanchardstown to Phoenix Park Cycle Route drawings). 3m wide greenway provided adjacent to the Old Navan Road.	4m shared greenway facility provided along the northern side of the Royal Canal from Granard Bridge to Talbot Bridge. Toucan crossing provided at Talbot Bridge. Underpass proposed on Granard bridge (as per Blanchardstown to Phoenix Park Cycle Route drawings).
	Rank		
4 Environment	4A Archaeology & Cultural Heritage	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.
	Rank		
4 Environment	4B Architectural Heritage	Route has the potential to directly impact on Granard Bridge. A pedestrian/cycle bridge is proposed to be built on the western side of the bridge in very close proximity to the bridge wall, protected structure (as per Blanchardstown to Phoenix Park Cycle Route drawings). A 3m shared route is to be provided on the eastern side of the road carriageway adjacent to Granard Bridge wall, protected structure. (as per Blanchardstown to Phoenix Park Cycle Route drawings). A 3m shared route is to be provided on the eastern side of the road carriageway adjacent to Talbot Bridge wall, protected structure. The fabric of the canal itself (also a protected structure) along the entire route may be directly impacted upon.	The fabric of the canal itself (also a protected structure) along the entire route may be directly impacted upon.
	Rank		
4 Environment	4C Flora & Fauna	Possible removal of a small number of trees due to the provision of a new cycle bridge on the western side of Granard Bridge (67m2).	Possible removal of a small number of trees due to the provision of a new ramp from Granard Bridge to the towpath eastbound (34m2).
	Rank		
4 Environment	4D Soils, Geology & Hydrology	No appreciable impacts.	No appreciable impacts.

Royal Canal Urban Greenway – Sub-Options for Section 3 Kirkpatrick Bridge to Kennan Bridge			
Appraisal Criteria	**Sub-Criteria**	**Option S3c-1 Greenway on the northern side of the Royal Canal.**	**Option S3c-2 Greenway on the southern side of the Royal Canal.**
	Rank		
4 Environment	**4E Landscape & Visual**	A pedestrian/cycle bridge is proposed on the western side of Granard Bridge to connect cyclists to the northern bank of the Royal Canal (as per Blanchardstown to Phoenix Park Cycle Route drawings) which may impact on the Landscape and visual of the Royal Canal and Granard Bridge (Protected Structure).	No appreciable impacts.
	Rank		
4 Environment	**4F Land Use Character**	No appreciable impacts.	Potential Land acquisition required from a small section of the paved area at 12th Lock Hotel & Restaurant to provide a 3m wide greenway at the pinch point.
	Rank		

APPENDIX G – Constraint Maps

Sheet 1 of 3

N

ST CATHERINES

FS1

WN2

GS2

WN2

WN2

FS1

PAKENHAM BRIDGE

GS2

GS2

GM1

WN2

FS1

WESTMANSTOWN YOUTH RUGBY CLUB

WESTMANSTOWN GAA CLUB

WESTMANSTOWN RD

COLLINS BRIDGE

R148

L3003

Legend

Cultural Heritage Constraints

- RPS and NIAH Structures
- ACA
- NIAH Structures
- Recorded Monuments
- RPS
- Demesnes landscapes

Ecological Constraints

- High value - calcareous spring
- High value
- Moderate value
- Moderate value
- Low value
- 500m buffer

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Fingal County Council

0 0.125 0.25 0.5 Kilometers

Sheet 2 of 3

N

Legend

Cultural Heritage Constraints

- RPS and NIAH Structures
- ACA
- NIAH Structures
- Recorded Monuments
- RPS
- Demesnes landscapes

Ecological Constraints

- High value - calcareous spring
- High value
- Moderate value
- Moderate value
- Low value
- 500m buffer

Comhairle Contae Fhine Gall
Fingal County Council

0 0.125 0.25 0.5 Kilometers

Sheet 3 of 3

N

Legend

Cultural Heritage Constraints

- RPS and NIAH Structures
- ACA
- NIAH Structures
- Recorded Monuments
- RPS
- Demesnes landscapes

Ecological Constraints

- High value - calcareous spring
- High value
- Moderate value
- Moderate value
- Low value
- 500m buffer

Comhairle Contae Fhine Gall
Fingal County Council

0 0.125 0.25 0.5 Kilometers

APPENDIX H – Royal Canal Urban Greenway, Biodiversity Assessment Report (2018)

Fingal County Council
Comhairle Contae Fhine Gall

ROYAL CANAL URBAN GREENWAY

BIODIVERSITY ASSESSMENT 2018

Report to Fingal County Council

October 2018

Version 4



NATURA ENVIRONMENTAL CONSULTANTS

Natura Environmental Consultants

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1 INTRODUCTION

This report assesses the biodiversity value (habitats and species) of the route for the proposed Royal Canal Urban Greenway. The methodologies for the surveys are presented. The existing ecological environment of the proposed development is described. The Royal Canal is a proposed Natural Heritage Area (pNHA) under the Wildlife Acts 1976 to 2012. Its importance lies in the diversity of the habitats along the canal corridor rather than the presence of rare habitats or species. The National Parks and Wildlife Service (NPWS) site synopsis for the site is presented in Appendix I.

1.1 Overview of the Project

The proposed Royal Canal Urban Greenway runs alongside the Royal Canal from the 12th Lock (Blanchardstown) to the Kildare County boundary (Figure 1). It is entirely within the jurisdiction of Fingal County Council. The proposed development will be largely confined to the existing towpath but at certain points will diverge from the canal corridor where there are significant constraints. The route is crossed by six old canal bridges, a railway bridge and a high-level concrete road bridge.

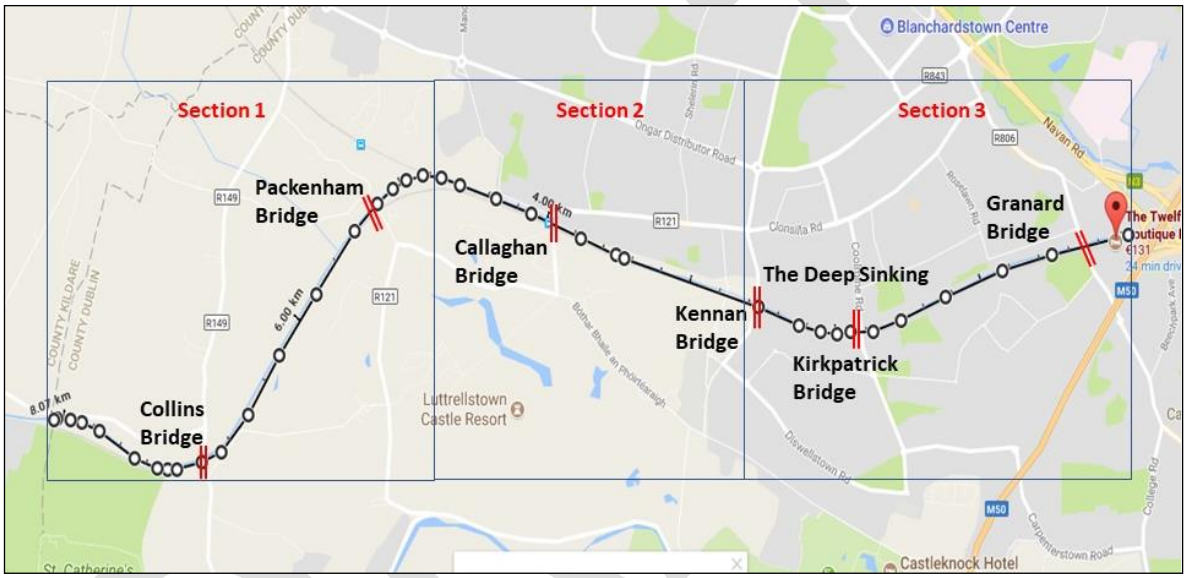


Figure 1. Location of the proposed Royal Canal Urban Greenway

1.2 Consultations

Consultations were undertaken throughout the project with Fingal County Council Biodiversity Officer. At his request additional surveys of molluscs (in particular of the snail group *Vertigo)* and of the impacts of lighting on existing sections of the footpath to the east of the M50 motorway.

Written consultations were also undertaken with the Department of Culture, Heritage and the Gaeltacht. A scoping response dated 20th June 2018 was received from the Department. This outlined the value of the Royal Canal pNHA corridor for biodiversity. It also recommended a series of items that should be included in an ecological survey and impact assessment. Some further issues including alien invasive species, hedgerows and protected species, rivers and wetlands and water quality were highlighted. These issues have been addressed in the biodiversity assessment which follows.

2 ASSESSMENT METHODOLOGY

2.1 Desk review

A desk review was undertaken of all relevant documentation for this section of the Royal Canal. This included reports of surveys undertaken prior to 2018, the database of the National Biodiversity Data Centre and the synopsis for the Royal Canal proposed Natural Heritage Area (NHA). Of particular importance was the baseline survey carried out by BEC Consultants (Brophy & Devaney 2013). All route options were considered and assessed in terms of their potential impacts on biodiversity.

2.2 Field surveys prior to 2018

A detailed survey of the Royal Canal was carried out in 1989/90 (Dromey *et al*., 1991), to identify and map habitats and species along the full length of the canal (Dublin to Longford), highlighting areas and species of ecological value. This included some sections that were navigable and others that were derelict and it coincided with the main period of restoration by the Office of Public Works which began in 1988. The full length of the canal, from the River Liffey to the River Shannon, was reopened in 2010.

In 2013 BEC Consultants Ltd was contracted by the National Transport Authority (NTA) to undertake a comprehensive ecological survey of the Royal Canal between Talbot Bridge (12th Lock), Blanchardstown, Co. Dublin and Maynooth Train Station, Maynooth, Co. Kildare (Brophy & Devaney 2013). It thus covered the entire length of the proposed Royal Canal Urban Greenway in Fingal County as well as sections further west in Co Kildare. The aim of this survey was to collect data on the flora, fauna and habitats that exist within these sections of the Royal Canal in order to help inform any future plans for development along the canal. The field surveys mapped and classified the habitats, recorded plants (including bryophytes), bird and mammal species, while highlighting habitats and species of particular importance (e.g. rare or protected habitats and species) within the study area. The surveys included both the waterbody itself and the terrestrial habitats marginal to the canal. A summary of the results of the 2013 surveys are given in section 2.4.1 below.

2.3 Field surveys during 2018

In order to supplement the 2013 surveys by BEC Consultants some more detailed surveys were conducted in 2018 by Natura Environmental Consultants and specialist contractors. These included:

- Habitat surveys of the woodland in the Deep Sinking.
- Habitat surveys of grassland in the western sections of the study area.
- Breeding waterbird surveys along the full length of the study area.
- Bat surveys of the bridges in the study area including bat activity.
- Bat activity surveys of the section between Ashtown station and the M50 for comparison with an earlier bat survey to examine the effects of lighting.
- Survey of terrestrial molluscs on the full length of the study area.

The methodologies for these surveys are described below:

2.3.1 Woodland survey

A survey of semi-natural woodland in the area known as the Deep Sinking (between Kennan Bridge and Granard Bridge in Section 3) was conducted during the spring 2018. This was carried out by ecologists Richard Nairn and Tim Nairn on various dates in March-April 2018 before all trees were in leaf and when the undergrowth was low, allowing better access. The woodland types were described using the classification of Fossitt (2000). Dominant tree species were recorded by species and relative age. This ecological survey was supplemented by a full tree survey that recorded the species, age, condition of mature trees and groups of trees along the entire route (Blackstock 2018).

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2.3.2 Grassland survey

The grassland on the towpath between Pakenham Bridge and Collins Bridge was surveyed by botanist Katharine Duff and Richard Nairn on 22 June 2018. This included a habitat survey (using the classification of Fossitt 2000), a general species list and a relevé on the canal bank. The criteria and indicators for classification of grasslands listed in Annex I of the EU Habitats Directive are given in the report of the National Grassland Survey (O'Neill *et al.* 2013). This survey was undertaken in fine warm conditions when the majority of species were in flower.

2.3.3 Breeding waterbird survey

Waterbirds in freshwater are generally regarded as those species dependent on permanent surface water and include, among others, the swans, ducks, waders, gulls and a few passerines that are linked to waterways. The methodology for the breeding waterbird survey followed broadly the British Trust for Ornithology (BTO) Waterways Breeding Bird Survey. Bird registrations were made using direct sightings. Standard nomenclature was that given by Svenssen *et al.* (2009). A field ornithologist carried out two breeding water bird surveys in May 2018. Bird registrations were entered on aerial photograph overlays, using standard BTO species codes. All field records were transferred to summary maps and retained for future reference. Weather conditions were excellent for all surveys with light winds and no significant rain. Each survey was carried out within one day in the period between 09:00 to 14:00 BST. The dates of the surveys were Visit 1: 01 May 2018; Visit 2: 22 May 2018. A preliminary survey was undertaken on 06 March 2018.

All waterbird species present were recorded and breeding species were determined by observation of their behaviour against a table of standardised indicators. These are the same indicators used in the *Bird Atlas 2007-2011* (Balmer *et al.* 2014). Passerine birds in the study area were not recorded. For example, Swallows frequently flew along the canal foraging but did not breed or rest there.

2.3.4 Bat survey of bridges

A bat survey of bridges along the canal was undertaken in 2018 by Tina Aughney. Night-time bat surveying was completed using bat detectors on various dates: Surveyor 1: Wildlife Acoustics EchoMeter Touch 2 Pro (with an android mobile phone) and Pettersson D200 Heterodyne Bat Detector. Surveyor 2: Wildlife Acoustics EchoMeter Touch (with an iPad 2) and Pettersson D200 Heterodyne Bat Detector.

Bridges were inspected during the daytime (13th July 2018) using a high-powered torch to determine the extent of crevices available for roosting. The bridges were then surveyed for 90 minutes from sunset to determine if bats emerged from the crevices under the arches of the bridges. In relation to bats, a daytime survey was undertaken to identify any Potential Bat Roosts (PBRs) in the structures with the arches examined. Using a 4-point classification system for bridges, the arches were inspected using this system. The survey methodology follows that of Billington and Norman (1997), the bridge is categorised as follows:
0 = no potential (no suitable crevices)
1 = crevices present may be of use to bats
2 = crevices ideal for bats but no evidence of usage
3 = evidence of bats (e.g. bat present, droppings etc.)

Evidence of bats is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present on stonework) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice has occurred in the past. To complete this grading inspection, the bridge structure was inspected using a high-powered narrow beamed torch to inspect crevices, holes, cracks and joints within the structures. Where necessary, this inspection was assisted using a fiberscope to check deep crevices not visible using a torch.

2.3.5 Assessment of lighting on bats on the Ashtown to M50 section

The bat activity levels along approximately 2km length of the Royal Canal between Ashtown and M50 were investigated by Tina Aughney on 5th-6th July 2018. This survey was undertaken on a section of the canal adjacent to the current study area in order to determine if the lighting installed here has had any impacts on bat activity. This study involved a literature review; a walking transect (2km); and 20 survey points.

Night-time bat surveying was completed using bat detectors: Walking Transects - Wildlife Acoustics EchoMeter Touch 2 Pro (with an android mobile phone) and Pettersson D200 Heterodyne Bat Detector. The walking transect involved a continuous walking survey along the entire length of the survey area starting at sunset. This was undertaken at a slow to medium walking pace from Ashtown Railway Station to the M50. This started at sunset and any bat species encountered was noted. The purpose of this survey was to record commuting bats, particularly the early emerging bats such as Leisler's bats. This transect took 1 hour to complete.

Survey Spots were recorded using Wildlife Acoustics EchoMeter Touch (with an iPad 2) and Pettersson D200 Heterodyne Bat Detector. Twenty survey spots were marked along a 2km transect (mapping was completed during the daytime). The interval between each survey spot was approximately 100m. Each survey spot was surveyed for 4 minutes (following the methodology of the All Ireland Daubenton's Bat Waterways Survey (Aughney *et al.,* 2012). This survey was completed from the M50 to Ashtown Railway Station and was undertaken directly after the walking transect was completed. Any bat species heard on the bat detectors during the 4-minute slot was noted. The purpose of this survey was to record foraging bats. The start time, approximately 1hr after sunset, coincided with the period when all Irish bat species would have emerged for foraging.

The LUX level was measures by placing the LUX meter (ETI – 8051 model, www.etiltd.com) on the ground at the location of the survey spot (approximately 1m from the standing position of the surveyor and ensuring that the surveyor did not cast a shadow over the LUX meter). LUX levels were also randomly recorded directly below the lamp posts and 1m and 5m intervals in front of the lamp posts located along the canal.

2.3.6 Mollusc survey

A survey of the non-marine molluscs on this section of the Royal Canal was undertaken on 4th and 5th July 2018 by Evelyn Moorkens and Anton Krastev. This was specifically designed to determine if any of the whorl snail *(Vertigo)* species were present as they are protected under the EU Habitats Directive (Annex 1).

Each section of the canal was visited, with particular reference to the locations mapped by Brophy & Devaney (2013). Where potential *Vertigo* habitat was found, a total of ten samples were taken by banging overhanging vegetation onto a white field survey tray and examining all molluscs through appropriate optical lenses. Species were identified in the field and an amalgamated sample from each distinguishable habitat area was removed for further processing for smaller species. The samples taken were dried, sieved through two mesh sizes, 3mm and 0.5mm. The contents of each sieve were examined for snails. An Olympus 40X binocular microscope was used to examine the smaller species.

3 EXISTING ENVIRONMENT

3.1 BEC Surveys 2013

The following is a brief summary of the findings of the various comprehensive surveys carried out BEC Consultants in 2013 (Brophy & Devaney 2013). Given the fact that very little change in management of the canal and towpath has occurred since 2013 it is considered that these findings are still valid. Thus, the additional surveys undertaken in 2018 were designed to supplement this information and to give more precision to the results. It should be noted that sections 1 to 8 of the 15 sections included in the BEC study are included in the route proposed by Fingal County Council.

3.1.1 Habitats

The 2013 BEC survey recorded 26 habitat types (as classified by Fossitt 2000) in the full study area (Table 1). Sections in Fingal (Dublin) had an average of 11 habitats recorded within them. The section between Granard Bridge and Kirkpatrick Bridge was the most diverse with 15 habitats while the Talbot Bridge & 12th Lock to Granard Bridge section had the least (6 habitats). These habitats were accurately mapped in 2013 and the present survey has confirmed that these boundaries remain unchanged in 2018.

Table 1. List of habitats recorded within the Royal Canal study area in 2013 (Brophy & Devaney 2013).

Habitat code[1]	Habitat type	Number of sections in which habitat recorded[2]
BC1	Arable crops	1
BC4	Flower beds and borders	1
BL1	Stone walls and other stonework	11
BL2	Earth banks	1
BL3	Buildings and artificial surfaces	15
ED2	Spoil and bare ground	10
ED3	Recolonising bare ground	3
ER2	Exposed calcareous rock	3
FP1	Calcareous springs	1
FS1	Reed and large sedge swamps	11
FS2	Tall-herb swamps	1
FW3	Canals	15
FW4	Drainage ditches	4
GA2	Amenity grassland (improved)	13
GM1	Marsh	1
GS1	Dry calcareous and neutral grassland	3
GS2	Dry meadows and grassy verges	14
GS4	Wet grassland	6
WD1	(Mixed) broadleaved woodland	3
WD5	Scattered trees and parkland	1
WL1	Hedgerows	12
WL2	Treelines	14
WN2	Oak-ash-hazel woodland	10
WN6	Wet willow-alder-ash woodland	3
WS1	Scrub	12
WS3	Ornamental/non-native shrub	2

1. Codes are those given by Fossitt (2000)
2. Note: The Royal Canal Urban Greenway includes only 1-8 of the 15 sections included in this survey

3.1.2 Plant species

A total of 372 plant species (including bryophytes, aquatic and invasive species) were recorded in the course of the 2013 survey. Forbs were the most abundant plant group (170 species), followed by woody species (trees, shrubs, woody climbers) (79 species), bryophytes (59 species), grasses (30 species), sedges (13 species), ferns (9 species), rushes (5 species), algae (4 species) and the fern-allies, horsetails

(3 species). Due to access difficulties (primarily the presence of the railway track) only one side of the canal for each section could be surveyed in detail, however the other side of the canal was viewed from the opposite bank, by binoculars when necessary, to ensure no obvious plant species were missed. While every effort was made to identify horticultural shrubs and garden escapes, the main focus of the plant survey was on species naturally found in the wild.

Grapnel sampling of the submerged aquatic vegetation of the Royal Canal was carried out in all sections within the study area in 2013. Due to a lack of aquatic vegetation, most likely caused by heavy shading, and difficulty of access, limited sampling was carried out in the Deep Sinking. A total of 49 grapnel samples were taken across the 15 sections, with 14 species recorded (including stoneworts and algae). The invasive species Canadian Waterweed *(Elodea canadensis)* was the most frequently recorded species in the grapnel samples (55%) followed by Yellow Water-lily *(Nuphar lutea)* (51%). Other species recorded in the course of the sampling were Ivy-leaved Duckweed *(Lemna trisulca),* Mare's Tail *(Hippuris vulgaris),* the invasive species Nuttall's Waterweed *(Elodea nuttallii)* and Unbranched Bur-reed *(Sparganium emersum).* The aquatic vegetation of the Royal Canal is largely similar within the study area, with the exception of the Deep Sinking, where heavy shading from the trees combined with the steep rock banks, restrict the distribution of aquatic vegetation, both submerged and emergent.



Figure 2. Pyramidal orchid in species-rich grassland in Section 1

3.1.3 Rare/protected plant species

No legally protected plants were recorded in the course of the 2013 survey. The Marsh Pea *(Lathyrus palustris)* and Cowslip *(Primula veris)* are scarce but neither species is protected under Irish law. Prickly Lettuce *(Lactuca serriola),* is rare in Ireland, but as it is a recent introduction, it is not protected. The Greater Spearwort *(Ranunculus lingua),* which was commonly recorded in the emergent vegetation along the canal edge, and Salad Burnet *(Poterium sanguisorba (=Sanguisorba minor)),* which was recorded in areas of calcareous grassland along the canal bank, are notable species due to their rather restricted distribution in Ireland. The native Hoary Ragwort *(Senecio erucifolius),* although widespread throughout Co. Dublin, is nationally rare and is therefore also notable.

Opposite-leaved Pondweed *(Groenlandia densa),* which is listed on the Flora Protection Order 1999 (S.I. 94/1999), has been recorded on the Royal Canal within Dublin City, but none was recorded within the study area in 2013. Tassel Stonewort *(Tolypella intricata),* listed in the Red Data Book as being Vulnerable in Ireland, has been recorded in the Royal Canal in Dublin; the only site in Ireland where it is now found. Again, this was not found within the study area during the 2013 survey.

3.1.4 Invasive plant species

Alien invasive plant species are a major and increasing threat to biodiversity in Ireland. A number of species that are considered invasive, both terrestrial and aquatic, were recorded within the study area in 2013. These included Japanese Knotweed *(Fallopia japonica),* cotoneasters *(Cotoneaster* spp.), Snowberry *(Symphoricarpos albus),* Winter Heliotrope *(Petasites fragrans),* Cherry Laurel *(Prunus laurocerasus),* Buddleja *(Buddleja davidii),* Wilson's Honeysuckle *(Lonicera nitida),* Sycamore *(Acer pseudoplatanus),* Canadian Waterweed *(Elodea canadensis)* and Nuttall's Waterweed *(Elodea nuttallii).* Due to the widespread distribution of Sycamore throughout the study area, no specific locations were recorded for this species.

Of these invasive species only the following two are listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011. This places certain restrictions on the spread of plants, seeds or soil from these areas. If site clearance is required, then a licence is required to disturb the site and this material needs to be sent to licenced landfill for deep burial.

- *Rhododendron ponticum* (Rhododendron)
- *Fallopia japonica* (Japanese Knotweed)

The remainder are invasive alien plants but not so problematic as they can be removed without licence. However, it is recommended that soils where the following occur should not be spread elsewhere.

- *Buddleja davidii* (Buddleia)
- *Cotoneaster* spp.
- *Symphoricarpos albus* (Snowberry)
- *Prunus laurocerasus* (Cherry laurel)
- *Petasites fragrans* (Winter heliotrope).

The Japanese Knotweed recorded by BEC near to Pakenham Bridge in Section 1 does not occur in this area presently. A further stand of Japanese Knotweed was located by Dr. Blackstock during the tree survey. It is on the northern side of Hansfield Road immediately west of Callaghan Bridge in Section 2. This is separated from the canal by a public road and will not be disturbed during the construction or operation of the proposed cycleway and footpath.

3.1.5 Bryophytes (mosses and liverworts)

The 2013 survey of the bryophyte flora of the study area recorded 59 species. These species were, for the most part, found growing on stone walls and surfaces, exposed soil and rock faces, and trees. Section 3 had the highest proportion of bryophytes recorded (38 species), while Section 1 had none recorded. The majority of the bryophytes collected from Section 3 were taken from the Calcareous springs (FP1) habitat and surrounding Treelines (WL2) and Oak-ash-hazel woodland (WN2). Section 3 runs through the Deep Sinking. This is an ideal spot for bryophytes as it is shaded, sheltered and humid, providing an excellent array of habitats for bryophytes.

The four most frequent species were Bird's-claw Beard-moss *(Barbula unguiculata),* Rough-stalked Feather-moss *(Brachythecium rutabulum),* Common Feather-moss *(Kindbergia praelonga)* and Swartz's Feather-moss *(Oxyrrhynchium hians).* Scarce Notchwort *(Leiocolea badensis)* and Claw-leaved Hook-moss *(Palustriella falcata =Palustriella commutata v. falcata)* are new vice-county records for Dublin (both found in Section 3).

3.1.6 Mammals (excluding bats)

Sightings of Rabbit *(Oryctolagus cuniculus)* and Brown Rat *(Rattus norvegicus),* as well as American Mink *(Mustela vison)* and Grey Squirrel *(Sciurus carolinensis)* (both invasive) were made during the 2013 survey, while definite evidence of Otter *(Lutra lutra)* was also found at a number of sites in the form of spraints (droppings). Feeding signs, likely to be Red Fox *(Vulpes vulpes),* were recorded along the canal bank, while Badger *(Meles meles)* feeding signs and two badger setts were also recorded. In addition to sightings of Rabbits, burrows and droppings were noted at a number of locations along the canal, mainly in treeline/hedgerow embankments and areas of woodland. The woodlands and hedgerows of the Royal

Canal are also likely to support other mammal species, such as Wood Mouse *(Apodemus sylvaticus)* and Hedgehog *(Erinaceus europaeus),* though these were not observed at the time of the survey.

The majority of the non-flying mammals so far recorded are not sensitive to disturbance from pedestrians and cyclists. Badgers and Otters are predominantly nocturnal so would not be active during construction periods or when the majority of people are using the final route. Otters occur widely in many heavily disturbed areas including city centres. Provided that there is no interference with the canal banks, immediately adjacent to the water, then it is unlikely that otter activity in the area will be impacted.

3.1.7 Bats

Four species of bat were recorded in the course of the 2013 survey carried out by Dr Tina Aughney of Bat Eco Services. These were Common Pipistrelle *(Pipistrellus pipistrellus),* Soprano Pipistrelle *(Pipistrellus pygmaeus),* Leisler's Bat *(Nyctalus leisleri)* and Daubenton's Bat *(Myotis daubentonii).* These species were recorded foraging or commuting along the canal corridor, along treelines and hedgerows and over the canal surface itself. Collins Bridge and Cope Bridge both had suitability for bats, while the building at Leixlip Spa had roost potential and the house at Pakenham Bridge provides a roosting site for Soprano Pipistrelles. The remaining bridges had no bat potential owing to the lack of suitable crevices for bats. A number of large, ivy-covered trees within the study area were identified as Potential Bat Roosts (PBRs).

In addition to the four bat species recorded in the course of the 2013 survey, three other bat species have been recorded on the Bat Conservation Ireland database as occurring along or close to the canal: Brown Long-eared Bat *(Plecotus auritus),* Nathusius' Pipistrelle *(Pipistrellus nathusii)* and Whiskered Bat *(Myotis mystacinus).*

3.1.8 Birds

A total of 40 bird species were recorded in the course of the 2013 survey, with commonly recorded species including Wood Pigeon, Blackbird, Wren, Great Tit, Robin, Swallow, Chaffinch, Mallard, Magpie and Rook. Kingfisher, listed under Annex I of the Bird Directive (2009/147/EC) and on the Birds of Conservation Concern in Ireland (BoCCI) Amber List, was recorded between Kirkpatrick Bridge and Kennan/Neville Bridge, while seven other species recorded are also on the Amber List (House Sparrow, Lesser Black-backed Gull, Little Grebe, Mute Swan, Starling, Swallow and Swift). One species listed on the BoCCI Red List was recorded in the course of the survey – Yellowhammer. The hedgerows, treelines and small areas of woodland provide nesting and feeding habitat for many terrestrial bird species, while the emergent vegetation of the canal provides cover vital to aquatic birds like Mallard, Moorhen and Little Grebe. A further survey of breeding waterbirds was undertaken in 2018 (see section

3.1.9 Ant hills

Ant hills were recorded in 2013 at a number of locations along the Royal Canal in the Deep Sinking. Sections 2 and 3 of the study area supported numerous ant hills between the path and the canal bank. The ants recorded here were identified as the yellow Meadow Ant *(Lasius flavus),* which is the main mound-building ant. Well-developed ant hills are a sign that a grassland has remained undisturbed for some time, increasing the likelihood that the habitat supports high species diversity and may be of conservation value.

3.1.10 Fish

The fish community of the Royal Canal is entirely comprised of coarse fish (excepting the occasional stray salmonid that may enter the system from nearby rivers), with six species and one hybrid recorded during an electro-fishing survey in 2011 between Collins Bridge and the 13th Lock (Paul McLoone, IFI, pers. comm.). Roach *(Rutilus rutilus)* completely dominated the fish community in this section, in terms of both numbers and biomass, followed by Perch *(Perca fluviatilis),* Pike *(Esox lucius),* Roach-Bream hybrid *(R. rutilus x Abramis brama)* and Eel *(Anguilla anguilla).* Small numbers of Tench *(Tinca tinca)* and Bream

(A. brama) were also recorded. Roach, Perch, Pike and Eel were all seen in the course of the 2013 survey, along with numerous shoals of juvenile fish.

3.1.11 Aquatic macroinvertebrates

Inland Fisheries Ireland carried out sampling of the aquatic macroinvertebrate population of the Royal Canal in spring 2009 (Tara Gallagher, IFI, pers. comm.). Samples were taken just upstream of Granard Bridge, Blanchardstown, Co. Dublin. The most common species recorded in this sample was the water slater Asellus aquaticus, with the invasive freshwater shrimp Crangonyx pseudogracilis also abundant. Other common species included the mussels Sphaerium corneum and Pisidium spp. and the snails Bithynia tentaculata and B. leachii.

3.1.12 Environmentally sensitive areas

The 2013 BEC survey labelled a number of the canal sections as environmentally sensitive areas (ESAs). Some of these habitats are of higher ecological value than others and in need of greater protection. These include stretches of the canal bank supporting grassland of high species diversity (Sections 4, 5, 6), all types of woodland (mixed broadleaved, oak-ash-hazel and wet willow-alder-ash woodland) (Sections 2, 3, 4, 5, 6, 8), reed and large sedge swamp (Section 8), tall-herb swamp (Section 8), calcareous springs (Section 3), some areas of freshwater marsh (Section 5) and wet grassland (Section 8). All woodland areas within the study area were deemed to be ESAs due to the fact that semi-natural woodland in Ireland today tends to be limited in extent and scattered in distribution. The woodland habitats within the survey area provide a valuable habitat for flora and fauna, particularly when the larger landscape of intensively managed farmland and urban areas surrounding the study area is considered.

A number of areas of high-quality grassland were identified as ESAs owing to their close correspondence to Annex I habitats such as 6210 calcareous grassland and 6510 lowland hay meadows. As with the areas of woodland, such grasslands are important in the context of the intensively managed farmland and urban areas surrounding the study area. The Hydrophilous tall herb community (6430) is an Annex I habitat that is rare within the study area, and as such is considered an ESA.

3.2 Grassland survey 2018

3.2.1 Survey results

The grassland habitat bordering the canal is generally categorised as unimproved dry meadows and grassy verges (GS2). It is relatively species-rich and has not been grazed. In the centre of the towpath there is an area of heavily trampled grassland that contains species such as Italian rye-grass *(Lolium perenne)* that have colonised from surrounding agricultural grassland.

A 4m x 1m relevé was located on the canal bank at GPS reference 03283 37484 between Pakenham Bridge and Collins Bridge. This contained 25 species of grasses and forbs with more than 40% cover of forbs. The species present included Pyramidal orchid *(Anacamptis pyramidalis),* Birds foot trefoil *(Lotus corniculatus),* Bulbous buttercup *(Ranunculus bulbosus),* Marjoram *(Origanum vulgare)*, Lady's bedstraw *(Galium verum)* and Glaucous sedge *(Carex flacca).* This combination of species corresponds to the habitat 'Lowland hay meadows *(Alopecurus pratensis, Sanguisorba officinalis)'* Code 6510 as listed in Annex 1 of the EU Habitats Directive (Directive 92/43/EEC, amended by Directive 97/62/EC). The criteria and indicators for this classification are given by O'Neill *et al.* (2013).

The Annex 1 habitat 'Lowland Hay Meadows' occurs in both Sections 1 and 2 between Collins Bridge and Kennan Bridge. The locations of the Annex 1 grassland (code 6510) are indicative only (see Table 2) and were shown on the 2013 maps as there were indicators of this habitat type among the Dry meadows and grassy verges (Code GS2). It is not feasible to map precisely the 6510 habitat as it forms a mosaic with the more common GS2.

Table 2: Indicative locations of Annex 1 grassland Lowland Hay Meadow (code 6510) recorded in 2013 and 2018.

Habitat type	*GPS co-ordinates*	*Canal section*
GS2 Meadows with indicators for the Annex I habitat 6510	ITM 705658 737925	2 (Kennan Bridge to Callaghan Bridge)
GS2 Meadows with indicators for the Annex I habitat 6510	ITM 704589 738277	2 (Callaghan Bridge to Railway Bridge)
GS2 Meadows with indicators for the Annex I habitat 6510	ITM 704639 738262	2 (Callaghan Bridge to Railway Bridge)
GS2 Species-rich grassy verges with orchids	ITM 703919 738335	1 (Railway Bridge to Pakenham Bridge)
GS2 Meadows with indicators for the Annex I habitat 6510	IO 03283 IG 37484	1 (Pakenham Bridge to Collins Bridge)

This shows that much of the grassland has potential to be restored to species-rich meadow given the correct management. Optimum management would involve a single late summer cut (early September) per year followed by removal of the hay cuttings. It would be possible to diversify the grassland to produce a species-rich sward over much of the area. This could be done after cutting by using a tractor-mounted scarifier followed by immediate sowing with Yellow Rattle *(Rhinanthus minor).* This species parasitizes the roots of certain grasses, opening up the sward and allowing other more sensitive species to colonise. Sowing should be done by hand at 2 grams (c.600 seeds) per 2m x 2m patch. The seed is mixed with lime-free sand and sown when the soil is moist. A local source of seed is the OPW managed estate at Castletown House, Celbridge.

3.2.2 Recommendations for grasslands

This sample survey indicates that some of the grasslands in the western section of the proposed Royal Canal Urban Greenway route are of high conservation value, especially those pockets containing the Annex 1 habitat 'Lowland hay meadows'. This habitat type is now rare in Ireland and especially in Fingal where the majority have been converted to improved agricultural grasslands. Where the proposed route is located in these sections of the canal towpath it should be set back at least 1m from the water's edge and no disturbance should be permitted to the grassland habitat on the canal bank during construction. Following construction of the Greenway, much of this marginal habitat could be converted to a species-rich grassland using the methods proposed above.

3.3 Woodland survey 2018

3.3.1 Survey results

The main woodland habitats in the study area are in the Deep Sinking area (Section 3), mainly located on the north side of the canal where they vary from a narrow line of trees to a band up to 50m in width. The main categories of woodland found are Oak-Ash-Hazel Woodland (WN2), Mixed Broadleaved/Conifer Woodland (WD2) with small areas of Scrub (WS1) and Scattered Trees and Parkland (WD5). These have been mapped accurately by the BEC survey (Brophy & Devaney 2013). While the Oak-Ash-Hazel Woodland is classified as semi-natural with native trees dominant, it does contain some non-natives such as Sycamore, Sweet Chestnut, Beech and a few conifer species.



Figure 3. Semi-natural woodland on the north bank of the canal west of Kirkpatrick Bridge

3.3.1.1 Kennan Bridge to Kirkpatrick Bridge

North Bank: The dominant tree species here are Ash, Alder, Willow and Hawthorn with some introduced Beech and Sycamore. Ages of the trees vary from immature (5-10 years) to mature (30-40 years). There is some mature Cherry Laurel at the western end between Kennan Bridge and the Clonsilla road bridge. This is an invasive species and needs to be controlled as it can cast a dense shade retarding natural woodland regeneration. The topography is uneven and a steep bank occurs in the middle of this section close to Sheepmoor Lane.

South Bank: The tree cover here is predominantly a single line of Alder, Ash, Sycamore, Sweet Chestnut and Hawthorn. This has been repeated trimmed to allow access for boats along the canal and pedestrians on the towpath.

3.3.1.2 Kirkpatrick Bridge to Granard Bridge

North Bank: The woodland on the north bank consists primarily of mixed broadleaved/conifer woodland with a dense stand of Ash, Sycamore, Alder, Holly, Hawthorn and various conifers which vary from 5 to 45 years in age. The topography here is very uneven with intermittent very steep banks which are not suitable for public access. On the north bank just east of Kirkpatrick Bridge there is an area of young Rhododendron. This is also an invasive species and needs to be controlled.

South Bank: This is fringed by a single tree line comprised mainly of Alder, Ash, Sycamore and Hawthorn with a maximum age of 25 years. Coppicing is regularly carried out here to facilitate access.

3.3.2 Discussion

The woodland on the northern bank of the Royal Canal in the Deep Sinking area is mainly classified as semi-natural although it contains a mixture of native and non-native tree species. The woodland is extensive in some areas and has a typical associated ground flora. It also provides a valuable corridor of semi-natural vegetation through essentially urban areas for the movement of animal species including mammals, birds and insects. The areas of Oak-Ash-Hazel Woodland (WN2) are of high conservation value and should be avoided by the proposed development, where possible.

3.4 Breeding waterbird survey 2018

3.4.1 Survey Results

A total of three water bird species were recorded along this section of the canal over two surveys. Mallard was the most abundant species with 40 registrations. Grey Wagtail was the least abundant with only one registration. In Table 3 the number of registrations for each species is given. Figure 5 shows a map of the survey area and the distribution of waterbird registrations.



Figure 4. Mallards roosting on the canal bank

Table 3: Summary of waterbird registrations in May 2018 within the Royal Canal study area (from 12th Lock to Kildare County boundary)

Species	No. Of Registrations	Breeding Status	Level of Conservation Concern[1]
Mallard	40 (incl. 13 juveniles)	Confirmed breeding	Green
Moorhen	4	Probable breeding	Not listed
Grey Wagtail	1	Unconfirmed breeding	Red

Birds of Conservation Concern in Ireland (Colhoun and Cummins 2013): Red = High conservation concern; Amber = Moderate conservation concern; Green = Low conservation concern.

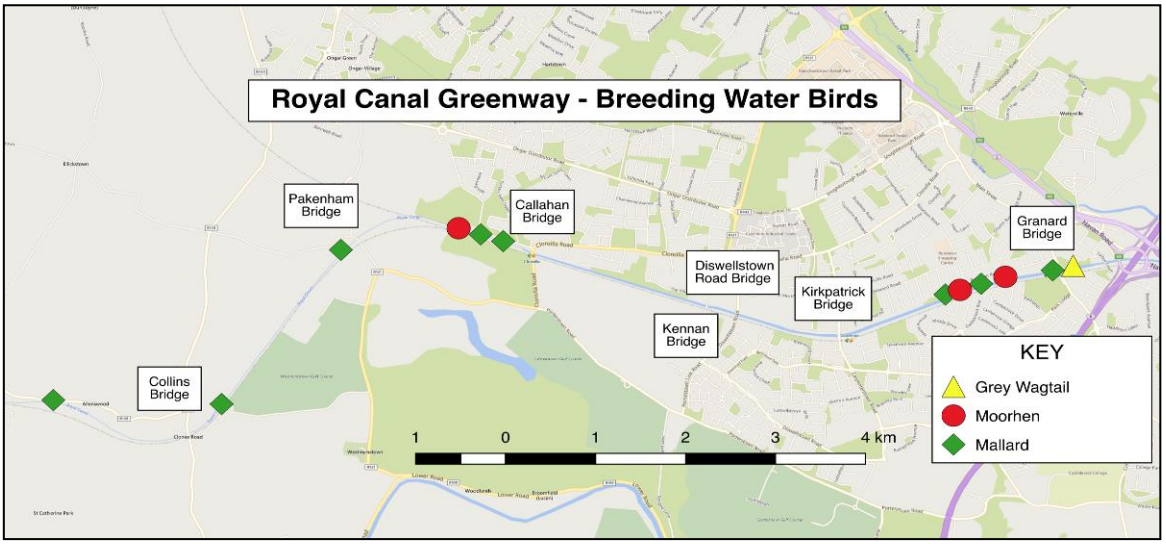


Figure 5: Map of Royal Canal survey area from 12th lock to Kildare County Boundary showing water bird distribution

3.4.2 Discussion

The breeding waterbird community on this section of the Royal Canal is typical of canals in general and of other sections of this waterway (Smiddy & Nairn 2012). The number of species is low and density is also low, largely because of the lack of vegetation cover in the waterway. Mallard occur frequently and generally nest in areas with a reed fringe. Moorhens select dense emergent vegetation or tree branches in the water for nesting. Grey Wagtails tend to nest in crevices in stonework or among tree roots or ivy invariably close to the water (Ferguson-Lees *et al.* 2011). The Grey Wagtail found in this survey was present at the 12th Lock on 22nd May 2018 and was likely to be nesting in the stonework around the canal close to this location Mute Swans and Grey Heron were present on the western section of the route during the preliminary survey in March 2018 but there was no evidence of either species breeding here in May. Grey Wagtail is of high conservation concern in Ireland because its population is estimated to have declined by at least 50% over the period 1998-2011 (Colhoun & Cummins 2013).

The waterbird species recorded breeding on this stretch of the canal are largely confined to the waterbody itself and are habituated to human disturbance. It is not expected that the development of a pedestrian path and cycleway parallel to the canal would have any significant impacts on them provided that the vegetation in the canal water is not disturbed.

3.5 Bat surveys of sections 1 to 3 in 2018

A full bat survey of this section of the Royal Canal was undertaken in 2013 (Aughney 2013). This included a survey of bat activity along the waterway. The results are summarised in Table 4. Four species were found with Soprano Pippistrelle being most widespread. The entire canal forms a significant foraging and commuting corridor for bats and this is likely to continue in 2018.

The old stone bridges were examined in 2013 for potential bat roosts. This survey was repeated between 13th and 18th July 2018 in order to update the assessment carried out in 2013 and to confirm if bats were present in any of the old bridge structures along the route.

Table 4: Summary of bat activity on the Royal Canal in June 2013

Section	Western limit	Eastern limit	Common Pippistrelle	Soprano Pippistrelle	Daubentons Bat	Leislers Bat
1	County Boundary	Collins Bridge	●		●	●
	Collins Bridge	Pakenham Bridge		●	●	●
	Pakenham Bridge	Railway Bridge		●		●
2	Railway Bridge	Callaghan Bridge		●		
	Callaghan Bridge	Kennan Bridge		●	●	
3	Kennan Bridge	Kirkpatrick Bridge	●	●		
	Kirkpatrick Bridge	Granard Bridge	●	●	●	
	Granard Bridge	Talbot Bridge/Lock 12	●	●	●	

3.5.1 Survey Results

Granard Bridge (Bridge No. 1)
This is a low single arch bridge with the canal towpath located under the arch. There are long narrow crevices under the arch of this bridge. The crevices are deemed suitable for roosting bats. A dusk emergence survey was completed on 18th July 2018 from 21:45 hrs to 23:15 hrs (Weather conditions: patchy cloud cover, dry, light wind and 16^{o}C). No bats were detected emerging from the crevices. The following bat species were recorded foraging adjacent to the bridge: Common Pipistrelle, Soprano Pipistrelle and Leisler's bat.

Kirkpatrick Bridge (Bridge No. 2)
This is a high single arch bridge and the only access to underneath the bridge is by scrambling down a steep bank towards the canal. There are a number of crevices under the arch of this bridge. The crevices are deemed suitable for roosting bats. A dusk emergence survey was completed on 16th July 2018 from 21:45 hrs to 23:15 hrs (Weather conditions: patchy cloud cover, dry, light wind and 14^{o}C). A single bat was detected emerging from a crevice and identified as a *Myotis* species, likely to have been a Daubenton's bat. The following bat species were recorded foraging adjacent to the bridge: Common Pipistrelle, Daubenton's Bat, Soprano Pipistrelle and Leisler's Bat.

Kennan Bridge (Bridge No. 3)
This is a high single arch bridge. There are no crevices deemed suitable for roosting bats. Therefore, a dusk survey was not undertaken at this bridge.

Callaghan Bridge (Bridge No. 4)
This is a low single arch bridge with the canal towpath located under the arch (Figure 6). There are a number of crevices under the arch of this bridge. The crevices are deemed suitable for roosting bats. A dusk emergence survey was completed on 14th July 2018 from 21:45 hrs to 23:15 hrs (Weather conditions: full cloud cover, dry, calm and 15.5^{o}C). No bats were detected emerging from the crevices. The following bat species were recorded foraging adjacent to the bridge: Common Pipistrelle and Leisler's bat.

Pakenham Bridge (Bridge No. 5)
This is a low single arch bridge with the canal towpath located under the arch allowing for ease of inspection. There are some shallow crevices under the arch of this bridge. These crevices were checked with a torch and no bats were recorded within the crevices. Therefore, a dusk survey was not completed.

Collins Bridge (Bridge no. 6)
This is a low single arch bridge with the canal towpath located under the arch. There are a number of crevices under the arch of this bridge. The crevices are deemed suitable for roosting bats. A dusk emergence survey was completed on 13th July 2018 from 21:45 hrs to 23:15 hrs (Weather conditions: patchy cloud cover, dry, calm and 16OC). No bats were detected emerging from the crevices. The following bat species were recorded foraging adjacent to the bridge: Daubenton's bat, soprano pipistrelle and Leisler's bat.

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Figure 6. Callaghan Bridge in Section 2

The author surveyed these bridges in 2013. It is interesting to note that in the five years since the previous surveys the bat roosting potential of the bridges has changed as shown in Table 4.

Table 4. Comparison between the bat roosting potential of bridges on the Royal Canal Urban Greenway route in 2013 and 2018.

Bridge name	2013 survey	2018 survey
1. Granard Bridge	No suitable crevices	Suitable crevices
2. Kirkpatrick Bridge	No suitable crevices	Suitable crevices, bat roost present
3. Kennan Bridge	No suitable crevices	No suitable crevices
4. Callaghan Bridge	No suitable crevices	Suitable crevices
5. Pakenham Bridge	No suitable crevices	Shallow crevices
6. Collins Bridge	Suitable crevices, no bats recorded	Suitable crevices

3.6 Bat survey of Ashtown to M50 section 2018

3.6.1 Survey Results

This survey was commissioned to investigate the effect of street lighting on the section of the Royal Canal between Ashtown Railway Station and the M50 (Figure 7) which was installed in the last 10 years. A full literature review of the impact of lighting on bats is given in Appendix 2.

Bat activity during the walking transect (60 minutes) was very low. Bats were only recorded on one occasion (Common Pipistrelle) approximately 300m from the Ashtown end or the start of the walking transect. Table 4 lists the bat species recorded at the survey spots (2 hrs and 1 minute of surveying). Bats were only recorded at 6 of the 20 survey spots (30%). Overall the level of bat activity was low and only common bat species were recorded; Leisler's Bat, Common Pipistrelle and Soprano Pipistrelle (Table 5).



Figure 7. Ashtown to M50 section of the Royal Canal paralleled by the Dublin-Kildare Railway

Bat activity was not recorded around the lamp posts but was generally along the tall vegetation on the far-side of the canal tow path where the lamp posts are not located. Leisler's Bats were only recorded commuting through the area. There were no feeding passes noted. Common and Soprano Pipistrelles were occasionally recorded feeding during the survey. No *Myotis* bat species or Brown Long-eared Bats were recorded. Overall only 8 bat encounters were recorded in 3 hours of surveying (both the walking transect and the survey spot surveys combined). The LUX level at 1m height off the ground and directly below the lamp posts was 5 LUX. The LUX level in the middle of the path at 1m off the ground was 10 LUX. A glare from the lamp posts spilled out onto the canal water surface.

Table 5. Bat species recorded at survey spots on the Ashtown to M50 section of the canal

No.	Survey spot location/description	Survey time	Species recorded	LUX
1	Survey spot at LP 63 starting at M50 end	22:59		2
2	Plus 100 paces. Survey spot at security post beside LP59	23:05		0
3	Plus 100 paces. Survey spot at LP 56	23:11	Leis	1
4	Plus 100 paces. Survey spot at LP 53	23:17		2
5	Plus 100 paces. Survey spot at Lock 2 from LP50	23:23		0
6	Plus 100 paces. Survey spot at black railing	23:29		0
7	Plus 100 paces. Survey spot at LP43	23:35		0
8	Plus 100 paces. Survey spot at halfway between LP39/40	23:41		0
9	Plus 100 paces. Survey spot at halfway between LP39/40	23:48		0
10	Plus 100 paces. Survey spot at security post between LP33/34	23:53		0
11	Plus 100 paces. Survey spot at 30	23:59	Cp, Leis	0
12	Plus 100 paces. Survey spot at 27	00:08		1
13	Plus 100 paces. Survey spot at 24	00:14		1
14	Plus 100 paces. Survey spot at black gate	00:19		0
15	Plus 100 paces. Survey spot at halfway between LP17/18	00:25		0
16	Plus 100 paces. Survey spot at ESB pylon	00:31	Cp	0
17	Plus 100 paces. Survey spot at LP11	00:37		0
18	Plus 100 paces. Survey spot at LP8	00:42	Sp	2
19	Plus 100 paces. Survey spot at black railing	00:48		0
20	Plus 100 paces. Survey spot at Lock 10 sign adjacent to Ashtown Railway Station	00:54	Cp	0

Bat species: Leis = Leisler's Bat; Cp = Common Pippistrelle; SP = Soprano Pippistrelle. LP = Lamp post

3.6.2 Review of the effects of lighting on bats

A previous bat survey was completed on this section of the canal in 2004 (Keeley, 2004) and this report was provided for review after the 2018 survey was completed. Bat detection work was undertaken here between July and October 2004 on three nights prior to the installation of lighting on this section of the towpath (Keeley 2004). In addition, a further bat survey was undertaken here by Keeley and Mullen (2013, prior to the construction of the existing greenway). Table 6 gives a comparison of bat species recorded in all three surveys.

Table 6. Bat species recorded on the Ashtown to M50 section of the Royal Canal 2004 and 2018.

Species	2004	2013	2018
Soprano pipistrelle *Pipistrellus pygmaeus*	Present	Present	Present
Common pipistrelle *Pipistrellus pipistrellus*	Present	Present	Present
Leisler's bat *Nyctalus leisleri*	Present	Present	Present
Daubenton's bat *Myotis daubentoni*	Present	Present	Not recorded
Brown long-eared bat *Plecotus auritus*	Present	Not recorded	Not recorded
Whiskered bat *Myotis mystacinus*	Present	Not recorded	Not recorded

The level of bat activity in summer 2018 was low. This, in addition to the absence of bat species considered to be light sensitive e.g. *Myotis* bat species, indicates that the lighting regime is impacting on local bat populations. As noted by Keeley (2004) two *Myotis* species and the Brown Long-eared Bat was recorded when there was no lighting present.

There is a dense treeline along much of the section of the canal surveyed. This is an ideal habitat to encourage bats along a waterway and has been shown to be the principal habitat that encourages the presence of Daubenton's bats along rivers and canals in Ireland (Aughney *et al.,* 2017). While the survey transect is located in an urban zone, bats will utilise urban areas once there is a continuous dark zone for them to travel through. It is likely that the lighting regime of the survey area reduces the suitability of the canal for foraging and commuting bats.

The results of the previous survey completed along this section of the canal prior to the installation of the lighting was available for review post 2018 surveying. As stated above, this 2004 survey recorded six bat species, three of which were not recorded in the 2018 survey. While the surveying protocol is different between the two surveys, the level of bat activity noted in the 2004 survey exceeds the level of bat activity for all bat species recorded in the 2018 survey. This was similar for the 2013 survey. Four species of bat was recorded in 2013, one more bat species than the 2018 survey. However, the 2013 survey was completed along a longer section of the canal but within the same survey area, the Daubenton's bat was recorded in the 2013 survey but not in the 2018 survey. This may be due to the increased lighting along the canal. Thus, the survey of the Ashtown-M50 section appears to show that there has been a decrease in bat activity along that section since the installation of lighting, although this is not conclusive. The three species not recorded in 2018 are all known to be deterred from foraging in areas with artificial lighting.

Recently published guidance on bats and artificial lighting in the UK (ILP-BCT 2018) states that illuminating a bat roost can cause disturbance and this may result in the bats deserting the roost or even becoming entombed within it. Light falling on a roost access point will at least delay bats from emerging and this shortens the amount of time available to them for foraging. As the main peak of nocturnal insect abundance occurs at and soon after dusk, a delay in emergence means this vital time for feeding is missed. This has been shown to have direct impacts on bats' reproductive ecology, such as slower growth rates and starvation of young. In addition, the associated flightpath to and from the access point is just as valuable and vulnerable as the roost itself. Severing a key flightpath some distance from the roost could cause desertion in its own right.

In addition to causing disturbance to bats at the roost, artificial lighting can also affect the feeding behaviour of bats. Many night-flying species of insect are attracted to light, especially those light sources that emit an ultraviolet component or have a high blue spectral content. Studies have shown that Leisler's Bat and Pipistrelle Bats can congregate around white mercury street lights and white metal halide lamps feeding on the insects attracted to the light. However, slower flying, broad-winged species such as Long-eared Bats, *Myotis* species (which include Brandt's Bat, Whiskered Bat, Daubenton's Bat and Natterer's Bat) generally avoid all street lights. Consequently, bat species less tolerant of light are put at a

competitive disadvantage and are less able to forage successfully and efficiently. This can have a significant impact upon fitness and breeding success in the latter species. In addition, studies have shown that continuous lighting in the landscape, such as along roads or waterways, creates barriers which many bat species cannot cross, especially the slower-flying species even at very low light levels. In Ireland it has been found the Daubenton's Bat is less likely to occur on waterways where there are artificial night lights (Aughney *et al.* 2012). A literature review of the impacts of lighting on bats is given in Appendix 2.

3.6.3 Recommendations for bats

3.6.3.1 Retain crevices for roosting bats

Due to the number of open crevices, a selection of crevices should be retained for bat usage if any repointing works are required. In preparation for this, a bat inspection is required prior to construction and the crevices to be retained should be filled with bubble wrap. Once works are finished, the bubble wrap should be removed to allow bat usage (Figure 8).



Figure 8: Example of a bat-suitable crevice filled/blocked with bubble wrap to prevent bat occupancy during proposed works (Photograph courtesy of Caroline Shiel).



Figure 9: Example of a bat tube incorporated into a stone wall.

Where crevices cannot be retained, then bat tubes should be erected in the vicinity of the bridge (Figure 9). The exact location depends on the bridge (Please seek advice from a bat specialist). Any lighting scheme planned for the proposed greenway should not be erected in vicinity of the bridges, especially under the arches. It is of great importance that a dark corridor is present the entire length of the greenway to allow nocturnal wildlife, including bats, to commute through the landscape. Section 1.3.6 contains the results of the investigation of the impact of lighting scheme on bats along the Ashtown to M50 section of the Royal Canal. A full literature review of the impact of lighting on bats is given in Appendix 2.

3.6.3.2 General Recommendations for Bats

1. Do not remove trees and shrubs along waterway banks adjacent to the bridge structures. Protect this habitat from any potential damage as a result of the proposed development works.
2. Treelines and shrubs should remain in-situ and remain protected from potential management work.
3. Minimise damage to the hedgerow habitat adjacent to the bridge.
4. Ensure that all equipment, construction materials are stored on the roadway and not in adjacent habitats to the bridges.
5. Avoid the use of chemicals (weed killers etc.) within the development zone. Undertake physical removal of weed species only.
6. Open areas required to facilitate works should be limited to areas where tree and hedgerows are not present. Lighting of such work spaces can also disrupt traditional foraging grounds for bats and therefore should be limited and should not occur during foraging period (30 minutes prior to sunset to 30 minutes after sunrise).

7. Permanent lighting on the Greenway should be of the high-pressure sodium type to avoid significant impacts on bats (see Appendix 2).
8. It is recommended that a survey, using a similar methodology to that used in the 2018 survey of the Ashtown to M50 section, should be completed along the 12th Lock to Kildare border sections of the canal which are proposed for lighting. A number of 2km walking transects and 20 survey spots should be set up and data gathered prior to any lighting installation to provide a pre-construction baseline against which to measure the effects of any lighting installed here. This would be best done in the summer season before construction so that the 'before-after' interval is short. This would help to rule out other impacts such as land use changes in the surrounding area. Ideally, further survey of this section should be completed on a seasonal basis to collate data on bat activity for each month of the year and then this would provide a better dataset for comparison.
9. Static bat recording could also be put in place prior to construction at a number of points to record continuous bat activity levels over a period of five nights in the main bat survey season (April to September). This would provide further baseline information. Additional collation of LUX levels should be undertaken from the canal water surface level and where possible from the far-side of the canal bank.

3.7 Mollusc survey 2018

3.7.1 Introduction

This mollusc survey was undertaken in 2018 in order to assess the quality of the relevant potential habitats that could support *Vertigo* whorl snail species, in particular the three Annex II species *Vertigo moulinsiana, V. angustior* and *V. geyeri.* The survey was assisted by the benefit of an ecological study undertaken by BEC Consultants Ltd (BEC 2013), which provided the locations of habitats that have the potential to support *Vertigo* species.

The Royal Canal is a proposed Natural Heritage Area (pNHA) under the Wildlife Acts 1976 to 2012. Areas close to the canal west of the current study area (Blanchardstown Talbot Bridge to the Dublin/Kildare border) support important populations of *Vertigo moulinsiana* and *V. angustior*, so it is important to assess the potential for these species along the pNHA, particularly where management changes or development may be proposed.

The BEC study of the Royal Canal (Brophy & Devaney 2013) listed only five habitats that could potentially support *Vertigo* species (Table 7).

Table 7. List of habitats recorded within the Royal Canal study area by BEC (2013) with potential to support *Vertigo* species

Habitat code	Habitat type	Comment
FP1	Calcareous springs	Discounted as it is not associated with fen habitat
FS1	Reed and large sedge swamps	Common habitat along the study area
FS2	Tall-herb swamps	Limited to Section 8
FW4	Drainage ditches	Limited to Sections 7 and 8
GM1	Marsh	Limited to Section 5
GS4	Wet grassland	Transitional habitat along the study area

The study area was divided into 8 sections to match those referred to in the BEC study (Brophy & Devaney 2013) (Table 8).

Table 8. Survey sections as demarcated by Royal Canal distance markers (from BEC 2013).

Section no.	From	To	Distance (km)
1	Talbot Bridge & Lock 12, Blanchardstown	Granard Bridge, Castleknock Road	0.30
2	Granard Bridge, Castleknock Road	Kirkpatrick Bridge, Carpenterstown	1.55
3	Kirkpatrick Bridge, Carpenterstown	Kennan or Neville Bridge, Porterstown	0.90
4	Kennan or Neville Bridge, Porterstown	Callaghan or Carhampton Bridge, Clonsilla	1.20

Section no.	From	To	Distance (km)
5	Callaghan or Carhampton Bridge, Clonsilla	Dublin & Meath Railway Bridge	0.85
6	Dublin & Meath Railway Bridge	Pakenham Bridge, Barberstown	0.40
7	Pakenham Bridge, Barberstown	Collins Bridge, Coldblow	1.80
8	Collins Bridge, Coldblow	Dublin-Kildare county boundary, boat slip	1.05

Some examples of reed and large sedge swamp (FS1) were surveyed, but they are all within the canal fringe open water, and not sloped into transition habitat, thus snails here are reliant on living and feeding within the stem and leaf areas of vegetation and cannot retreat to root or litter areas (Figure 10). The total submergence of the vegetation was noted by BEC in 2013, and this was confirmed to be unsuitable habitat for *Vertigo* within the study area, except where a small area of tall herb swamp (FS2) formed a transition zone in Section 8.



Figure 10. Reed and large sedge swamp in the canal west of Pakenham Bridge (Section 1).

Tall herb swamps (FS2) were investigated in the only recorded area of Section 8. The habitat supported plants such as Meadowsweet *(Filipendula ulmaria),* Common Valerian *(Valeriana officinalis)* and Wild Angelica *(Angelica sylvestris).*

Drainage ditches (FW4) can support tall herb and sedge species in a transitional pattern, where parts of ditches maintain open water areas while others support damp sedge litter, and these habitats are ideal for *Vertigo moulinsiana.* These drainage ditches need to still support open water or high groundwater. The ditch areas noted by BEC (2013) in Sections 7 and 8 were investigated.

Marsh (GM1) was recorded by BEC (2013) in Section 5 only and was noted as an Environmentally Sensitive Area. The marsh habitat existed just above the water level of the canal and broadleaved herbs, such as Hemp-agrimony *(Eupatorium canabinum)* and Meadowsweet, accounted for greater than 50% of the vegetation. Wet grassland (GS4) was recorded by BEC in 2013 across a number of sections, and as often present in a narrow area between the grassy verges (GS2) and reed swamp (FS1) fringing the canal. It was noted that it reflected a transitional zone rather than a distinct GS4 habitat. This is a positive indication for *Vertigo* species, as it indicates potential for these snail species to move upslope to prevent inundation and downslope into conditions that prevent desiccation through the seasons. The habitat / transition zone was characterised by Hard Rush *(Juncus inflexus),* Meadowsweet, Yellow Iris *(Iris pseudacorus),* Wild Angelica *(Angelica sylvestris)* and Hemp-agrimony.

As *Vertigo* species favour transitional habitats, samples were taken across habitat zones, and so sampling points do not easily divide into the above habitat categories.

3.7.2 Survey Results

Very few snail species (12) were found during the survey, and none of the genus *Vertigo*. The sites are given in Table 9, and the results in Table 10.

Table 9. Sites surveyed for Molluscs.

Site no.	Area	Habitats surveyed
1	Talbot Bridge and Lock 12, Blanchardstown to start of 2	No suitable habitat
2	Granard Bridge, Castleknock to start of 3	Limited transition habitat, not suitable
3	Kirkpatrick Bridge, Carpenterstown to start of 4	No suitable habitat
4	Kennan Bridge, Porterstown to start of 5	Very dry transition, some emergent *Glyceria*, some dry litter N bank
5	Callaghan Bridge, Clonsilla to start of 6	5a – fringe transition GS4/FS1 5b – marsh habitat GM1 N bank
6	Dublin & Meath Railway Bridge to start of 7	Fringe transition GS4/FS1 N bank
7	Pakenham Bridge, Barberstown to start of 8	7a – drainage ditch FW4 7b - fringe transition GS4/FS1
8	Collins Bridge, Coldblow to slipway at Kildare border	8a – drainage ditch FW4 N bank 8b - fringe transition GS4/FS1 N bank 8c – tall herb swamps FS2 S bank

Table 10. Molluscan species found in the survey (nomenclature follows Anderson (2005))

Species	1	2	3	4	5a	5b	6	7a	7b	8a	8b	8c
Oxyloma elegans						X		X		X		X
Carychium minimum											X	
Cochlicopa lubrica					X		X		X		X	X
Arion vulgaris							X				X	
Vitrea contracta											X	X
Nesovitrea hammonis											X	
Oxychilus cellarius							X			X		
Oxychilus alliarius						X						
Clausilia bidentata				X	X							
Ashfordia granulata									X		X	
Trochilus striolatus				X				X	X	X		X
Cepaea nemoralis		X						X		X		X
Total = 12 species	**0**	**1**	**0**	**2**	**2**	**2**	**3**	**3**	**3**	**4**	**6**	**5**
Total species per section	**0**	**1**	**0**	**2**	**4**		**3**	**5**		**11**		

3.7.3 Discussion

The molluscan survey of the canal was undertaken during a prolonged dry spell, which meant that the survey conditions were very good for locating permanent damp and wet habitats that are conducive to *Vertigo* species. Very few snail species were found in the study, because the survey was targeting the habitats required for rare and protected species, rather than tolerant and widespread species that would occur in drier habitats.

No *Vertigo* species were found in the survey, and no habitats with potential to support the damp and gentle transition needed for them were found. There were areas where there were the combinations of wet grassland with reed and sedge swamps below, but the steepness of the canal bank in all areas prevented the conditions that would be required by *Vertigo* species on a year-round basis.

The most interesting species recorded was *Ashfordia granulata*, the silky snail, from 7b (found in the field at O 03800 38161) and at 8b (found in the field at O 02281 36801). This species is known from both Dublin and Kildare, but this adds two 1km^2 records for this near-threatened species, for which Ireland holds approximately 20% of the world population (Byrne *et al*. 2009). This snail is likely to follow the tree line and woodland areas along the canal.

The habitats improve from east to west, getting much better in section 8 towards the Kildare border. There are better snail habitats known from the Kildare side of the canal (Moorkens 1995, 2007a and b; Moorkens & Killeen 2011). The aquatic habitats of the Royal Canal also improve in this area of the canal, with the rare aquatic glutinous snail *Myxas glutinosa* recorded from the Dublin-Kildare border slipway to Collins Bridge (Moorkens & Killeen, 2005). There are no particular management recommendations for this section of canal, other than ensuring that any construction activity does not result in discharges which could pollute the aquatic habitat. The limited fringe habitats are robust and unlikely to be unduly affected by works, except for the specific locations noted as being Environmentally Sensitive Areas by BEC (2013).

3.8 Other sensitive habitats

3.8.1 Calcareous spring

A single calcareous spring was located in the canal bank in the Deep Sinking area at GPS reference 706155 737768 by the BEC survey in 2013. The spring was in a rock face created by the construction works of the canal (in the 19th century). The spring contained abundant moss and liverwort species, including *Eucladium verticillatum, Palustriella falcata, Aneura pinguis* and *Leiocolea badensis*. This type of calcareous spring corresponds to the priority Annex I habitat: Petrifying springs with tufa formation (Cratoneurion) (7220). The spring is on the north bank of the canal and should be avoided during any construction works for the proposed Greenway.

3.8.2 Ant hills

Ant hills were recorded in the 2013 BEC survey at a number of locations along the Royal Canal in the Deep Sinking (Table 11). This area supported numerous ant hills between the path and the canal bank. The ants recorded here were identified as the Yellow Meadow Ant *(Lasius flavus)*, which is the main mound-building ant and is considered widespread in Ireland (Niechoj, 2011).

Table 11. Location of ant hills along the Royal Canal in the study area (Brophy & Devaney 2013).

Section no.	Section	Location	ITM grid reference
3	Granard Bridge to Kirkpatrick Bridge	Railway embankment	707539 737799
3	Granard Bridge to Kirkpatrick Bridge	Between canal and path	707415 737750
3	Granard Bridge to Kirkpatrick Bridge	Between canal and path	707531 737800
3	Kirkpartrick Bridge to Kennan Bridge	Between canal and path	706386 737692



Figure 11. Typical anthill in undisturbed grassland

Well-developed ant hills are a sign that a grassland has remained undisturbed for some time, increasing the likelihood that the habitat supports high species diversity and may be of conservation value. It is likely that the abundance of ant hills in the Deep Sinking is due to the inaccessibility of the area for machinery, resulting in lower maintenance compared to the towpath further west. The use of tractor-mounted mowers on the towpath and other path maintenance works in Section 1 appear to have prevented the development of large ant hills despite the presence of the Yellow Meadow Ant in these areas also. The limited area of undisturbed semi-natural grassland in Dublin and Kildare means that there are few areas that will support ant hills (Brophy & Devaney 2013).

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4 EVALUATION

The habitats along the full section of the proposed Royal Canal Urban Greenway were mapped and described in the BEC survey (Brophy & Devaney 2013). The present survey has confirmed the continued presence of these habitats. Table 10 provides an evaluation of those habitat types that could potentially be affected by the Greenway development and a list of general constraints to be taken into account during construction and operation.

Table 12. Evaluation of habitats with constraints and mitigation for proposed Royal Canal Urban Greenway development

Ecological evaluation	Habitat types (Fossitt 2000)	Criteria for evaluation	Constraints and Mitigation
High Value	WN2 Oak-ash-hazel woodland	Areas of the habitat types listed in Annex I of the Habitats Directive but which do not satisfy the criteria for valuation as of International or National importance.	Avoid *any* adverse impacts either direct or indirect, during construction or operation. No other mitigation is recommended.
	FP1 Calcareous spring	Semi-natural habitat types with high biodiversity in a regional context and a high degree of naturalness, or populations of species that are uncommon within the County.	Avoid *any* adverse impacts either direct or indirect, during construction or operation. No other mitigation is recommended.
	GS2 Dry meadows and grassy verges with indicators for Annex 1 habitat	Includes some areas of habitat that correspond to the habitat 'Lowland hay meadows *(Alopecurus pratensis, Sanguisorba officinalis)'* listed in Annex 1 of the EU Habitats Directive	Set back the pathway at least 1m from the edge of the canal. Avoid any impacts on this fringe vegetation during construction or maintenance of the pathway.
	BL1 Stonework in bridges and walls	Potential for bat roosts	Survey for bat roosts prior to construction. Implement mitigation recommended in section 1.3.7 above
Moderate Value	FS1 Reed and large sedge swamp FS2 Tall-herb swamp WD1 Mixed broadleaved woodland GM1 Marsh GS4 Wet grassland	Semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon within the local area	Limit adverse impacts to minimum required to complete the scheme. Avoid removal of these habitats where possible. Do not remove vegetation during the period 1st March to 31st August to avoid impacts on breeding birds. Implement standard pollution controls during construction. Implement mitigation to reduce impacts. Where impacts cannot be avoided implement habitat restoration or creation.
Low Value	FW3 Canal water body FW4 Drainage Ditches WL1 Hedgerows WL2 Treelines WS1 Scrub	Habitats that are relatively common in the local area but are unimproved.	Implement standard pollution controls during construction. Do not remove vegetation during the period 1st March to 31st August to avoid impacts on breeding birds.

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Appendix 1: Natural heritage area site synopsis

SITE NAME: ROYAL CANAL pNHA

SITE CODE: 002103

The Royal Canal is a man-made waterway linking the River Liffey at Dublin to the River Shannon near Tarmonbarry. There is a branch line from Kilashee to Longford Town. The canal pNHA comprises the central channel and the banks on either side of it. The main water supply is from Lough Owel (also an NHA) via a feeder channel into the canal at Mullingar. The Royal Canal was closed to navigation in 1961. The section of canal west of Mullingar was allowed to dry out, and the eastern section silted up and became overgrown. Restoration began in 1988, and is still in progress.

A number of different habitats are found within the canal boundaries - hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The hedgerow, although diverse, is dominated by Hawthorn *(Crataegus monogyna).* On the limestone soils of the midlands Spindle *(Euonymus europaeus)* and Guelder-rose *(Viburnum opulus)* are present. The vegetation of the towpath is usually dominated by grass species. Crested Dog's-tail *(Cynosurus cristatus),* Quaking Grass *(Briza media)* and Sweet Vernal-grass (Anthoxanthum odoratum) are typical species of the calcareous grasslands of the midlands. Where the canal was built through a bog, soil (usually calcareous) was brought in to make the banks. The contrast between the calcicolous species of the towpath and the calcifuge species of the bog is very striking.

Otter spraints are found along the towpath, particularly where the canal passes over a river or stream. The Rare and legally protected Opposite-leaved Pondweed *(Groenlandia densa)* (Flora Protection Order 1987) is present at one site in Dublin, between Locks 4 and 5. *Tolypella intricata* (a stonewort listed in the Red Data Book as being Vulnerable) is also in the Royal Canal in Dublin, the only site in Ireland where it is now found.

The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than in the presence of rare species. It crosses through agricultural land and therefore provides a refuge for species threatened by modern farming methods.

13th February, 1995.

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Appendix 2: Literature review of effects of lighting on bats

The following are summaries or extracts from a selection of research papers on the potential impact of lighting on bats. Anthropogenic light pollution is an increasing global problem, affecting ecological interactions across a range of taxa and impacting negatively upon critical animal behaviours including foraging, reproduction, and communication. Almost all bats are nocturnal and previous studies have shown that bat species adapted to foraging in open environments feed on insects attracted to lamps of varying lighting regimes.

Artificial lighting can affect bats in different ways. For many species, including bats, the natural light regime is a cue that synchronizes their window of activity with the environment. The artificial illumination of maternity roosts can delay the emergence of female bats, which has important fitness costs for reproductive females as they miss the peak abundance of insects at dusk. Artificial lighting can also modify resource availability and change species foraging patterns. Slow-flying species adapted to prey on insects in cluttered vegetation, such as *Rhinolophus* spp*., Myotis* spp., and *Plecotus* spp., appear to completely avoid illuminated areas. In contrast, fast-flying species adapted to hunt insects in the open air, such as *Pipistrellus pipistrellus*, appear to benefit from new and predictable foraging opportunities provided by streetlights. Studies on the effects of light intensity on bat activity have highlighted that even low levels of Artificial Light At Night (ALAN) have a detrimental effect on the activity of light-averse species.

The attractiveness of lighting to insects, and therefore to bats that exploit these congregations of prey, is linked to the amount of short-wavelength light produced, particularly ultraviolet (UV). Traditional mercury vapour lamps produced large amounts of UV light and had high attractiveness. There is also evidence that the acoustic defences of tympanate (hearing) moths, which allow them to evade hunting bats, are compromised at mercury vapour lights. By contrast, the replacement orange low-pressure sodium lamps are effectively monochromatic, producing no UV, and are therefore much less attractive to insects or bats. The newer pinkish-yellow high-pressure sodium lights have a broader spectral composition, but still relatively little short-wavelength emissions. Like low-pressure sodium, they are therefore much less attractive to insects than mercury vapour: several studies report that insect abundance is around 50% lower, and moths 75% lower at high-pressure sodium compared with mercury vapour lights.

Stone *et al.* (2009) erected high-pressure sodium lights that mimic the intensity and light spectra of streetlights along commuting routes of lesser horseshoe bats *(Rhinolophus hipposideros).* Experimental hedges were illuminated with high-pressure sodium (HPS) streetlights to an average of 53.09 lux (SD = 2.73, range = 47.3–60.2, n = 36). Their experiments demonstrated that bat activity was reduced dramatically and the onset of commuting behaviour was delayed in the presence of lighting, with no evidence of habituation to the presence of such lighting over a period of time. These results demonstrate that light pollution may have significant negative impacts upon the selection of flight routes by bats. But their experiments also showed that once a hedgerow is lit up, the unlit side of the linear habitat feature is also not used. This they consider unsurprising that few bats flew along the unlit side of the hedge, given that light levels on the unlit side on lit nights (mean 4.17 lux) were significantly higher than those along dark hedges (mean 0.45 lux); even these relatively low light levels may make established routes unsuitable for commuting.

In addition, Stone *et al.* (2009) reported that bat activity commenced significantly later on lit nights (mean 78.6 min after sunset) compared to the control treatments. The results from this study imply that light pollution may fragment the network of *R. hipposideros* commuting routes, causing bats to alter their commuting behaviour, which could have significant conservation consequences. Disruption of animal spatial behaviour can decrease energetic gains and increase costs by increasing flight time and stress and cortisol levels, which may in turn reduce survival and reproductive success. For bats, such effects are likely to be more pronounced during periods of high energetic demand such as during the maternity season.

Stone *et al.* (2009) showed that LED street lights caused a reduction in activity of slow-flying bats (such as *Rhinolophus hipposideros* and *Myotis* spp.). Both *R. hipposideros* and *Myotis* spp. activities were significantly reduced even during low light levels of 3.6 lux. There was no effect of LED lighting on the relatively fast-flying *Pipistrellus pipistrellus, Pipistrellus pygmaeus* and *Nyctalus/Eptesicus* spp. This study showed that LED lights can potentially fragment commuting routes for bats with associated negative conservation consequences.

Azam *et al.* (2018) showed that while streetlight attraction effect was mostly limited to a 10m radius for *Pipistrellus* sp. and *Nyctalus* sp., streetlight avoidance was detected at up to 25 and 50m for *Myotis* sp. and *Eptesicus serotinus,* respectively. Streetlight effects on *Myotis* sp. and *Nyctalus* sp. remained after lamps were turned-off. The study showed that illuminance had a negative effect on *Myotis* sp. below 1 lux, a mixed effect on *E. serotinus*, and a positive effect on the other species, although a peak of activity was observed between 1 and 5 lux for *P. pipistrellus* and *N. leisleri*. The authors recommend separating streetlights from ecological corridors by at least 50m and avoiding vertical light trespass beyond 0.1 lux to ensure their use by light-sensitive bats.

The negative effect of Artificial Light At Night (ALAN) on four species of bats was investigated as part this study by Azam *et al*. (2016). Artificial Light At Night (ALAN) is defined as an urban-induced pollution that affects a substantial part of world and it is considered to be increasing on average by 6 % per annum worldwide. However, the responses of bats to ALAN at a landscape scale are unclear. At a local scale, bat responses to ALAN vary among species according to their foraging strategy and flight abilities. In general, it is considered that slow-flying species, that are adapted to prey on insects in cluttered vegetation, such as *Rhinolophus* spp. and *Myotis* spp., are more likely to be affected by illuminance. In contrast, fast-flying species adapted to hunt insects at dusk in the open air, such as *Pipistrellus* spp. and *Nyctalus* spp., can benefit from new and predictable foraging opportunities provided by streetlights which can attract a large proportion of the surrounding flying insect biomass.

In this context, ALAN is likely to be a driver of habitat loss and fragmentation for slow-flying species while creating new and predictable foraging opportunities in the landscape for fast-flying species. However, movements and gap-crossing behaviours of fast-flying species can also be altered by ALAN in urban landscapes, suggesting that an increase in landscape-scale level of ALAN may reduce landscape connectivity for all species regardless of their foraging strategy. Such an increase may also reduce the availability of suitable dark roosting sites in the landscape although essential for the reproduction of all bat species. The authors characterized the landscape-scale impacts of ALAN on 4 insectivorous bat species *Pipistrellus pipistrellus, Pipistrellus kuhlii, Eptesicus serotinus, Nyctalus leisleri,* and compared the extent of their effects to other major land-use pressures. The impact was significant for *P. pipistrellus, P. kuhlii* and *E. serotinus,* but not for *N. leisleri*. This suggests that even if a streetlight can present foraging advantages for some species of bats locally, at a landscape-scale level, ALAN generates a landscape ‘‘filter’’ that negatively influences the occurrence and activity of bats in a given place.

Mathews *et al.* (2015) investigated the implications of lighting for abundant and widespread bats with important ecosystem functions. *Pipistrellus pipistrellus, P. pygmaeus, N. noctula, N. leisleri* and *E. serotinus* are all generally considered light-attracted, potentially using the insect congregations that accumulate at street lamps. However, in the largest investigation to date, this study showed that their activity is not increased, except possibly for *N. leisleri* and for *P. pipistrellus* under certain habitat conditions. For *P. pipistrellus*, activity was actually lower in the lit habitats studied in the English transect study except for where dense tree cover was available, and in the widest scale study (Irish transect study) we found no evidence for increased activity of pipistrelles in transects with lights.

Although part-night lighting schemes have been adopted by many local authorities across Europe to reduce the carbon footprint and save energy, their effects on biodiversity are unknown. This was investigated by Azam *et al*. (2015). It has been suggested that this measure, so-called part-night lighting, is unlikely to limit the impacts of artificial lighting on biodiversity because it does not coincide with the activity peaks of most nocturnal organisms, which occur at dusk when public demand for outdoor lighting is very high. There was significantly more activity on part-night lighting sites compared to full-night lighting sites for the late-emerging, light-sensitive *Plecotus* spp., and a similar pattern was observable for *Myotis* spp., although not significant. In contrast, part-night lighting did not influence the activity of early emerging bat species around streetlights, except for *Pipistrellus pipistrellus* for which there was significantly less activity on part-night lighting sites than on full-night lighting sites. Overall, no significant difference in activity between part- and full-night lighting sites were observed in 5 of the 8 species studied, suggesting that current part-night lighting schemes fail to encompass the range of activity of most bat species. We recommend that such schemes start earlier at night to effectively mitigate the adverse effects of artificial lighting on light-sensitive species, particularly along ecological corridors that are especially important to the persistence of biodiversity in urban landscapes.

Many local authorities are replacing old lighting stock such as low-pressure sodium (LPS) and high-pressure sodium (HPS) street lights with light-emitting diode (LED) street lights [5]. LED street lights offer

a number of advantages over older lighting technologies, including increased energy efficiency, flexibility and longevity. Rowse *et al.* (2018) conducted a field experiment to determine how light intensity affects the activity of the light-opportunistic *Pipistrellus pipistrellus* and light-averse bats in the genus *Myotis*. Four lighting levels controlled under a central management system at existing street lights in a suburban environment (0, 25, 50 and 100% of the original output). Higher light intensities (50 and 100% of original output) increased the activity of light-opportunistic species but reduced the activity of light-averse bats. Compared to the unlit treatment, the 25% lighting level did not significantly affect either *P. pipistrellus* or *Myotis spp*. The results suggest that it is possible to achieve a light intensity that provides both economic and ecological benefits by providing sufficient light for human requirements while not deterring light-averse bats. At the low lighting level (25%), as less light was distributed from the light source, it is likely that dark corridors were created that light-averse species, such as *Myotis* spp., could fly along, either as a more efficient commuting route or even to forage. However, once the street light intensities exceeded 11.35 lux, the perceived threat of predation becomes too great, significantly reducing the number of Myotis spp. passes near the street lights.

Even when LED street lights were dimmed to a low level (mean 3.6 lux, range 2.90–4.86 lux), there were significantly fewer passes from the light-averse bats *Myotis* spp. and *Rhinolophus hipposideros* than on unlit nights. However, dimming street lights to intensity below 3.6 lux may not be feasible: street lights exist for human safety and if humans cannot see their surroundings clearly because the light intensity is too low, this nullifies the benefits of having street lights.

The All Ireland Daubenton's bat Waterways Survey has collated lighting details along 1km transects and has shown that the level of Daubenton's bat activity is reduced by up to 15% in the presence of lighting (Aughney *et al*. 2012, Aughney *et al*. 2017). Linear habitat features are important for many bat species at the landscape level. Many other slow-flying bat species avoid open areas, typically flying within vegetation cover, commuting along hedgerows or tree lines between roosts and foraging areas. Bats use linear landscape features for increased insect abundance, shelter from wind and rain, acoustic orientation, and predator avoidance. Reliance on linear habitat features makes bats vulnerable to habitat fragmentation.

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APPENDIX I – Detailed Technical Note outlining the comparisons between route options on the northern and southern side of the Royal Canal.

TECHNICAL NOTE 170239/14

Subject:	Deep Sinking Preliminary Designs (Ch. 6250 – 7800)	**Produced by:**	MK
Project:	Royal Canal Urban Greenway	**Checked by:**	RK
Job No:	170239	**Date:**	24th May 2021

1.0 Introduction

1.1 Purpose

1.1.1 This technical note summarises preliminary design options for greenway route options to the north and south of the Royal Canal in the area known as the 'Deep Sinking', between Coolmine and Castleknock train stations (Ch. 6250-7800). The 'Route Options Assessment Report' presents the route option development and assessment process for the entire 8.1 km length of the Scheme including 11 route options for the area between Coolmine & Castleknock.

1.1.2 A number of submissions made as part of the non-statutory public consultation held in 2019 suggested that the greenway be along the southern embankment rather than the Emerging Preferred Route as presented along the northern embankment. Fingal County Council subsequently requested that DBFL develop preliminary designs for the northern and southern embankments for this section so more detailed considerations including constructability and environment could be incorporated into the updated route options assessment to determine the Preferred Route for the Scheme.

1.1.3 These preliminary designs were also informed by site investigations undertaken by Ground Investigations Ireland 'Ground Investigation Report (Rev B)' as well as consultation with stakeholders such as Waterways Ireland, Iarnród Eireann, the NTA, An Garda Siochana & FCC officials. Design options developed for the southern embankment were also subjected to independent expert peer review by Gavin & Doherty Geosolutions Ltd (GDG).

1.1.4 The two principal options that are considered technically feasible, and are considered in greater detail in this Note are:

- Along the southern embankment (existing towpath) of the Royal Canal, which includes a cantilevered boardwalk design to achieve the proposed 4m greenway width due to limited width on the towpath.
- On the northern side of the canal (as per Emerging Preferred Route), on the upper embankment to the rear of houses in Delwood Park and into the open space (green area) at Brompton (to minimise the impact on sensitive trees). A new pedestrian/cycle bridge will link the greenway between Brompton and the southern embankment of the Canal.

1.1.5 The design elements of these options will be discussed in **Sections 2 & 3** while a comparison between the 2 options in provided in **Section 4**. The Note concludes in **Section 5** by providing a summary of the Preferred Route for this section of the Royal Canal Urban Greenway.

1.1.6 A schematic outlining the principle route options on the northern and southern embankments of the Royal Canal is illustrated in **Figure 1.1** overleaf.



Figure 1.1 Route Options on the Northern and Southern side of the Royal Canal

2.0 Southern Embankment Option

2.1.4 The route option to the south of the royal canal involves 800m of concrete supporting structure for the greenway path to achieve the 4m greenway width. Two distinct structure types have been developed to suit geotechnical conditions, the available width of the towpath and proximity to the railway line, these are termed **Zone 1** and **Zone 2**, refer to **Figure 2.1** below.

- **Zone 1** - Area with Underlying Rock or Competent Glacial Till - Boardwalk Separated from Rail Line by Embankment.
- **Zone 2** - Area with Underlying Competent Glacial Till - Boardwalk Directly Alongside Boundary Wall & Rail Line.



Figure 2.1 Locations of the two distinct structure types on southern embankment (Zone 1 & Zone 2)

2.2 Zone 1 structure type (approx. 700m)

2.2.4 Along Zone 1, the railway track level is between 0.5m and 3.75m higher than the towpath, with the greatest level difference observed adjacent to Coolmine Station. The increase in level between the towpath and the railway track is due to an apparent man-made embankment. There is evidence of a historic stone masonry wall in the

lower half of the embankment at various locations along the initial 200m extending from the Kirkpatrick bridge as shown in **Figure 2.2** and **Figure 2.3**. This wall is inclined at approximately 60° to the horizontal. The stone wall is in poor condition, as the blocks appeared to be loosened with soil between the blocks in place of mortar. The wall is also heavily overgrown by vegetation, and the roots from this vegetation intrude the gaps between stone blocks. From site observations, it is likely that this wall is acting less like a retaining wall and is more likely contributing dead weight at the base of the slope to maintain the stability of the slope alongside the mature vegetation.



Figure 2.2: Apparent masonry retaining wall supporting Coolmine Train Station Platform 1



Figure 2.3: Apparent masonry retaining wall supporting Dublin-Sligo railway line

2.2.5 For Zone 1, a cantilevered type boardwalk design would be the preferred option due to the inadequate width along this section. This structure type will be secured to the towpath via vertical tension anchors, most likely installed from a barge on the canal. This would require the closure of the canal during the construction period due to width constraints as the canal is approx. 8 - 9m wide along Zone 1 and a barge width is typically in excess of 7.5m, see **Figure 2.4** below. The construction period/closure of the canal for Zone 1 could take approximately 6 months which Waterways Ireland has indicated would not be acceptable.

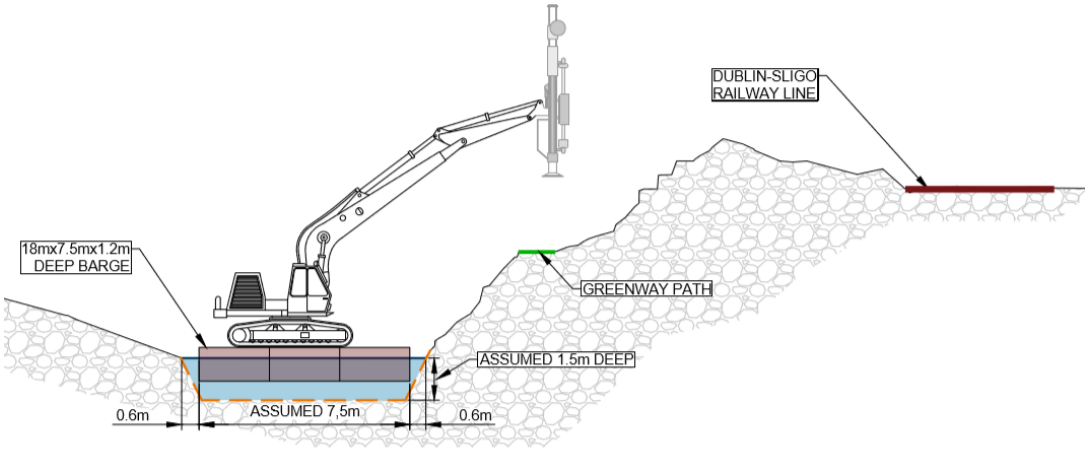


Figure 2.4 Drilling rigs or excavators using a barge on the canal as a working platform.

2.2.6 The front edge of the cantilever may experience tension due to wind buffeting and so will be connected to a diagonal tension anchor. Where rock anchoring is not available these tension anchors will terminate in the glacial till, minimum length of a tension anchor is noted to be 3m.

2.2.7 It is likely that the depth of overburden is relatively shallow, as the railway line is in close proximity to the slope crest and as such is anticipated to be constructed on competent rock. The shallow depth of soil along the slopes adjacent to the Coolmine Station are to be protected from erosion using a geocell anti-erosion net. Once the geocell anti-erosion mat is laid and seeded, it will act to stabilise the slope in the permanent condition and will bring the stability of the slope within the requirements of the current geotechnical design codes. To place the geocell anti-erosion net, the majority of the existing vegetation will have to be removed with the geocell to span between mature trees that are deemed to be in an acceptable condition. It is recommended that the slope is probed prior to devegetation to determine the depth to rock behind the slope face and permit an assessment of the slope stability.

2.2.8 All works would require monitoring of the railway line for potential settlement.

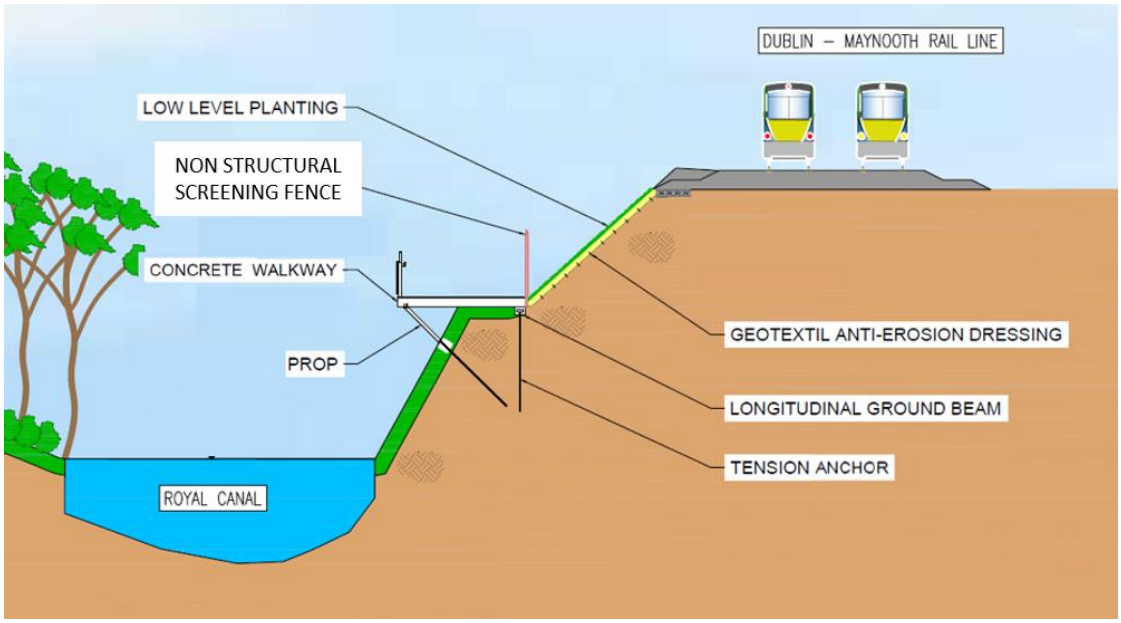


Figure 2.5 Zone 1 structure type



Figure 2.6 Photograph of existing southern embankment in Zone 1 (facing west toward Kirkpatrick bridge)



Figure 2.7 Photomontage of cantilevered boardwalk in Zone 1 (facing west toward Kirkpatrick bridge)

2.2.9 Provision of a cantilevered boardwalk greenway along the southern towpath between Kirkpatrick Bridge and 600m west of Granard Bridge would have a significant visual impact on the Royal Canal and would result in loss of trees on the upper embankment. The Royal Canal is designated as a Protected Structure. See **Figures 2.6 & 2.7** above.

2.2.10 Approaching Kirkpatrick Bridge (from the east) there is approximately 1.2m width between the retaining wall (Irish Rail) and the pedestrian bridge pier (Ch. 6250). To provide a 4m greenway on approach to Kirkpatrick bridge (pinch point between the pedestrian bridge and the retaining wall) would require land acquisition from Iarnród Eireann at the pedestrian entrance to the eastbound platform of Coolmine Station. However, Iarnród Eireann have stated that this access would likely be retained and enhanced as part of the Dart + West works. As such the suggested land acquisition would not be feasible. Widening to the north, would impact on the existing pedestrian bridge piers which would likely result in the retrofitting or removal of the existing pedestrian bridge.



Figure 2.8 Pinch point between the pedestrian bridge and Coolmine Station pedestrian access (facing eastwards)

2.3 Zone 2 structure type (approx. 200m)



2.3.4 At the second pinch point (Ch. 7000-7160), Zone 2 (created by the railway masonry retaining wall and the towpath) the anchored cantilever option with upper embankment works would not be feasible due to the limited width along the towpath, separation to the rail line and the Iarnród Eireann requirement for minimum 2.04m horizontal separation requirement from the centre of outer track to continuous fence line. Currently the minimum separation between the existing masonry retaining wall and the outer railway track is approx. 2.076 m at this pinch point location.

2.3.5 The existing masonry gravity retaining wall along the eastern end of the site has a near vertical orientation. The stone retaining wall is in better condition than the wall adjacent to the Coolmine Train Station. The mortar between rock blocks is present and the facing is relatively even. However, the wall appears to be overturning in the direction of the towpath and previous efforts including retrofitted concrete buttresses to rectify this instability are evident in the area. Based on these constraints, a potential design proposal is to install a structural facing to overlie the face of the existing wall without demolishing the existing wall. The structural facing would then be tied back by steel anchors beneath the railway track. The railway embankment/existing retaining wall will be secured via anchors at 20° to the horizontal, at depths 0.5 and 1.5m below the retained ground level (railway embankment) at the 2m high wall face. These tie-back anchors will protrude under the railway line and would compromise or preclude the installation of OHLE equipment in these locations. The feasibility of undertaking the works during the operational hours of the railway line will have to be discussed with Iarnród Eireann but are unlikely to be possible without significant disruption/constraints/cost etc that would render this option less feasible. All works would require monitoring of the railway line for potential settlement.

2.3.6 The greenway structure is secured via two vertical screw or driven piles with some tension capacity. The available towpath width at this zone is such that one of the vertical piles would be required to be installed within the envelope of the canal. Owing to the existing width of the towpath and the vertical separation between canal water level and towpath level, a diagonal prop is not considered appropriate.

2.3.7 Piling into the canal bed could have a significant impact on the structural integrity of the canal bed in the 'Deep Sinking'/narrow rock cutting section. In discussions, Waterways Ireland were not in favour of invasive ground investigations into the canal bed for this reason.

2.3.8 This structure type will be secured to the towpath from a barge on the canal. This would require the closure of the canal during the construction period, due to width constraints as the canal is approx. 10 - 12m wide (excluding trees overhanging the canal) along Zone 2 and the barge width is typically in excess of 7.5m. The construction period/closure of the canal for Zone 2 could take a minimum of 4 months which represents a significant constraint on this potential option.

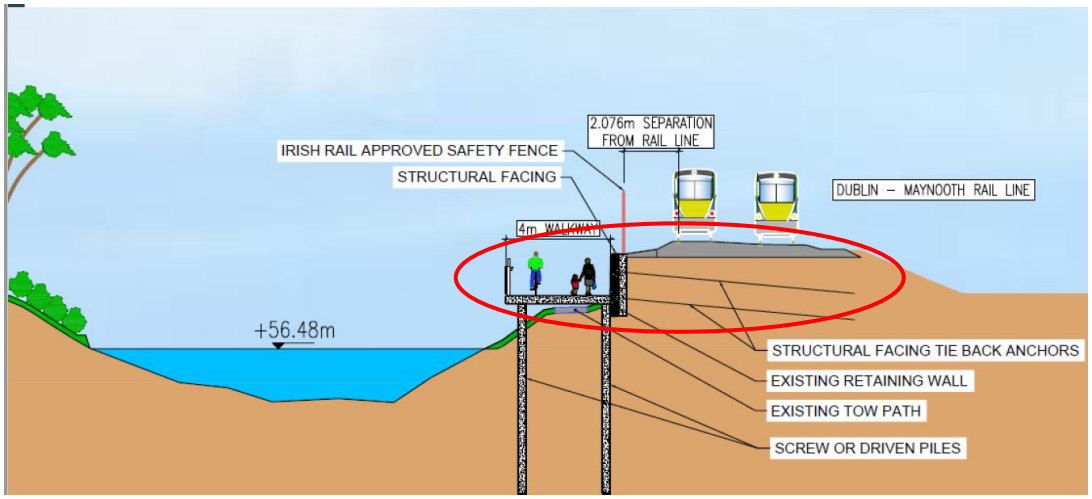


Figure 2.9 Zone 2 structure type

2.3.9 For the remainder of the route along the southern towpath there is sufficient width to provide a 4m wide bituminous greenway, by widening the existing towpath into the grass verge on the southern side (potential removal of some vegetation). There is sufficient room along this section of the southern embankment to construct the greenway on the towpath, without impacting on the canal or the railway line.

Construction machinery can gain access to this section of the towpath via Castleknock Station. This remaining section is also common to the second option (Northern Option).

Consultation with Iarnród Éireann

2.3.10 A number of meetings have been undertaken with Iarnród Éireann to discuss the route option along the southern towpath from Coolmine Station to Castleknock Station and the interaction between the DART+West proposals and the Royal Canal Urban Greenway.

2.3.11 In terms of the greenway option along the southern towpath adjacent to the Railway Line, Iarnród Éireann outlined the following:

i. Impact on slope stability between the railway embankment and the greenway will need to be preserved. Monitoring for settlement would be required in accordance with IÉ specification CCE-TRK-SPN-010.

ii. Security of the rail line will need to preserved either by retaining existing fencing or replacement fencing.

iii. If existing vegetation is to be cut back at all it should be to the boundary/fence only.

iv. Greenway works should not be impinging on IE existing boundary and IE existing embankment above tow path level. New fence should be installed at the existing boundary/bottom of the existing slope and work outside that fence

v. Minimum 2.04m lateral clearance from the railway line to the proposed greenway infrastructure required.

vi. Any infrastructure such as anchors below the retained ground level (railway embankment) could possibly be severed during the installation of future Overhead infrastructure required for the Dart + West scheme. Permanent anchors under the railway were not welcomed by IE. IE cannot guarantee that these anchors are not going to be severed at some stage in the future including piling for overhead stanchions.

vii. In locations of tight clearances at present it is unlikely that undertaking these works during the normal running of trains will be allowed and they will therefore have to happen during possessions at night.

viii. Impact of possible train derailment to be considered or risk assessed

3.0 Northern Embankment Option

3.1.4 The Greenway will be provided on the northern side of the Royal Canal from Kirkpatrick Bridge to a proposed ped/cycle bridge at Ch. 6250-7250 between Kirkpatrick Bridge and Granard Bridge.

3.1.5 For this route, where possible, a paved greenway will be the primary solution with the standard 4m wide raised boardwalk utilised as a secondary solution on steep and uneven terrain.



Figure 3.1 Photomontage of the Elevated Greenway at Coolmine Road facing east.

3.1.6 At a rock inlet which is a historic quarry section (Ch. +6500m) a 30m single span composite steel beam and concrete deck bridge is proposed, incorporating some earth retaining elements. See **Figure 3.2** below and for further details, see drawing 170239-9110 in **Appendix A**.

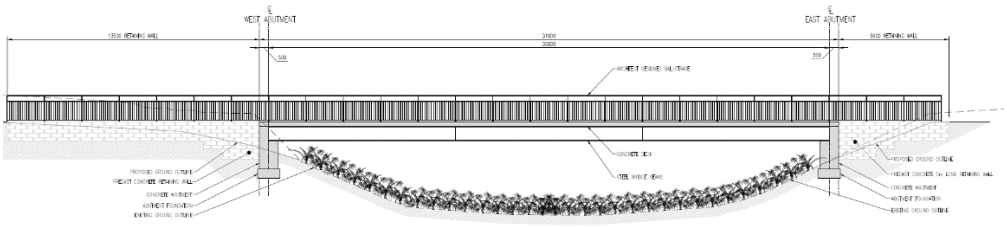


Figure 3.2 Disused quarry bridge elevation

3.1.7 To minimise the impact on highly sensitive trees (Oak-Ash-Hazel Woodland WN2) and habitats, the Preferred Route is proposed near the top of the northern embankment (adjacent to Delwood Park residential back gardens) and into the open space at Brompton. To prevent the greenway overlooking the back gardens of the residents of Delwood Park and for security reasons, the ground level of the greenway would be lowered. Also, security fencing and defensive planting will be provided between the greenway and the back gardens to increase security and any visual intrusion.



Figure 3.3 Photomontage of Greenway behind Delwood Park residential back gardens

3.1.8 Construction of the greenway on the northern side of the canal will be via access locations at Coolmine Road and the Brompton green area. For example, to construct the Quarry Bridge mentioned above, the greenway will be constructed to basecourse from either side of the bridge via Coolmine Road (west) and Brompton. The greenway will act as a haul road for the construction of the bridge. Mini-diggers will be able to track to the bridge location, spoil will be removed by dumpers and the steel beams can be craned into position from both sides and bolted in situ. The constructability plan for the Quarry Bridge is outlined in figure 170239-9122 in **Appendix B**.

3.1.9 The construction of the greenway on the northern embankment would not impact on the rail network or the use of the canal. Construction works could be undertaken during the day time, minimising noise and nuisance.

3.1.10 This option proposes a new pedestrian/cycle bridge (Landmark Bridge Ch + 7180m) which will link the greenway from the Brompton open space to the southern embankment of the Canal. The steel bridge will have span of 30m across the Royal Canal. The foundation design includes large diameter piled foundations to dense sands and gravels or bedrock where available. A geological fault is noted in a direction skew to the canal in this area, however, it is not viewed as a significant geotechnical risk item as the sands and gravels overlying the variable bedrock are sufficiently dense to facilitate a piled foundation. Similar to the bridge at the quarry, the greenway will be constructed either side of the canal, therefore, providing access to construct the abutments and to crane the steel beams into position. Alternatively, the steel beams could be transported and craned into position from a barge.



Figure 3.4 Landmark bridge main span

3.1.11 The proposed ped/cycle bridge tie-in on the southern towpath has been chosen east of the pinch point at Ch. 7000-7160 (created by the railway masonry retaining wall and the towpath, Zone 2). The towpath begins to widen from Ch.7220 eastwards towards Granard Bridge, which provides sufficient available width for the bridge abutment and greenway, while maintaining at least 4.5m (minimum) separation from

Iarnród Eireann assets. The proposed bridge will be architecturally designed to be aesthetically pleasing and fit into surrounding environment.

3.1.12 For the remainder of the route along the southern towpath, there is sufficient width to provide a 4m wide bituminous greenway, by widening the existing towpath into the grass verge on the southern side (potential removal of some vegetation). There is sufficient room along this section of the southern embankment to construct the greenway on the towpath, without impacting on the canal or the railway line. Construction machinery can gain access to this section of the towpath via Castleknock Station. The existing towpath on the southern side of the canal will be maintained and will run under the proposed bridge.

4.0 Comparison between the route option on the southern embankment and on the northern embankment

4.1.4 **Table 4.1** below provides a comparison between the route option on southern embankment (existing towpath) and on the northern embankment on the section of the route between Kirkpatrick Bridge (Coolmine Road) and 400m west of Castleknock Station.

	Royal Canal Comparisons between the Southern Embankment (Existing Towpath) and the Northern Embankment (Preferred Route)	
Criteria	**Southern Embankment (Existing Towpath)**	**Northern Embankment (Preferred Route)**
Constructability	This route options proposes a cantilevered boardwalk due to the inadequate width along this section. This would require the installation of a series of anchors to provide structural support to greenway. Anchoring into rock would be the preferred option (approx.950m). To prevent any settlement/slope slips on the railway embankment an anti-erosion geocell will be installed. To place the geocell anti-erosion net, majority of the existing vegetation will have to be removed with the geocell to span between mature trees that are deemed to be in an acceptable condition. Once the geocell anti-erosion mat is laid and seeded, it will act to stabilise the slope in the permanent condition and will bring the stability of the slope within the requirements of the current geotechnical design codes. Working widths for tracking equipment (drilling rigs or excavators) is limited. The precast concrete boardwalk sections would need to be transported and placed into position via a crane on a barge. The canal and towpath (southern embankment) between Kirkpatrick Bridge and Granard Bridge will need to be closed during works. At the pinch point, created by the railway masonry retaining wall and the towpath (Ch.7000-7200) the cantilevered boardwalk will be continued along this section and the existing masonry gravity retaining wall will be reinforced by providing a structural facing to overlie the face of the existing wall and secured by anchors below the retained ground level (railway embankment) at the 2m high wall face. Retrofitting or removal of the existing pedestrian bridge at Kirkpatrick Bridge may be required (pinch point 1.2m width) to provide a 4m greenway on approach to Kirkpatrick bridge.	For this route, where possible, a paved greenway will be the primary solution with the standard 4m wide raised boardwalk utilised as a secondary solution on steep and uneven terrain. At the quarry section (Ch. +6500m) a 30m single span composite steel beam and concrete deck bridge is proposed, incorporating some earth retaining elements. The bridge over the quarry section will be constructed with steel beams and concrete decking. The greenway will be constructed from either side of the quarry, therefore, providing access to construct the abutments and to roll or crane the steel beams into position and then to pump the concrete deck. A new steel pedestrian/cycle bridge will link the greenway between Brompton and the southern embankment of the Canal (Ch. 7100-7200). Similar to the bridge at the quarry, the greenway will be constructed either side of the canal, therefore, providing access to construct the abutments and to crane the steel beams into position. Alternatively, the steel beams could be transported and craned into position from a barge.
Potential impact on Rail Network	Sections of **Zone 2** are within the Iarnród Eireann 'Red Zone Working' area (within 3m of the nearest track). Along **Zone 1**, to prevent any settlement/slope slips on the railway embankment an anti-erosion geocell will be installed. To place the geocell anti-erosion net, a majority of the existing vegetation will have to be removed with the geocell to span between mature trees that are deemed to be in an acceptable condition. Once the geocell anti-erosion mat is laid and seeded, it will act to stabilise the slope in the permanent condition and will bring the stability of the slope within the requirements of the current geotechnical design codes. At the pinch point, **Zone 2** (created by the railway masonry retaining wall and the towpath) the existing wall direction of the towpath and previous efforts including retrofitted concrete buttresses to rectify this instability were evident in the area. To stabilise the railway embankment/existing retaining wall it will be secured via anchors to the horizontal. These tie-back anchors will protrude under the railway line. These anchors could possibly be severed during the installation of future Overhead infrastructure required for the Dart + West scheme. As such this could preclude the future upgrade of the rail line. Irish Rail have advised that there would likely be time and methodology restraints placed on the construction/reinforcing of the existing retaining wall in **Zone 2**. The rail line would have to be closed during these works. This would result in night works, anchoring during the night would create noise and nuisance.	This route option will not require working within the Iarnród Eireann 'Red Zone Working' area (within 3m of the nearest track). At the proposed ped/cycle bridge tie-in, the towpath begins to widen from Ch.7220 eastwards towards Granard Bridge, which provides sufficient available width for the bridge abutment and greenway, while maintaining at least 4.5m (minimum) separation from Irish Rail assets (Irish Rail Requirement). This route option will have no appreciable impact on the Iarnród Eireann network.
Impact on Canal Users	The proposed cantilevered boardwalk along the southern towpath of the canal may impact on: i. Waterways Ireland's maintenance along the southern bank of the canal. ii. The operation of barges along the route may be impacted due to the extent of the projected cantilever. iii. At **Zone 2**, the available towpath width is such that one of the vertical piles would be required to be installed within the envelope of the canal. Safety barriers will be required along the towpath for the majority of the route. These barriers may hinder the used of the towpath to tow barges (Waterways Ireland Requirement).	The Preferred Route will have no appreciable impact on canal users. The proposed pedestrian/cycle bridge will be constructed as per Waterways Ireland clearance requirements, therefore, it should not impact on the operation of barges along the canal. The bridge landing on the southern embankment will be sited and designed to maintain a continuous route along the southern towpath for canal users.
Integration with surrounding community	Accessibility to the greenway on the southern embankment is restricted between Kirkpatrick Bridge and Granard Bridge (approx. 1.5km) due to the railway line on the southern side of the towpath, thereby resulting in a less secure and effective facility.	The Preferred Route on the northern embankment permits permeability and linkages from residential catchments (Delwood Close and the Brompton green area), in accordance with DMURS principles. The exact location and number of access points for the 1.5km section between Kirkpatrick Bridge and Granard bridge will need to be further assessed/determined.
Safety During Construction	There are a number of safety concerns during construction: i. Risk of construction workers falling off the embankment (towpath) into the canal. iv. Proximity of workers to a live railway line particularly at the pinch point 400m west of Castleknock Station Ch. 7000-7160 between the canal towpath's edge and masonry retaining wall structure for Irish Rail (1-2m width).	The topography on the northern bank of the Royal Canal varies along the section (Ch. 6400 – 7150), with steep banks, particularly at the historic quarry locations. There is a risk that construction workers could fall from these steep banks when filling, bridging or re-grading of lands to achieve the desirable longitudinal gradients. There is also a potential risk of construction workers falling into the canal during the construction of the pedestrian/cycle bridge. However, the probability and severity of such incidents could be mitigated by a suitably qualified contractor.
Safety Operation Period	Safety barriers will be required along the towpath for the majority of the route, some 1km (based on the use of cantilevered boardwalk and an effective fall height ≥ 4m), to prevent people falling from height into the canal which could result in serious injury or death.	Safety barriers will be required at the steep bank/historic quarry locations, some 300-400m (based an effective fall height ≥ 4m), to prevent people falling from height which could result in serious injury or death.

Criteria	Royal Canal Comparisons between the Southern Embankment (Existing Towpath) and the Northern Embankment (Preferred Route) Southern Embankment (Existing Towpath)	Northern Embankment (Preferred Route)
Architectural Heritage	This route option has the potential to directly impact Kirkpatrick Bridge (protected structure) as the bridge would have to be modified to allow for the 4m width at the junction with Coolmine Road. This option would result in significant physical and visual alternations to the fabric of the canal (protected structure) and the protected bridge structures, along with impacts on their setting which FCC Conservation Department advised to be avoided.	The proposed route is sufficient distance from Kirkpatrick Bridge, therefore, it is unlikely that there will be any direct impact on Kirkpatrick Bridge (protected structure). This option complies with FCC Conservation Department request, that physical alterations to the fabric of the canal and the protected bridge structures, along with impacts on their setting are to be avoided. The proposed pedestrian/cycle bridge will be of high architectural value and will complement and enhance the existing Royal Canal environment/landscape.
Flora & Fauna	Providing a cantilevered structure along the towpath would result in the removal of the treeline/hedgerow between the Railway Line and the towpath. According to FCC Biodiversity department, the removal of this ecological corridor would have a detrimental impact on corridor function of the canal for fauna, particularly in terms of bats (commuting and feeding routes), birds (breeding habitat) and invertebrates (commuting and feeding routes). Disturbance to nocturnal wildlife along the royal canal may occur during the night works. Iarnród Eireann indicated a preference that replacement planting is not provided adjacent to the train line.	FCC Biodiversity Department advised that the loss of woodland on the northern embankment is not desirable, therefore, to minimise the impact on highly sensitive trees, the Preferred Route is proposed in close proximity to the back gardens of the residents of Delwood Park and into the open space (green area) at Brompton. Replacement planting is proposed between the Greenway and the residential properties to the north of the greenway.
Landscape & Visual	The Conservation Department in Fingal County Council advised that the provision of a 4m wide cantilevered boardwalk greenway (concrete or steel) along the southern towpath for 1km, would have a significant visual impact on the Royal Canal (and its status as a protected structure).	The preferred route will be hidden/separated from the northern embankment of the Royal Canal by a large woodland. There will be negligible visual impact on the Royal Canal (protected structure). The proposed new pedestrian & cycle bridge crossing from the northern side of the canal at Roselawn to the southern towpath may have a visual impact on the Roselawn Residents and on the Royal Canal. However, it will be architecturally designed to complement and potentially enhance the existing Royal Canal landscape.
Land Use Character	No appreciable impacts.	Proximity To minimise impact on highly sensitive trees, the proposed route will be located in close proximity to the back gardens of the residents of Delwood Park, which will impact upon its Land Use Character. Security Fencing and landscaping will be provided between the greenway and the back gardens to increase security. CCTV surveillance will also be placed along the greenway route to deter anti-social behaviour. Accessibility/permeability To provide accessibility/permeability to the greenway, linkages at Delwood Close and from the open space/green area at Brompton.

Table 4.1: Comparisons between the Southern Embankment (Existing Towpath) and the Northern Embankment (Preferred Route)

5.0 Conclusion

5.1.4 The aforementioned sections and table in this technical note summarise the characteristics of the design options developed for the section of the Royal Canal Urban Greenway on the northern and southern embankments.

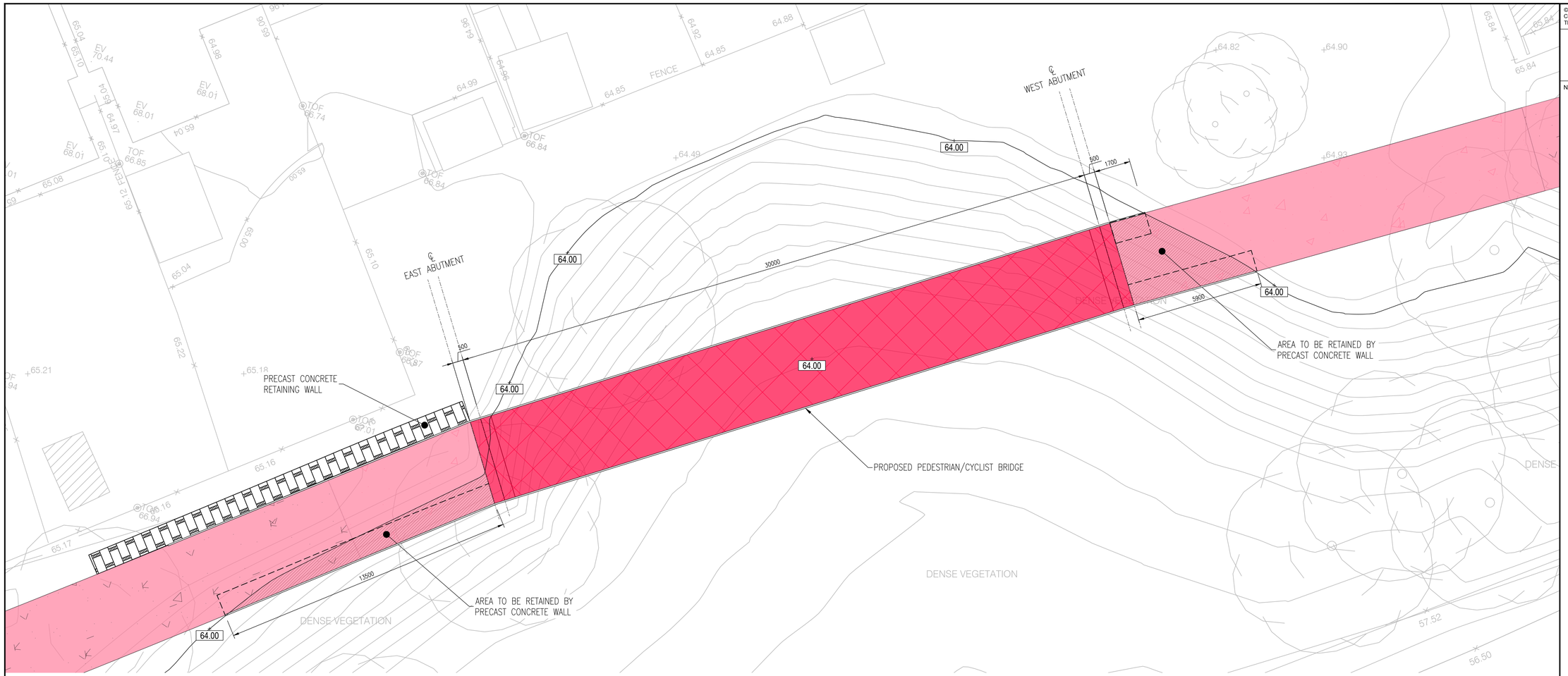
5.1.5 Based on the Route Options Assessment undertaken, the route option on the northern side of the Royal Canal offers more benefits over the option on the southern embankment. The **Northern Route Option** is the **Preferred Route Option** for the following reasons:

- The northern route option provides greater access for construction, access will be via Waterways Ireland access gate at Coolmine Road and via the Brompton green area. For the southern option, working widths for tracking equipment (drilling rigs or excavators) on the towpath is limited. It is proposed to use the canal with a barge type system for a working platform.
- The northern option will not impact on existing or proposed Iarnród Eireann infrastructure. The southern option, with the proposed cantilevered boardwalk design along the towpath (particularly at 'Zone 2' where tie-back anchors will protrude under the railway line) will impact on existing Irish Rail operations and future Dart + West proposals.
- The northern option will have no appreciable impact on canal users, the cantilevered boardwalk on the southern side may impact on Waterways Ireland maintenance along the canal and the operation of barges due to the extent of the projected cantilever. During construction/installation of the cantilevered boardwalk from a barge, the canal may need to be closed for a period of 8-12 months.
- The northern route option permits permeability and linkages from residential catchments (in accordance with DMURS principles), the southern option is restricted between Kirkpatrick Bridge and Granard Bridge (approx. 1.5km) due to the railway line on the southern side of the towpath. There would be no opportunity to provide additional access points along this section on the

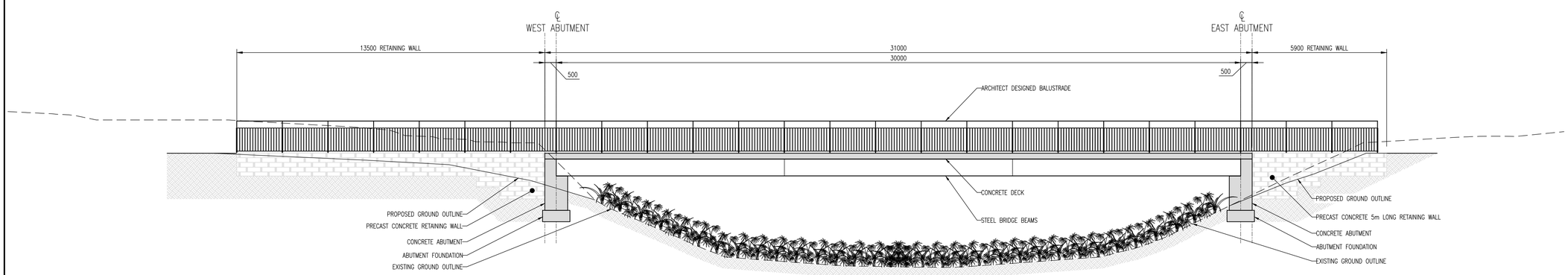
southern embankment which would create considerable security issues for greenway users.

- There will be a negligible visual impact from the northern option on the Royal Canal as the route will be hidden/separated from the northern embankment of the Royal Canal by a large woodland, compared to the proposed concrete cantilevered boardwalk greenway along the southern towpath for 1km, which would have a significant visual impact on the Royal Canal (protected structure).
- In terms of Architectural heritage, the northern route option will not directly impact on Kirkpatrick Bridge or result in significant physical and visual alternations to the fabric of the canal (protected structure).
- To minimise the impact on highly sensitive trees, the northern route option is proposed in close proximity to the back gardens of the residents of Delwood Park and into the open space (green area) at Brompton, providing a cantilevered structure along the towpath for the southern option would result in the removal of the treeline/hedgerow between the Railway Line along the towpath (approx. 1km length).

APPENDIX A – Quarry Bridge Plan & Elevation drawing (170239-9110)



UNUSED QUARRY BRIDGE - PLAN
SCALE 1:100



UNUSED QUARRY BRIDGE - ELEVATION
SCALE 1:100

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ON ORIGINAL

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NOTES:

REV.	DATE	DESCRIPTION	BY	CHKD
D0	18/12/19	ISSUED FOR DISCUSSION	MKO	KOR

DESIGN DEVELOPMENT

DESIGNED	KOR	PREPARED	MKO
DATE	DECEMBER 2019	CHECKED	WBA

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PROJECT
ROYAL CANAL GREENWAY

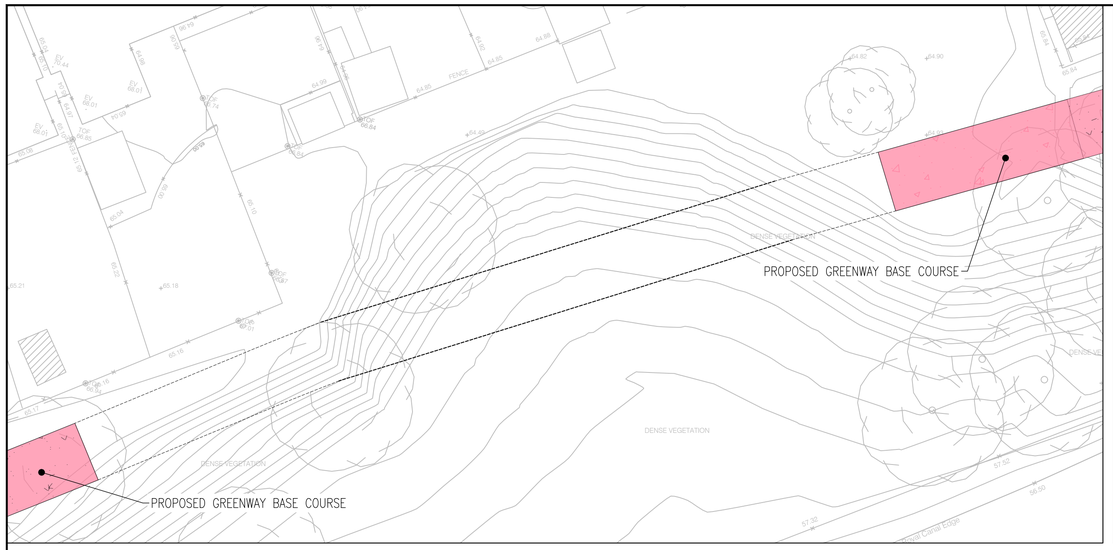
DRG. TITLE
DISUSED QUARRY - BRIDGE OPTION - PLAN & ELEVATION

CLIENT
FINGAL COUNTY COUNCIL

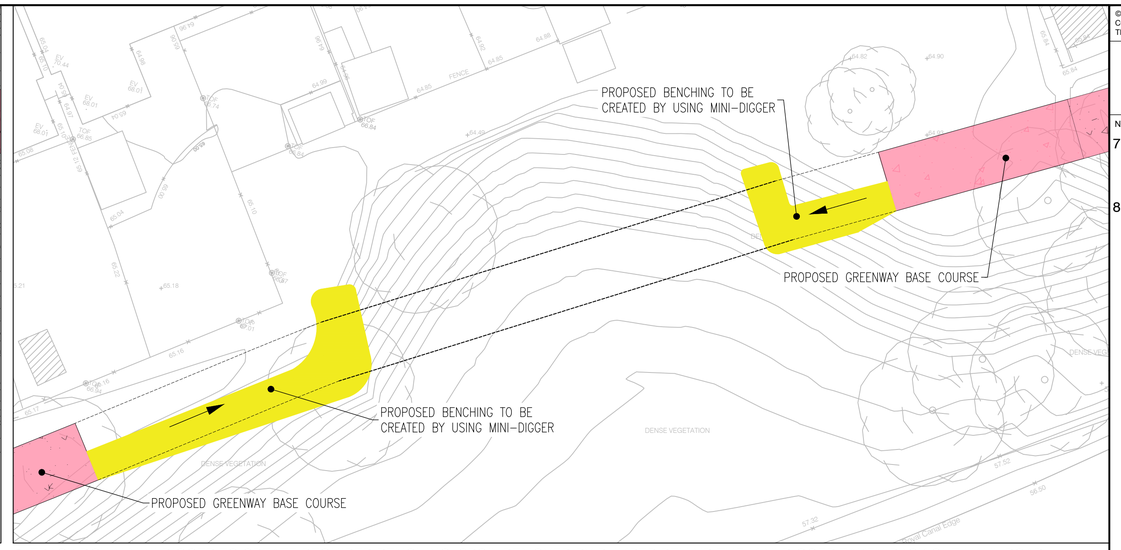
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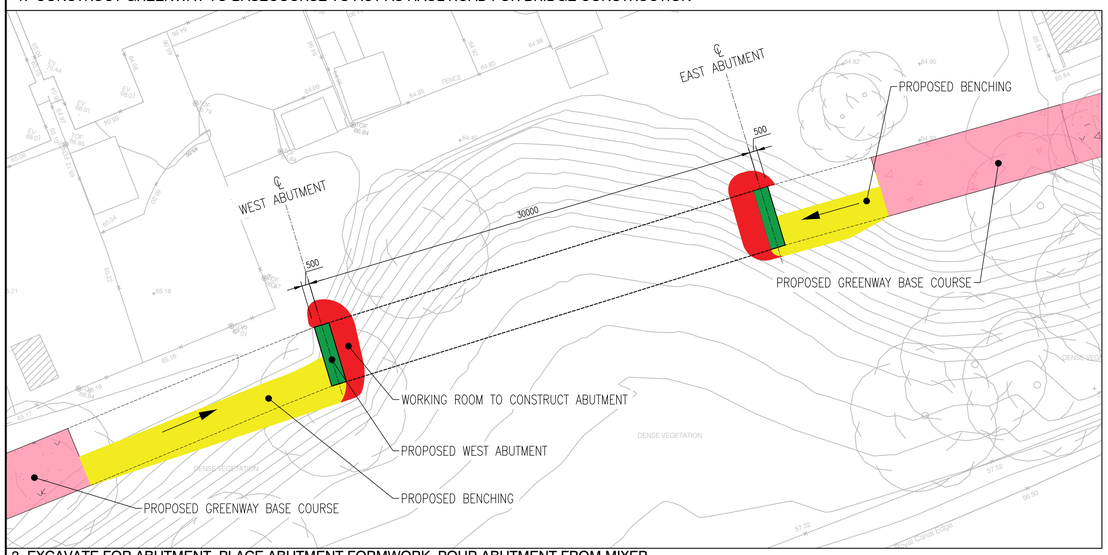
APPENDIX B – CONSTRUCTABILITY PLAN (170239-9112)



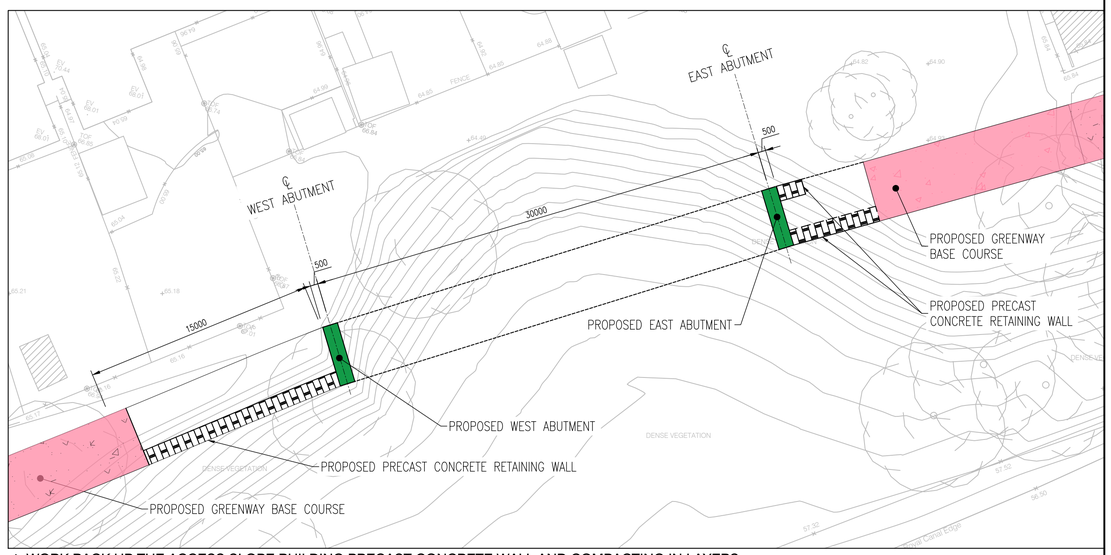
1. CONSTRUCT GREENWAY TO BASECOURSE TO ACT AS HAUL ROAD FOR BRIDGE CONSTRUCTION



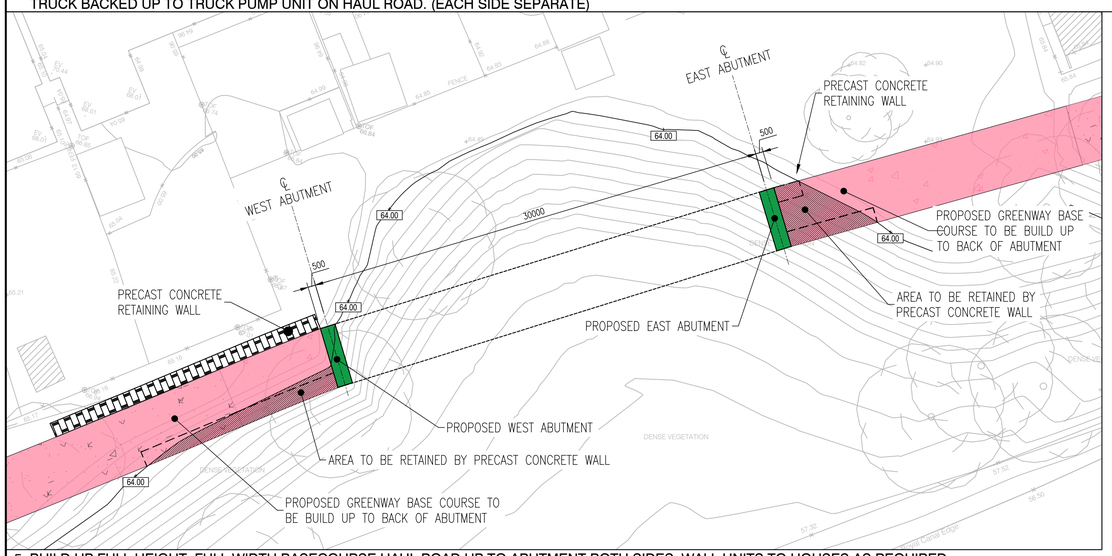
2. TRACK DOWN MINI-DIGGER TO CREATE REQUIRED BENCHING, SPOIL REMOVED BY DUMPER BEHIND THE MINI-DIGGER TAKEN BACK OUT HAUL ROAD



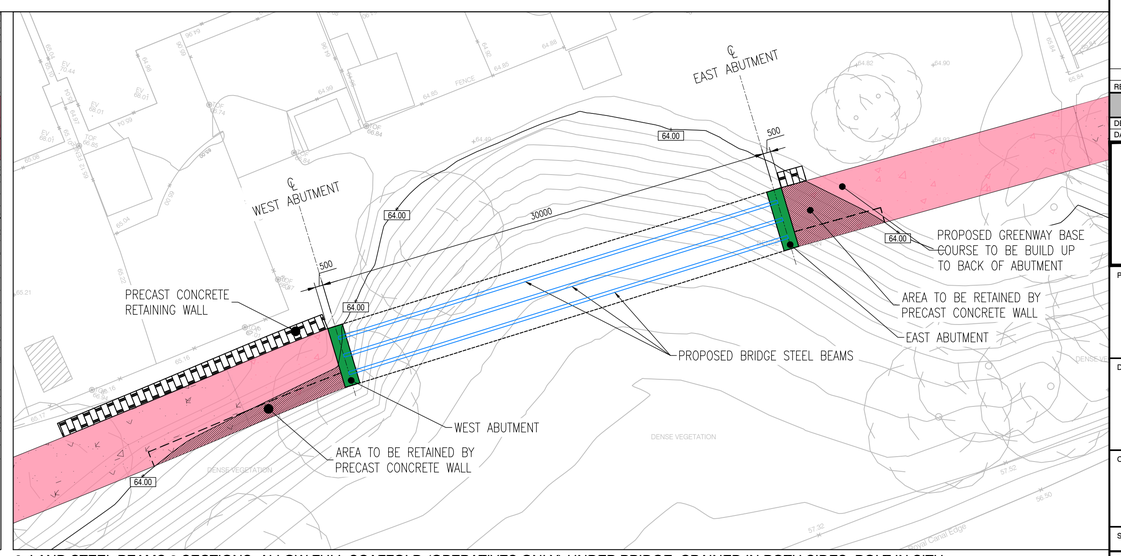
3. EXCAVATE FOR ABUTMENT, PLACE ABUTMENT FORMWORK, POUR ABUTMENT FROM MIXER TRUCK BACKED UP TO TRUCK PUMP UNIT ON HAUL ROAD. (EACH SIDE SEPARATE)



4. WORK BACK UP THE ACCESS SLOPE BUILDING PRECAST CONCRETE WALL AND COMPACTING IN LAYERS



5. BUILD UP FULL HEIGHT, FULL WIDTH BASECOURSE HAUL ROAD UP TO ABUTMENT BOTH SIDES. WALL UNITS TO HOUSES AS REQUIRED



6. LAND STEEL BEAMS 3 SECTIONS. ALLOW FULL SCAFFOLD (OPERATIVES ONLY) UNDER BRIDGE. CRAINED IN BOTH SIDES, BOLT IN SITU

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NOTES:

7. POUR DECK: CONCRETE TRUCKS + PUMP ON ONE SIDE. PERMANENT FORMWORK PLACED FROM SCAFFOLD IF PRESENT
8. LANDSCAPING, HANDRAILS, FINAL FINISH SURFACING

REV.	DATE	DESCRIPTION	BY	CHKD
D0	18/12/19	ISSUED FOR DISCUSSION	MKO	KOR

DESIGN DEVELOPMENT

DESIGNED	KOR	PREPARED	MKO
DATE	DECEMBER 2019	CHECKED	WBA

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PROJECT
ROYAL CANAL GREENWAY

DRG. TITLE
DISUSED QUARRY - CONSTRUCTABILITY PLAN OF BRIDGE OPTION

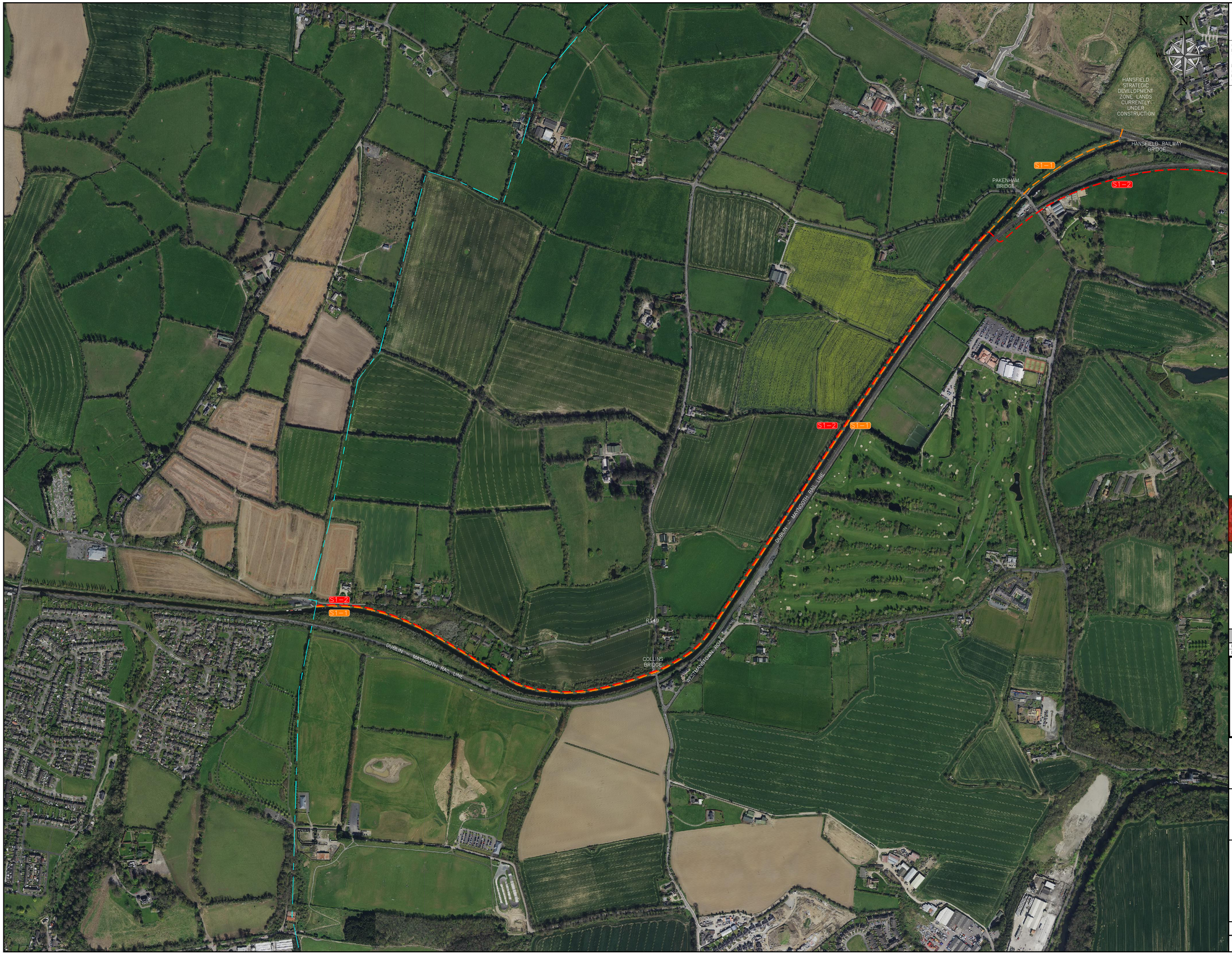
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DRG. NO. 170239-9112 DO

APPENDIX J – Route Options drawings.

APPENDIX J – Route Options drawings.



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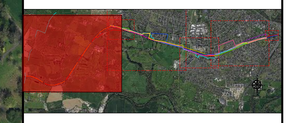
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ROUTE OPTION S1–1
ROUTE OPTION S1–2
KILDARE / DUBLIN COUNTY BORDER

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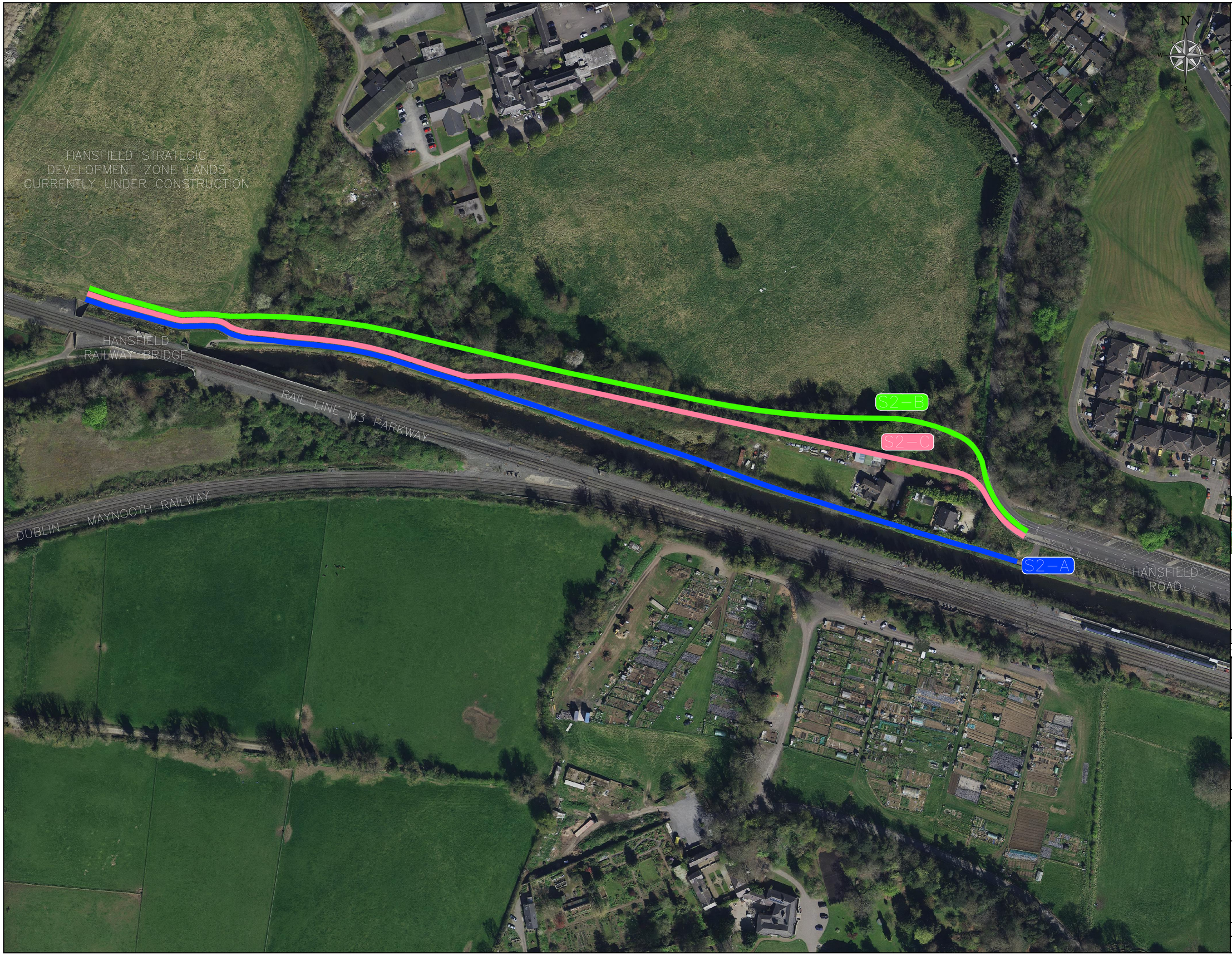
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PROJECT
ROYAL CANAL URBAN GREENWAY

DRG. TITLE
SECTION 1 ROUTE OPTIONS

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Waterways Ireland Uiscebhealaí Éireann Watterways Ireland
NTA Údarás Náisiúnta Iompair National Transport Authority
Tionscadal Éireann Project Ireland 2040
Comhairle Contae Fhine Gall Fingal County Council

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SECTION 2 SUB OPTION S2-A
SECTION 2 SUB OPTION S2-B
SECTION 2 SUB OPTION S2-C

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ROYAL CANAL URBAN GREENWAY

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SECTION 2 SUB OPTIONS

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Comhairle Contae Fhine Gall Fingal County Council

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DRG. NO.	170239-2301		A

HANSFIELD STRATEGIC DEVELOPMENT ZONE LANDS CURRENTLY UNDER CONSTRUCTION

S2–1

S2–2

HANSFIELD RAILWAY BRIDGE

S2–3

DUBLIN – MAYNOOTH RAILWAY

HANSFIELD ROAD

S2–4

CLONSILLA RAIL STATION

CLONSILLA ROAD

S2–5

S2–6

DUBLIN – MAYNOOTH RAILWAY

S2–7

KENNAN BRIDGE

POTTERSTOWN ROAD

N

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ROUTE OPTION S2–1
ROUTE OPTION S2–2
ROUTE OPTION S2–3
ROUTE OPTION S2–4
ROUTE OPTION S2–5
ROUTE OPTION S2–6
ROUTE OPTION S2–7

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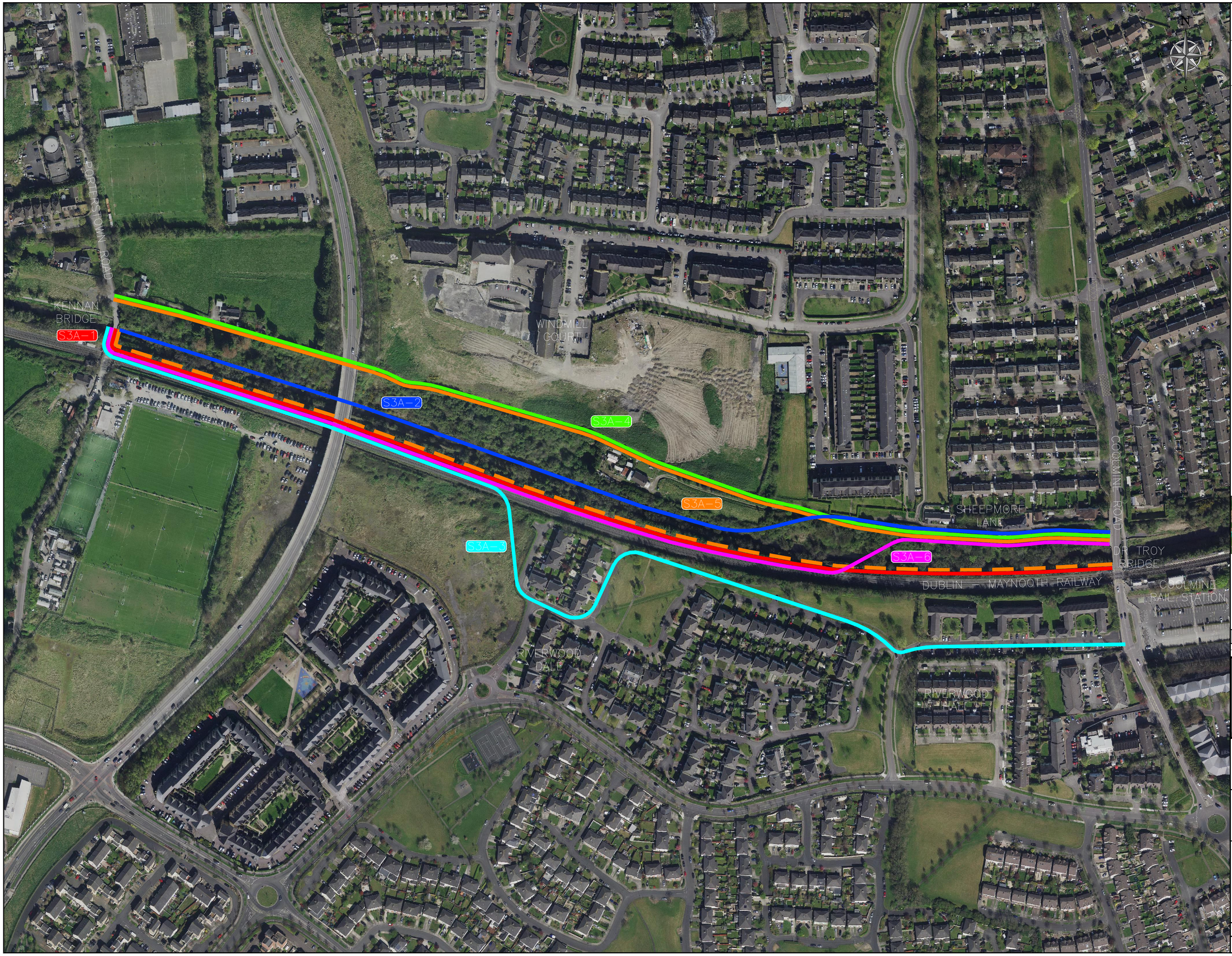
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ROYAL CANAL URBAN GREENWAY

DRG. TITLE
SECTION 2 ROUTE OPTIONS

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ROUTE OPTION S3A–1
ROUTE OPTION S3A–2
ROUTE OPTION S3A–3
ROUTE OPTION S3A–4
ROUTE OPTION S3A–5
ROUTE OPTION S3A–6

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- ROUTE OPTION S3B-1
- ROUTE OPTION S3B-2
- ROUTE OPTION S3B-3
- ROUTE OPTION S3B-4
- ROUTE OPTION S3B-5
- ROUTE OPTION S3B-6
- ROUTE OPTION S3B-7
- ROUTE OPTION S3B-8
- ROUTE OPTION S3B-9
- ROUTE OPTION S3B-10
- ROUTE OPTION S3B-11
- CONTINUATION OF ROUTE S3B-10, S3B-9, S3B-8, S3B-6, S3B-5, S3B-4 FROM NORTHERN TO SOUTHERN EMBANKMENT VIA PED/CYCLE OVERBRIDGE

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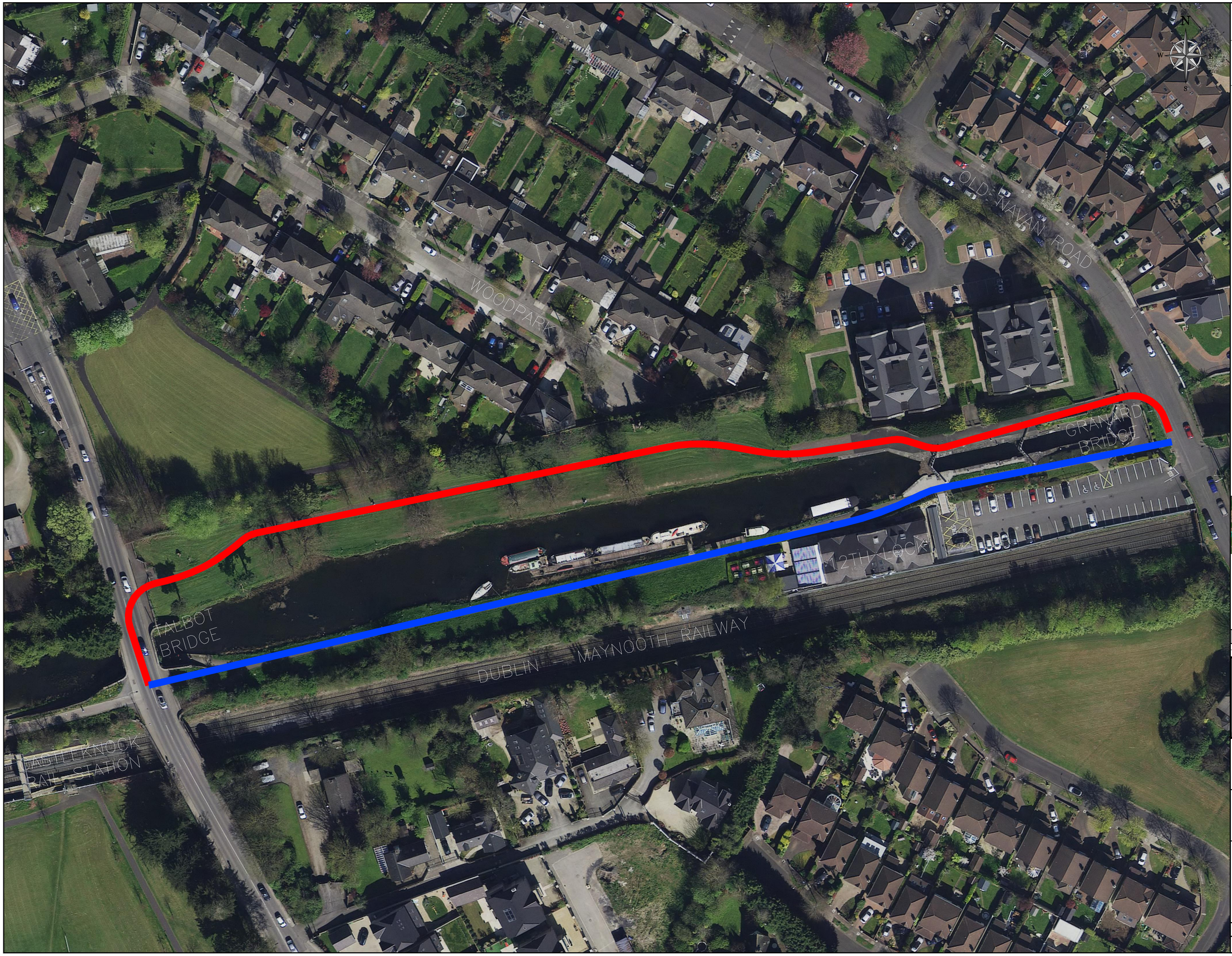
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SECTION 3B ROUTE OPTIONS

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SECTION 3C SUB OPTION S3C-1
SECTION 3C SUB OPTION S3C-2

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PROJECT
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DRG. TITLE
SECTION 3C ROUTE OPTIONS

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DRG. NO.	170239-2305		A

APPENDIX K - Supplementary Sub-section 2 Route Options Assessment

Technical Note

Project Title:	Royal Canal Urban Greenway		
Document Title:	Supplementary Sub-section 2 Route Options Assessment		
Document Ref:	170239 – TN – 16	Rev:	-
Document Status:	P1-Information : S-Issued		

Rev.	Date	Description	Prepared	Reviewed	Approved
-	29/09/26	Final	Mark Kelly	Robert Kelly	Robert Kelly

1. Introduction

1.1. Purpose of Technical Note

This Technical Note records the supplementary route options assessment undertaken for the Hansfield subsection of Section 2 of the Royal Canal Urban Greenway. The assessment post-dated completion of the main Route Options Assessment and approval of the Preferred Route Option by the National Transport Authority in March 2023. It is intended to be appended to the Route Options Assessment Main Report and should be read with that report and Chapter 4, Alternatives Considered, of the Environmental Impact Assessment Report. The location and extent of the Hansfield subsection are shown in Figure 1.1.



Figure 1.1 Hansfield Subsection Extent within Section 2

1.2. Assessment Context

The scheme-wide Route Options Assessment, undertaken between 2018 and 2022, included an assessment of the route options through the Hansfield subsection between Hansfield Railway Bridge and Hansfield Road. The assessment informed the Emerging Preferred Route and subsequently the Preferred Route Option, which was approved by the NTA in March 2023. Following that approval, a further localised assessment was undertaken to account for the completion of pedestrian and cycle facilities through Piper's Court and St. Joseph's, together with land availability and access constraints and the physical constraints along the Royal Canal towpath. The supplementary assessment did not reopen the approved scheme-wide route selection.

2. Supplementary Hansfield Assessment

2.1. Assessment Approach and Methodology

The supplementary assessment applied the same Multi-Criteria Analysis (MCA) approach used for the scheme-wide Route Options Assessment. That assessment was undertaken under the Common Appraisal Framework (CAF), the applicable national transport appraisal guidance when the route selection work was completed. The MCA provides a structured means of comparing the relative advantages and disadvantages of reasonable alternatives. It is a decision-support tool and does not replace professional judgement or the environmental assessments undertaken by the relevant specialists.

The CAF criteria are Economy, Integration, Physical Activity, Accessibility and Social Inclusion, Safety and Environment. Physical Activity was excluded because all options provide for the same walking and cycling modes and therefore do not produce a meaningful relative difference. Accessibility and Social Inclusion was also excluded because the areas along this subsection have a broadly similar deprivation profile. The supplementary assessment therefore compares the options under Economy, Integration, Safety and Environment.

Table 2.1 Assessment Criteria and Sub-Criteria

Assessment Criteria	Assessment Sub-Criteria
1. Economy	1a. Capital Cost
	1b. Constructability
	1c. Quality of Service
2. Integration	2a. Cycling Network Integration
	2b. Traffic Network Integration
	2c. Potential Impact on Rail Network
	2d. Potential Impact on Canal Users
	2e. Potential Impact on Communities/Residents
3. Safety	3a. Road Safety
	3b. Pedestrian Safety
4. Environment	4a. Archaeology and Cultural Heritage
	4b. Architectural Heritage
	4c. Flora & Fauna
	4d. Soils, Geology & Hydrology
	4e. Landscape and Visual
	4f. Land Use Character

For each sub-criterion, the options were compared using the five-point colour-coded scale adopted in the Route Options Assessment: significant advantages, some advantages, neutral, some disadvantages and significant disadvantages relative to the other options. No numerical weighting was applied to the main criteria or sub-criteria. The preferred option was selected through a holistic review of the comparative performance, with particular regard to environmental effects and whether those effects could be avoided or reduced, while also considering safety, route quality, integration, constructability and land requirements. The detailed MCA can be found in the supporting information in Error! Reference source not found..

Table 2.2 Route Options Colour-Coded Ranking Scale

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

2.2. Options Considered

Figure 2.1 illustrates the four route options within the Hansfield subsection between Hansfield Railway Bridge and Hansfield Road.

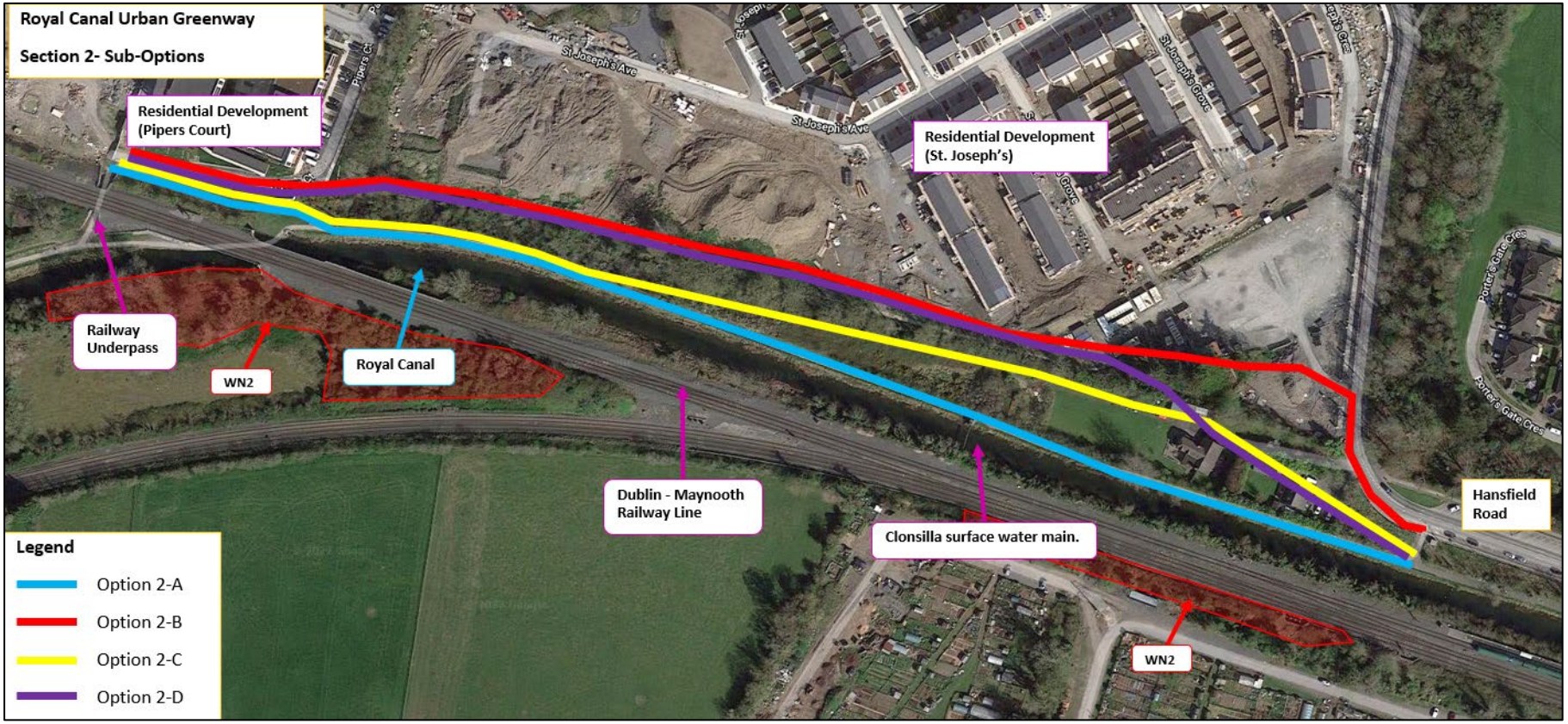


Figure 2.1 Hansfield Subsection Route Options

The following four route options, as identified above, were taken forward to initial assessment:

- Option S2-A: Greenway along the northern towpath of the Royal Canal from Hansfield Railway Bridge to the maintenance access at Hansfield Road.
- Option S2-B: Greenway via the existing pedestrian and cycle routes through Piper's Court and St. Joseph's residential development to Hansfield Road.
- Option S2-C: Greenway along the northern towpath from Hansfield Railway Bridge for approximately 250 m, before diverting through the residential property between the towpath and Hansfield Road.
- Option S2-D: Greenway via the existing pedestrian and cycle routes through Piper's Court and St. Joseph's residential development, before diverting through the residential property between the towpath and Hansfield Road.

The four options were assessed using the MCA methodology set out in Section 2.1 to identify the preferred layout for incorporation into the principal route options for Section 2.

2.2.1. Option S2-A: Northern Towpath to Hansfield Road

This option proposes a 4 m wide paved greenway following the existing towpath on the northern side of the Royal Canal from Hansfield Railway Bridge to the service access at Hansfield Road, as shown in Figure 2.2.

The existing pedestrian route and towpath would be widened towards the northern side, potentially requiring the removal of some trees that are not categorised as high value.

Land acquisition may be required, together with works affecting the retaining wall or embankment adjoining the residential property.

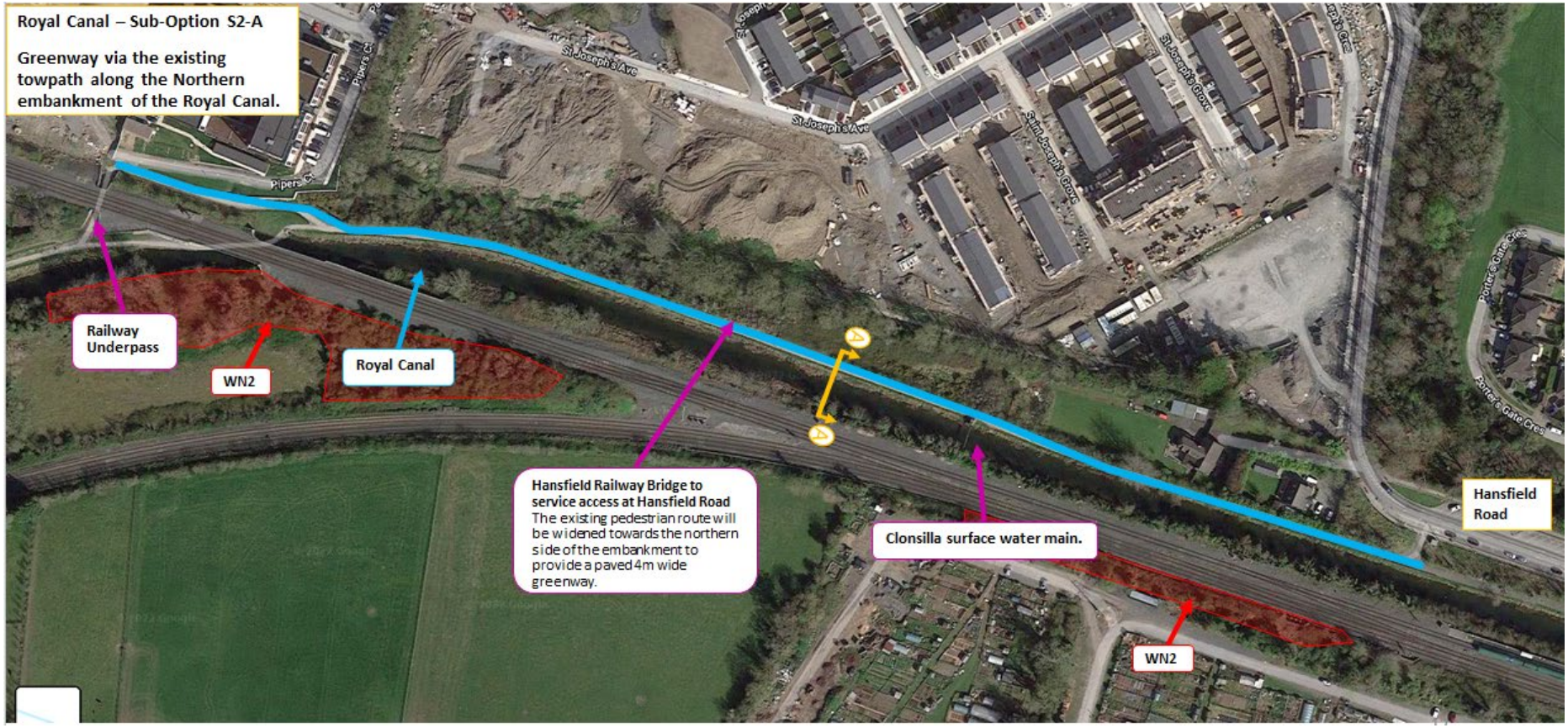


Figure 2.2 Route Option S2-A

A sample cross-section for Option S2-A is presented in Figure 2.3.

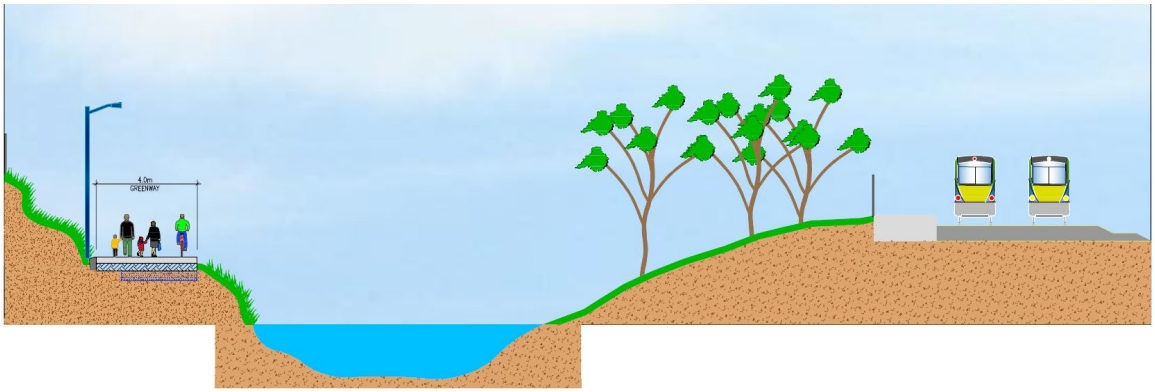


Figure 2.3 Route Option S2-A, Proposed Cross-Section A-A

The following constraints would need to be considered if this route option is progressed:

- Presence of hedgerow and species-rich grassland, including Annex I habitat.
- Existing water main thrust block on the canal bank.
- Potential requirement for land acquisition from a residential property.
- Potential effects on the retaining wall or embankment adjoining the residential property.
- Potential removal of trees that are not categorised as high value to facilitate widening of the existing pedestrian route.

2.2.2. Option S2-B: Piper's Court and St. Joseph's to Hansfield Road

This option directs greenway users onto the existing pedestrian and cycle facilities through Piper's Court and St. Joseph's residential development. Piper's Court has a 2.6 m two-way cycle facility and a 2 m pedestrian route, segregated by road markings. St. Joseph's has a 2.25 m two-way cycle facility and a 2 m pedestrian route, also segregated by road markings. A bridge or embankment would be required to connect the two routes because of the intervening level difference. The route would then continue beside Hansfield Road before reconnecting to the towpath.



Figure 2.4 Pedestrian and Cycle Facilities via St. Joseph's (left) and Piper's Court (right)

The existing cycle facilities are on opposite sides within the two residential developments. Under this option, the facilities would be upgraded to a shared pedestrian and cycle route and the segregation line markings removed. A traffic-calmed environment is intended along the route. The alignment through the residential developments is illustrated in Figure 2.5.

The existing unbound towpath would be retained for pedestrians and anglers.

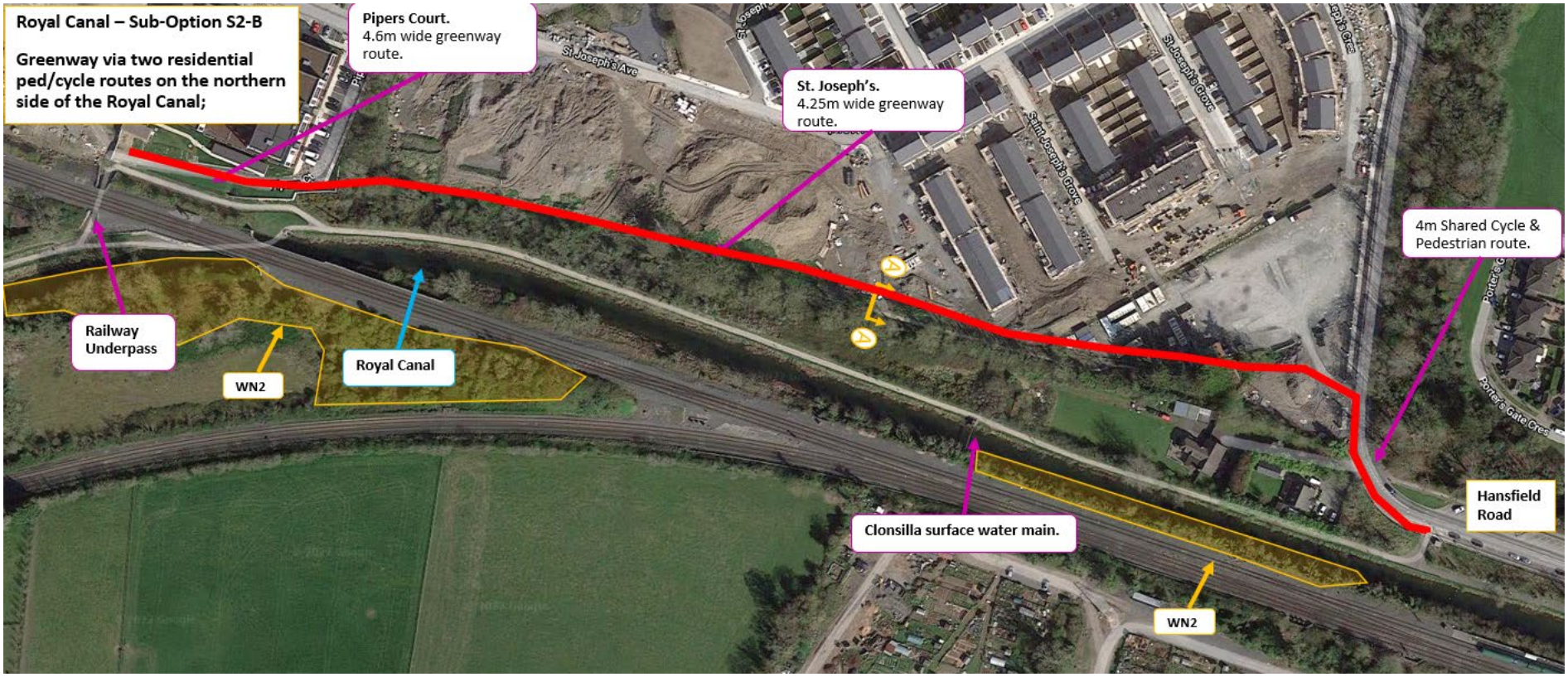


Figure 2.5 Route Option S2-B

A sample cross-section for Option S2-B is presented in *Figure 2.6*.

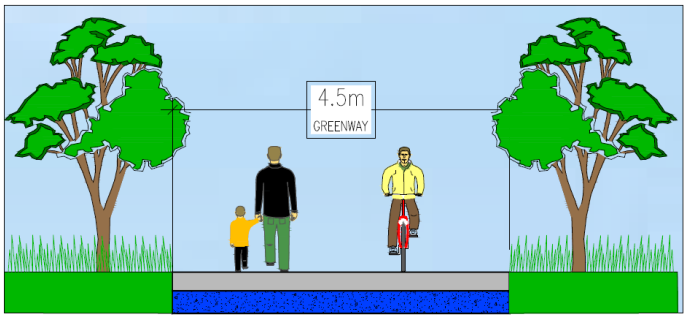


Figure 2.6 Route Option S2-B, Proposed Cross-Section A-A

The following constraints would need to be considered if this route option is progressed:

- Access from the railway underpass to the pedestrian and cycle facilities in the new residential development may be difficult because of level differences.
- Providing pedestrian and cycle facilities on Hansfield Road may be constrained by the available width and level differences at the residential access on the corner.
- The available greenway width varies between 4.0 m and 4.6 m.
- There is currently no connection between the pedestrian and cycle routes in the two residential developments. A separate ownership strip and level difference would need to be addressed, potentially by a bridge or embankment.

2.2.3. Option S2-C: Northern Towpath and Residential Property Diversion

This option provides a 4 m wide paved greenway along the northern towpath from Hansfield Railway Bridge for approximately 250 m. The existing pedestrian route would be widened towards the northern side of the towpath.

The greenway would leave the canal towpath and pass through a residential property to Hansfield Road. The route through these lands could facilitate a pocket park. A paved 4 m wide greenway would continue along the northern side of the lands to Hansfield Road. The alignment is illustrated in Figure 2.7.

The existing unbound towpath would be retained for pedestrians and anglers.

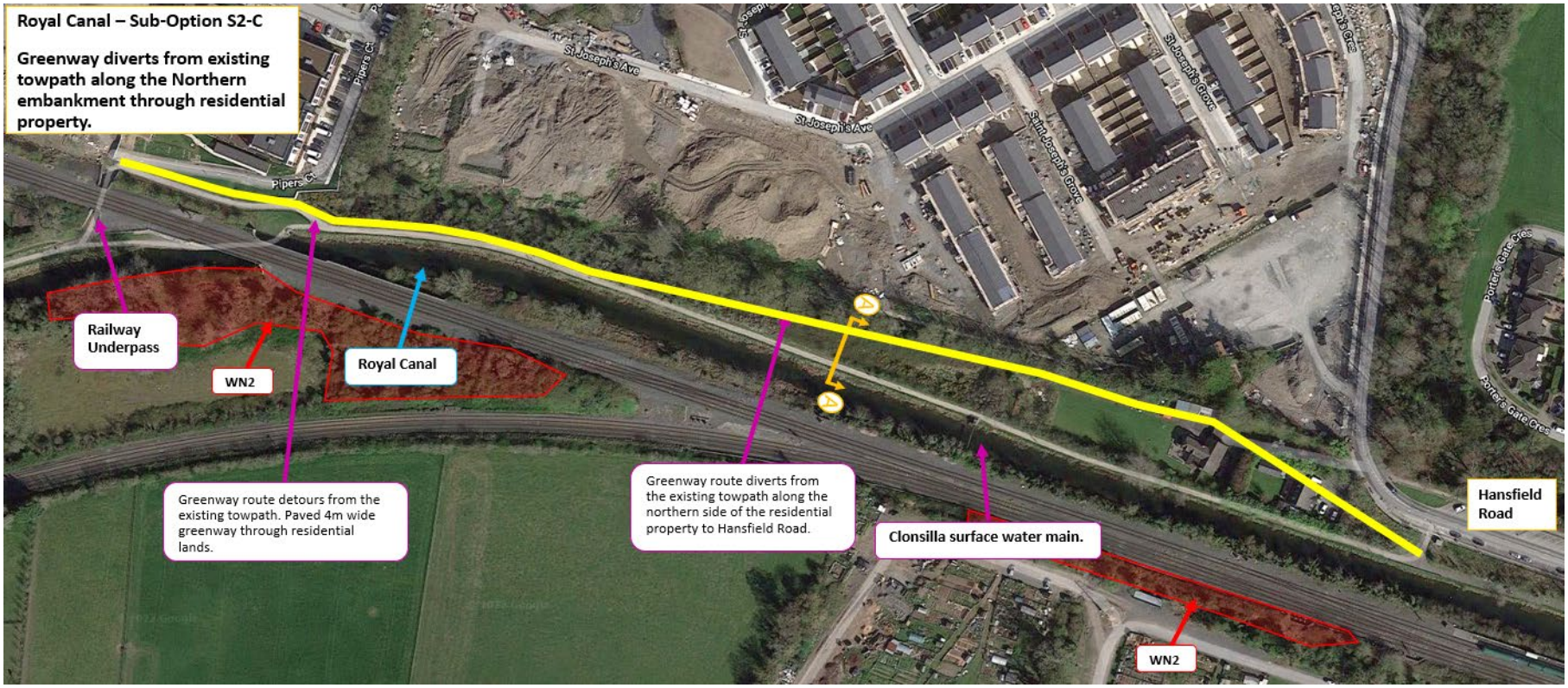


Figure 2.7 Route Option S2-C

A sample cross-section for Option S2-C is presented in Figure 2.8.

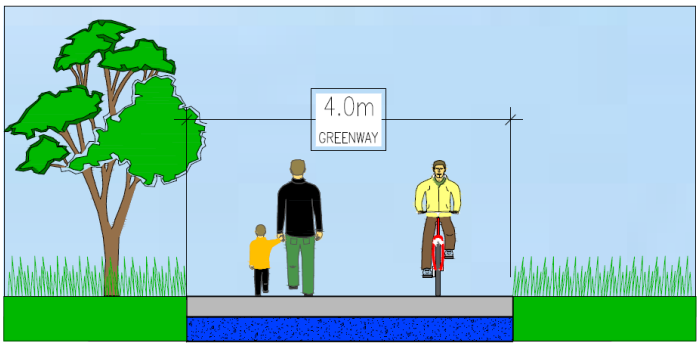


Figure 2.8 Route Option S2-C, Proposed Cross-Section A-A

The following constraints would need to be considered if this route option is progressed:

- Access from the railway underpass to the proposed greenway through residential land may be difficult because of level differences.
- Potential removal of trees and effects on habitats.
- Land acquisition from a residential property, including demolition of two properties.

2.2.4. Option S2-D: Piper's Court, St. Joseph's and Residential Property Diversion

This option provides a 4 m wide paved greenway using the existing pedestrian and cycle routes through Piper's Court and St. Joseph's residential development.

The route would leave the canal at the railway underpass, connect to the existing pedestrian and cycle facilities in Piper's Court and St. Joseph's, and then turn south to rejoin the canal towpath through a residential property. This would require a new 4 m wide route through the property and could facilitate a pocket park. The alignment is illustrated in *Figure 2.9*.

The existing unbound towpath would be retained for pedestrians and anglers.

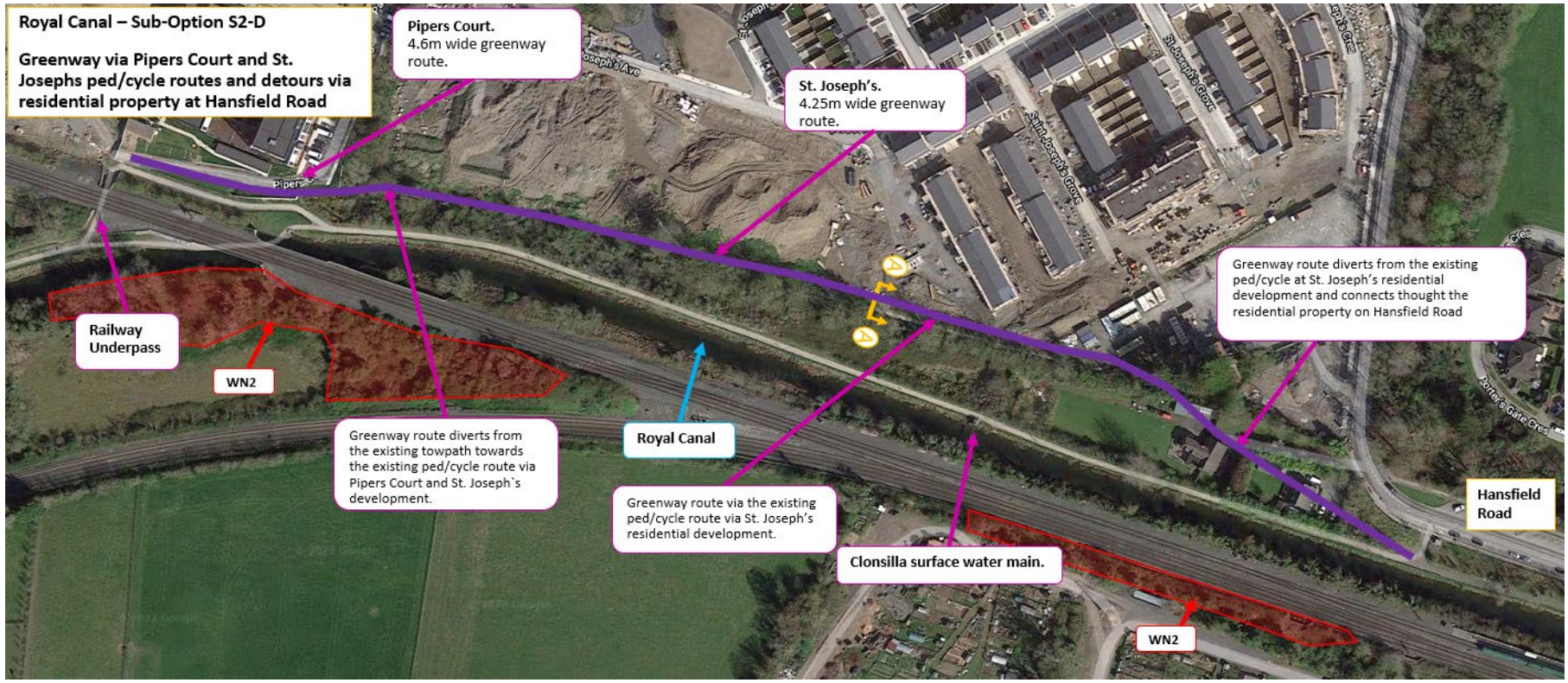


Figure 2.9 Route Option S2-D

A sample cross-section for Option S2-D is presented in Figure 2.10.

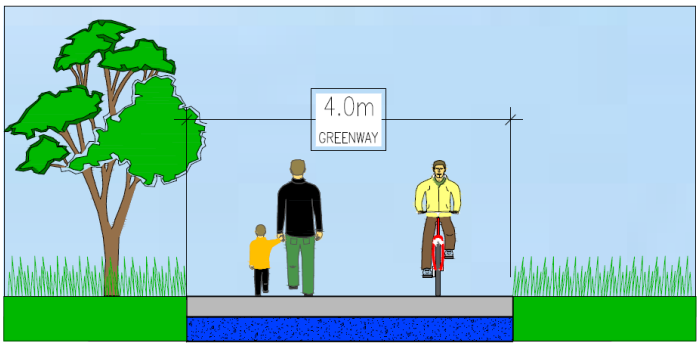


Figure 2.10 Route Option S2-D, Proposed Cross-Section A-A

The following constraints would need to be considered if this route option is progressed:

- Land acquisition from a residential property, including demolition of two properties.
- Potential tree removal.

2.3. Route Options Multi-Criteria Analysis

The detailed route options assessment tables are provided in the supporting information in Error! Reference source not found.. The relative ranking of the four options against the sub-criteria is summarised in Table 2.3.

Table 2.3 Hansfield Sub-Options MCA Summary (Sub-Criteria)

Royal Canal Urban Greenway Section 2 – Sub-Options					
Appraisal Criteria	Sub-Criteria	Option S2-A Greenway via the existing towpath along the Northern embankment of the Royal Canal.	Option S2-B Greenway via two residential pedestrian/cycle routes on the northern side of the Royal Canal.	Option S2-C Greenway along the existing towpath on the northern embankment of the Royal Canal from the Hansfield Railway Bridge for 95m, greenway detours via residential property to Hansfield Road.	Option S2-D Greenway diverts via St. josephs pedestrian/cycle route along the Northern embankment.
1 Economy	1A Capital Cost				
	1B Constructability				
	1C Quality of Service				
2 Integration	2A Cycling Integration				
	2B Traffic Network Integration				
	2C Potential Impact on Rail Network				
	2D Potential Impact on Canal Users				
	2E Potential Impact on Communities/Residents				
3 Safety	3A Road Safety				
	3B Pedestrian Safety				
4 Environment	4A Archaeology & Cultural Heritage				
	4B Architectural Heritage				
	4C Flora & Fauna				
	4D Soils, Geology & Hydrology				
	4E Landscape & Visual				
	4F Land Use Character				

Capital Cost: The main differences relate to land acquisition, use of existing infrastructure and towpath works. S2-A requires approximately 580 m of towpath widening but no land acquisition. S2-C has the highest cost because of residential land acquisition. S2-D requires more localised acquisition, while S2-B requires a short shared facility along Hansfield Road.

Constructability: S2-A and S2-C perform least favourably because of constrained towpath widening. S2-B and S2-D make greater use of existing or proposed facilities, with works focused on tie-ins, access points and boundary treatments.

Quality of Service: S2-A provides the most direct canal-side route. S2-B performs least favourably because it diverts through residential areas and includes a section beside Hansfield Road. S2-C and S2-D also leave the towpath but provide a more continuous and segregated route than S2-B.

Cycle Network Integration: S2-A aligns most directly with the canal corridor identified in the Greater Dublin Area Cycle Network Plan. The other options are less direct, although S2-D retains route continuity using existing and proposed active travel infrastructure.

Traffic Network Integration: S2-B has the greatest interaction with the traffic network because of its Hansfield Road section, private accesses and tie-in arrangements. S2-A is separated from vehicular traffic, while S2-C and S2-D have more limited local interfaces.

Potential Impact on Rail Network and Canal Users: No material comparative rail effect was identified. S2-A performs best for canal users because it upgrades the existing towpath. Under S2-B, S2-C and S2-D, some cyclists may continue to use the more direct towpath, potentially increasing conflicts with walkers and anglers.

Potential Impact on Communities and Residents: S2-B performs least favourably because it redirects greenway users through Piper's Court and St. Joseph's and affects residential accesses along Hansfield Road. S2-C and S2-D require residential land acquisition, with S2-C requiring the greatest land take.

Safety: S2-B performs least favourably because of greater interaction with traffic, private accesses and the tie-in to an existing one-way cycle track. S2-A, S2-C and S2-D are largely segregated from vehicular traffic.

Architectural Heritage: S2-A performs least favourably because towpath widening would introduce works throughout this part of the protected Royal Canal corridor. S2-B, S2-C and S2-D have less direct effect on the canal.

Flora and Fauna: S2-A may require the greatest tree removal. S2-B has limited effects, while S2-C and S2-D may require more localised vegetation removal.

Soils, Geology and Hydrology; Landscape and Visual: No material comparative difference was identified for soils, geology and hydrology. S2-A performs least favourably for landscape and visual effects because towpath widening and tree removal would alter the enclosed canal corridor. Effects under S2-C and S2-D would be more localised, while S2-B mainly uses existing facilities.

Land Use Character: S2-C performs least favourably because of residential acquisition. S2-D requires localised acquisition but avoids the greater towpath intervention of S2-A and the more extensive acquisition associated with S2-C.

The overall comparative ranking against the four main assessment criteria is presented in Table 2.4.

Table 2.4 Hansfield Sub-Options MCA Summary (Main Criteria)

Royal Canal Urban Greenway Section 2– Sub-Options				
Appraisal Criteria	Option S2-A Greenway via the existing towpath along the Northern embankment of the Royal Canal.	Option S2-B Greenway via two residential pedestrian/cycle routes on the northern side of the Royal Canal.	Option S2-C Greenway along the existing towpath on the northern embankment of the Royal Canal from the Hansfield Railway Bridge for 95m, greenway detours via residential property to Hansfield Road.	Option S2-D Greenway diverts via St. josephs pedestrian/cycle route along the Northern embankment.
1 Economy				
2 Integration				
3 Safety				
4 Environment				

Overall, Option S2-D provides the best balance for the Hansfield subsection. Although S2-A is the most direct canal-side route, it requires the greatest intervention within the canal corridor. S2-B has the least environmental effect but performs less well for safety and directness, while S2-C requires the greatest residential land acquisition. S2-D provides a continuous, largely segregated route, makes practical use of existing infrastructure and limits canal-side works, vegetation removal and residential land acquisition.

Option S2-D is therefore the preferred route for the Hansfield subsection of Section 2 for the following reasons:

- It provides a continuous route that is largely segregated from vehicular traffic.
- It performs well in constructability and quality of service terms by using existing and proposed pedestrian and cycle facilities, with works focused on tie-ins, access points and local boundary treatments.
- It reduces direct intervention within the Royal Canal corridor compared with S2-A, thereby reducing potential effects on architectural heritage, trees, landscape character and visual amenity.
- It avoids the greater residential land acquisition associated with S2-C and the less favourable safety and integration issues associated with S2-B.

On the basis of the MCA, Option S2-D was identified as the preferred route for the Hansfield subsection between Hansfield Railway Bridge and Hansfield Road and was incorporated into the principal Section 2 route option.

Appendix A : MCA Tables

Royal Canal Urban Greenway Section 2 – Sub-Options					
Appraisal Criteria	**Sub-Criteria**	**Option 2-A Greenway along the towpath on the northern towpath of the Royal Canal from the Hansfield Railway Bridge to Hansfield Road (service access)**	**Option 2-B Greenway via the existing pedestrian/cycle routes through Piper's Court and St. Joseph's residential development to Hansfield Road;**	**Option 2-C Greenway along the towpath on the northern towpath of the Royal Canal from the Hansfield Railway Bridge for 250m, the greenway then detours via a residential property to Hansfield Road;**	**Option 2-D Greenway via the existing pedestrian/cycle routes through the Piper's Court and St. Joseph's residential development then detours through a residential property;**
1 Economy	**1A Capital Cost**	**€420,000** *Indicative Infrastructure costs €375,000 include:* • Greenway will be provided on the existing towpath along northern side of the Royal Canal from Hansfield railway underpass to the service access at Hansfield Road. • To prevent impact on the potential Annex 1 'Lowland hay meadows' along the bank of the canal, a 1m riparian strip will be provided between the water's edge and the proposed greenway. Therefore, a cantilevered option for this section is not feasible. • The existing pedestrian route/towpath will be widened towards the northern side of the towpath, possibly requiring the removal of some trees (non-environmentally sensitive). • Possible land acquisition may be required from a residential property due to widening towards the northern side of the towpath. *Land Acquisition Costs €180,000* • Land acquisition for residential property.	**€385,000** *Indicative Infrastructure costs €160,000 include:* • This option proposes to direct the greenway users onto the existing pedestrian/cycle facilities via Pipers Court and St. Joseph's residential developments. • As part of this option, both facilities will be upgraded to shared pedestrian/cycle route and the segregation line markings will be removed. A calmed environment is intended along the greenway route. • Due to the steep section between both pedestrian/cycle route a bridge/culvert is proposed to be constructed as part of the residential scheme to connect both existing pedestrian/cycle routes. • The unbound trail along the towpath will be maintained for Pedestrians & Anglers. *Land Acquisition Costs €90,000* • Land acquisition - A new boundary wall treatment will be required for two residential properties on Hansfield Road.	**€3,910,000** *Indicative Infrastructure costs €310,000 include:* • Greenway will be provided on the existing towpath along northern side of the Royal Canal from the Hansfield Railway Bridge for 250m. The existing pedestrian route/towpath will be widened towards the northern side of the towpath. • The greenway will detour from the canal towpath through a residential property to Hansfield Road. A 4m wide paved greenway will be provided. • Creation of a pocket park, play area or other amenities would be possible within the lands. • The unbound trail along the towpath will be maintained for Pedestrians & Anglers. *Land Acquisition Costs €3,600,000* • Land acquisition for residential property.	**€1,182,000** *Indicative Infrastructure costs €170,000 include:* • The Greenway will connect the canal towpath to the existing pedestrian/cycle routes Via Pipers Court and St. Joseph's residential developments before detouring through a residential property to Hansfield Road. • This involves the construction of a new 4m wide route through the residential property to the south. • Due to the steep section between both pedestrian/cycle route a bridge/culvert is proposed to be constructed as part of the residential scheme to connect both existing pedestrian/cycle routes. • Creation of a pocket park, play area or other amenities would be possible within the lands. • The unbound trail along the towpath will be maintained for Pedestrians & Anglers. *Land Acquisition Costs €1,012,000* Land acquisition for residential property
	Rank				
	1B Constructability	This route option involves widening of the existing towpath to 4m along the northern side of Royal Canal for the entire section (approx. 580m). For this route, a paved greenway will be the primary solution with the standard 4m wide within the existing width of the towpath. Working widths for tracking equipment (drilling rigs or excavators) are limited on the towpath. There is currently a pinch point between the residential boundary fence and the canal/towpath edge. A retaining structure may be required due to level difference to the north of the towpath.	This option proposes to direct greenway users onto the existing pedestrian/cycle facilities via Pipers Court and St. Joseph's residential developments. A new boundary wall treatment will be required for two residential properties on Hansfield Road. Complicated construction works will be required due to the level difference between the residential access and Hansfield Road. Boundary treatment will be required on the existing fence line along Hansfield Road.	This route option involves widening of the existing towpath to 4m along the northern side of Royal Canal for the entire section (approx. 250m). The greenway will detour from the canal towpath through a residential property to Hansfield Road (320m). For this route, a paved greenway will be the primary solution with the standard 4m width. A paved shared ped/cycle facility will be provided on Hansfield Road to tie the greenway route to the extent of this sub-section i.e. service access at Hansfield Road (35m). Construction of a pocket park/play area.	This option proposes to direct greenway users onto the existing pedestrian/cycle facilities via Pipers Court and St. Joseph's residential developments. The greenway will detour from the canal towpath via the existing pedestrian and cycle route and through a residential property to Hansfield Road. This involves the construction of a new 4m wide route through the residential property to the south (140m). Construction of a pocket park/play area.

Royal Canal Urban Greenway Section 2 – Sub-Options					
Appraisal Criteria	**Sub-Criteria**	**Option 2-A Greenway along the towpath on the northern towpath of the Royal Canal from the Hansfield Railway Bridge to Hansfield Road (service access)**	**Option 2-B Greenway via the existing pedestrian/cycle routes through Piper's Court and St. Joseph's residential development to Hansfield Road;**	**Option 2-C Greenway along the towpath on the northern towpath of the Royal Canal from the Hansfield Railway Bridge for 250m, the greenway then detours via a residential property to Hansfield Road;**	**Option 2-D Greenway via the existing pedestrian/cycle routes through the Piper's Court and St. Joseph's residential development then detours through a residential property;**
2 Integration	1C Quality of Service	Greenway segregated from vehicular traffic for the entire section. In terms of directness, the greenway runs along the entire bank of the Royal Canal, it does not have any detours (580m). The environment along the route is pleasant and interesting. A surface watermain creates a localised pinch point on the towpath, however, this could be overcome with widening to the north (possible land acquisition).	Greenway segregated from vehicular traffic for the majority of the section. Greenway adjacent to Hansfield Road for 60m. In terms of directness, the greenway detours from the canal via the Pipers Court and St. Joseph's pedestrian/cycle routes (600m). The environment along the busy Hansfield Road is not very pleasant or interesting (approx. 60m).	Greenway segregated from vehicular traffic for the entire section. The greenway runs along the bank of the Royal Canal for 95m. In terms of directness, the greenway detours from the canal via the residential property lands (320m). Creation of a pocket park, play area or other amenities would be possible within the lands, which would make it a pleasant environment.	Greenway segregated from vehicular traffic for the entire section. The greenway detours from the canal via the Pipers Court and St. Joseph's pedestrian/cycle routes and through the residential properties for its full section (580m). Creation of a pocket park, play area or other amenities would be possible within the lands, which would make it a pleasant environment.
2 Integration	2A Cycling Integration	This route option is identified as the Royal Canal Greenway in the GDA Cycle Network Plan.	This proposed cycle route detours from the Royal Canal Greenway route at the Pipers Court and St Joseph Developments (600m). The section of Hansfield Road is identified as a Greenway Route in the GDA Cycle Network Plan. This route option will offer pedestrian/cycle access to/from the Pipers Court and St Joseph Developments.	This route option runs along the towpath of the Royal Canal for 95m, which is identified as the Royal Canal Greenway in the GDA Cycle Network Plan. The greenway detours from the canal via the residential property lands (480m). This option does not offer pedestrian/cycle access to/from the Pipers Court and St Joseph Developments.	This proposed cycle route detours from the Royal Canal Greenway route (GDA Cycle Network Plan) via Pipers Court and St Joseph Developments and the residential property lands (580m). This route option will offer pedestrian/cycle access to/from the Pipers Court and St Joseph Developments.
2 Integration	2B Traffic Network Integration	No appreciable impacts.	Cycle facility along/adjacent to the busy Hansfield Road may have a negative impact on traffic (approx. 60m). Modifications to the existing driveways at the bend on Hansfield Road.	No appreciable impacts.	No appreciable impacts.
2 Integration	2C Potential Impact on Rail Network	No appreciable impacts.	No appreciable impacts.	No appreciable impacts.	No appreciable impacts.

Royal Canal Urban Greenway Section 2 – Sub-Options					
Appraisal Criteria	**Sub-Criteria**	**Option 2-A Greenway along the towpath on the northern towpath of the Royal Canal from the Hansfield Railway Bridge to Hansfield Road (service access)**	**Option 2-B Greenway via the existing pedestrian/cycle routes through Piper's Court and St. Joseph's residential development to Hansfield Road;**	**Option 2-C Greenway along the towpath on the northern towpath of the Royal Canal from the Hansfield Railway Bridge for 250m, the greenway then detours via a residential property to Hansfield Road;**	**Option 2-D Greenway via the existing pedestrian/cycle routes through the Piper's Court and St. Joseph's residential development then detours through a residential property;**
2 Integration	**2D Potential Impact on Canal Users**	Walkers will benefit from the existing towpath being upgraded to 4m bound surface from Hansfield Railway Bridge to Kennan Bridge. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route. This route option proposes to widen the towpath towards the northern side, there will be no encroaching into the canal which would impact the operation of barges along the canal.	Unbound trail along the towpath will be maintained for Pedestrians & Anglers. Due to the detour of the greenway route from the canal, cyclist and walkers may choose to use the exiting towpath (more direct route) for the 580m section. This may have a negative impact on walkers and anglers who currently use the towpath as there will be very little room for both cyclists & pedestrians on the existing towpath. This could also result in collisions between cyclists and pedestrians due to the lack of space. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route.	Unbound trail along the towpath will be maintained for Pedestrians & Anglers. Due to the detour of the greenway route from the canal, cyclist and walkers may choose to use the exiting towpath (more direct route) for the rest of the 580m section. This may have a negative impact on walkers and anglers who currently use the towpath as there will be very little room for both cyclists & pedestrians on the existing towpath. This could also result in collisions between cyclists and pedestrians due to the lack of space. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route	Unbound trail along the towpath will be maintained for Pedestrians & Anglers. Due to the detour of the greenway route from the canal, cyclist and walkers may choose to use the exiting towpath (more direct route) for the rest of the 580m section. This may have a negative impact on walkers and anglers who currently use the towpath as there will be very little room for both cyclists & pedestrians on the existing towpath. This could also result in collisions between cyclists and pedestrians due to the lack of space. This proposed route option will not impact on Waterways Ireland maintenance of the canal banks or the operation of barges along the route
2 Integration	**2E Potential Impact on Communities/Residents**	A proportion of land acquisition may be required from a residential back garden (approx. 80m length).	Land acquisition may be required from the front of two residential properties (boundary walls) on Hansfield Road in order to accommodate access to the properties. Greenway users (potentially non-residents) will be rerouted from the canal towpath through Pipers Court and St. Joseph's residential developments. There will be an increase level of use along the existing facilities which may not have been envisaged by the residents. Accessibility to the greenway is provided through Pipers Court and St. Joseph's residential, providing permeability and linkages from residential catchments	Significant Land acquisition required from a residential property. As part of this route option, amenities such as a pocket park etc are proposed.	Greenway users (potentially non-residents) will be rerouted from the canal towpath through Pipers Court and St. Joseph's residential developments. There will be an increase level of use along the existing facilities which may not have been envisaged by the residents. Accessibility to the greenway is provided via Pipers Court and St. Joseph's residential, providing permeability and linkages from residential catchments. Land acquisition required from a residential property. As part of this route option, amenities such as a pocket park etc are proposed.
3 Safety	**3A Road Safety**	No. of Junctions: 0 0 turn movements required Greenway segregated from traffic for the entire route.	No. of Junctions: 1 0 turn movement required. Greenway generally segregated from traffic for the majority of the route, with the exception of portion of route by Hansfield Road.	No. of Junctions: 1 0 turn movement required. Greenway segregated from traffic for the entire route.	No. of Junctions: 0 0 turn movements required Greenway segregated from traffic for the entire route.
	Rank				

Royal Canal Urban Greenway Section 2 – Sub-Options					
Appraisal Criteria	**Sub-Criteria**	**Option 2-A Greenway along the towpath on the northern towpath of the Royal Canal from the Hansfield Railway Bridge to Hansfield Road (service access)**	**Option 2-B Greenway via the existing pedestrian/cycle routes through Piper's Court and St. Joseph's residential development to Hansfield Road;**	**Option 2-C Greenway along the towpath on the northern towpath of the Royal Canal from the Hansfield Railway Bridge for 250m, the greenway then detours via a residential property to Hansfield Road;**	**Option 2-D Greenway via the existing pedestrian/cycle routes through the Piper's Court and St. Joseph's residential development then detours through a residential property;**
3 Pedestrian Safety	3B Pedestrian Safety	Fully segregated 4m shared greenway facility provided along the bank of the Royal Canal for the entire section of the route. Accessibility to the greenway along the towpath is restricted between Hansfield Railway underpass and Hansfield Road (580m) due to lack of permeability/access to the residential developments, thereby, resulting in a less secure and safe facility for pedestrians.	Fully segregated shared greenway facility provided through Piper's Court and St. Joseph's residential developments. This route will provide permeability/accessibility with Piper's Court and St. Josephs' residential developments, resulting in a safer route with passive surveillance. Due to the detour of the greenway route from the canal, cyclist and walkers may choose to use the exiting towpath (more direct route) for the 580m section. This could also result in collisions between cyclists and pedestrians due to the lack of space. Shared pedestrian/cycle route adjacent to the busy Hansfield Road (60m).	Fully segregated shared greenway facility provided through the residential property. Due to the detour of the greenway route from the canal, cyclist and walkers may choose to use the exiting towpath (more direct route) for the 580m section. This could also result in collisions between cyclists and pedestrians due to the lack of space.	Fully segregated shared greenway facility provided via Pipers Court and St. Joseph's residential developments. Due to the detour of the greenway route from the canal, cyclist and walkers may choose to use the exiting towpath (more direct route) for the 580m section. This could also result in collisions between cyclists and pedestrians due to the lack of space. This route will provide permeability/accessibility with Piper's Court and St. Josephs' residential developments, resulting in a safer route with passive surveillance..
	Rank				
4 Environment	4A Archaeology & Cultural Heritage	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.	No impacts predicted upon the recorded archaeological resource.
	Rank				
4 Environment	4B Architectural Heritage	The fabric of the canal itself (also a protected structure) along the entire route may be directly impacted upon (approx. 580m). The route is along the canal, which will directly impact the canal	The fabric of the canal itself (also a protected structure), the proposed greenway will not impact on the canal (approx. 580m). The route will detour from the canal passing thought the Pipers Court and St Josephs Active Travel routes. No alterations will be made at the towpath along the canal.	The fabric of the canal itself (also a protected structure), the proposed greenway will not impact on the canal (approx. 580m). The route will follow the towpath and then detour to the Residential area. No alterations will be made at the towpath along the canal.	The fabric of the canal itself (also a protected structure), the proposed scheme will not impact on the canal (approx. 580m). The route will detour from the canal passing thought the Pipers Court and St Josephs Active Travel routes. No alterations will be made at the towpath along the canal.
	Rank				
4 Environment	4C Flora & Fauna	Possible removal of trees from Hansfield Railway Bridge to the service access at Hansfield Road (approx. 300m^2). Environmentally sensitive trees of low value are located along this route (Dry Meadows & grassy verges). Possible removal of approx. 100m^2 of trees (low value).	No appreciable impacts.	Possible removal of trees to access the private residential property (approx. 113m^2).	Possible removal of trees to access the Pipers Court and St. Joseph's (approx. 113m^2).
	Rank				
4 Environment	4D Soils, Geology & Hydrology	No appreciable impacts.	No appreciable impacts.	No appreciable impacts.	No appreciable impacts.
	Rank				

Royal Canal Urban Greenway Section 2 – Sub-Options					
Appraisal Criteria	**Sub-Criteria**	**Option 2-A Greenway along the towpath on the northern towpath of the Royal Canal from the Hansfield Railway Bridge to Hansfield Road (service access)**	**Option 2-B Greenway via the existing pedestrian/cycle routes through Piper's Court and St. Joseph's residential development to Hansfield Road;**	**Option 2-C Greenway along the towpath on the northern towpath of the Royal Canal from the Hansfield Railway Bridge for 250m, the greenway then detours via a residential property to Hansfield Road;**	**Option 2-D Greenway via the existing pedestrian/cycle routes through the Piper's Court and St. Joseph's residential development then detours through a residential property;**
4 Environment	**4E Landscape & Visual**	Possible removal of trees from Hansfield Railway Bridge to the service access at Hansfield Road (approx. 300m^2). Potential impact on the visual landscape along the canal.	No appreciable impacts.	Possible removal of trees to access the private residential property (approx. 150m^2).	Possible removal of trees to access the private residential property (approx. 113m^2).
	Rank				
4 Environment	**4F Land Use Character**	Possible removal of trees from Hansfield Railway Bridge to the service access at Hansfield Road (approx. 300m^2). A small proportion of land acquisition may be required from a residential back garden. The area is currently overgrown, the boundary wall and fence will be reinstated and regular planting of trees.	Land acquisition may be required from the front of two residential properties (boundary walls) on Hansfield Road in order to accommodate access to the properties.	Land acquisition required from a residential property. Land acquisition may be required from the front of one residential property (boundary walls) on Hansfield Road in order to accommodate access to the properties.	Land acquisition may be required to link the two pedestrian/cycle route between Piper's Court and St. Joseph's residential development. Land acquisition may be required of two residential properties.
	Rank				

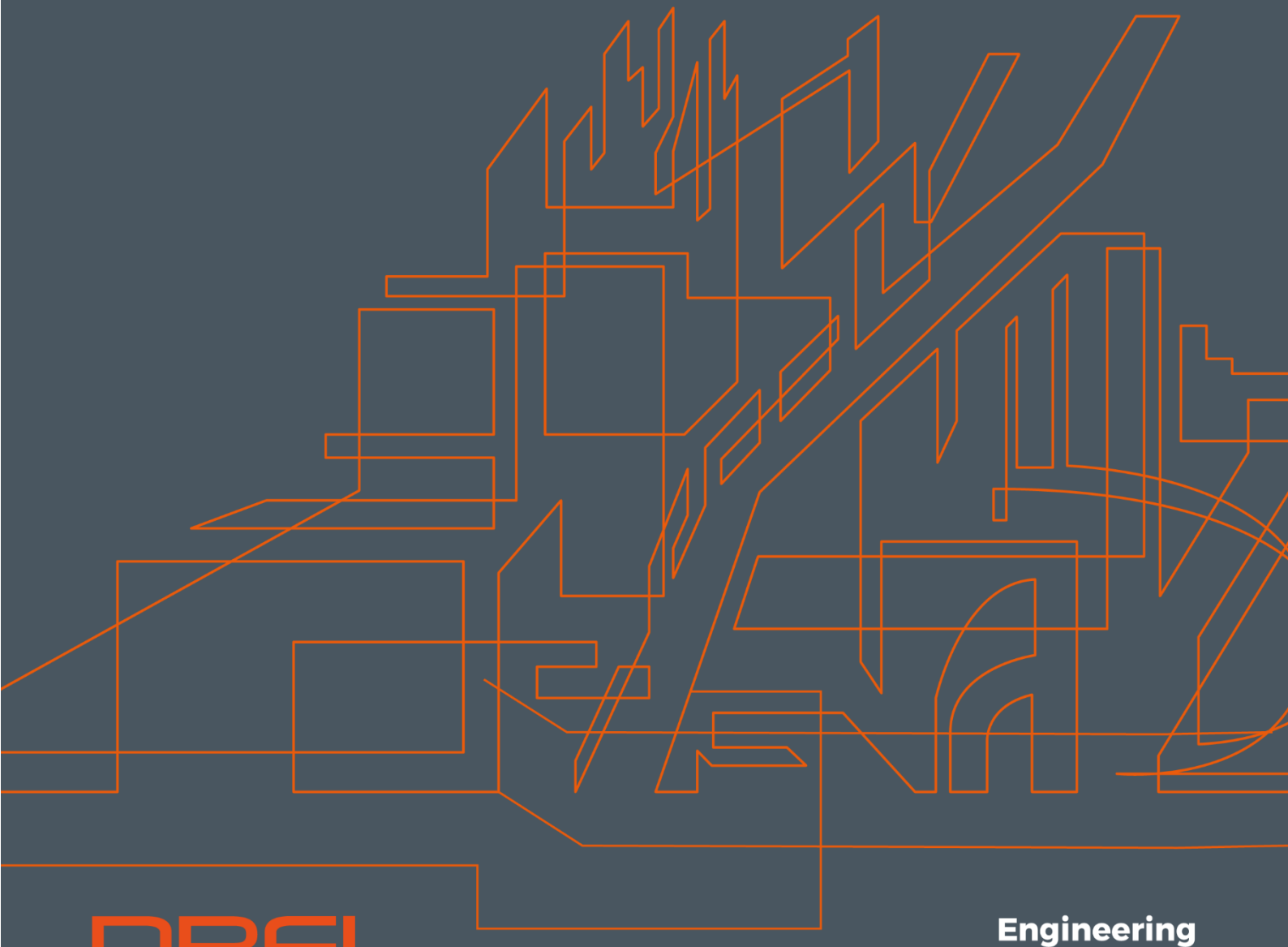
APPENDIX L - Bridge Structure Options Report

Royal Canal Urban Greenway

Bridge Structural Options Report

170239-DBFL-XX-XX-RP-C-0010

Sept 2026



DBFL CONSULTING ENGINEERS

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Project Title:	**Royal Canal Urban Greenway**		
Document Title:	**Bridge Structural Options Report**		
File Ref:	**170239-DBFL-XX-XX-RP-C-0010**		
Status:	**P1 - Information** **S - Issued**	Rev:	**0**

Status	Rev.	Date	Description	Prepared	Reviewed	Approved
P1	0	24/09/26	Final	Brendan Curran	Mark Kelly	Robert Kelly

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1 Introduction

This Structure Options Report outlines the proposed structural solutions for the two bridge structures forming part of the Royal Canal Urban Greenway development, namely the Landmark Bridge and the Quarry Bridge. The bridge locations are shown in Figure 1 below.

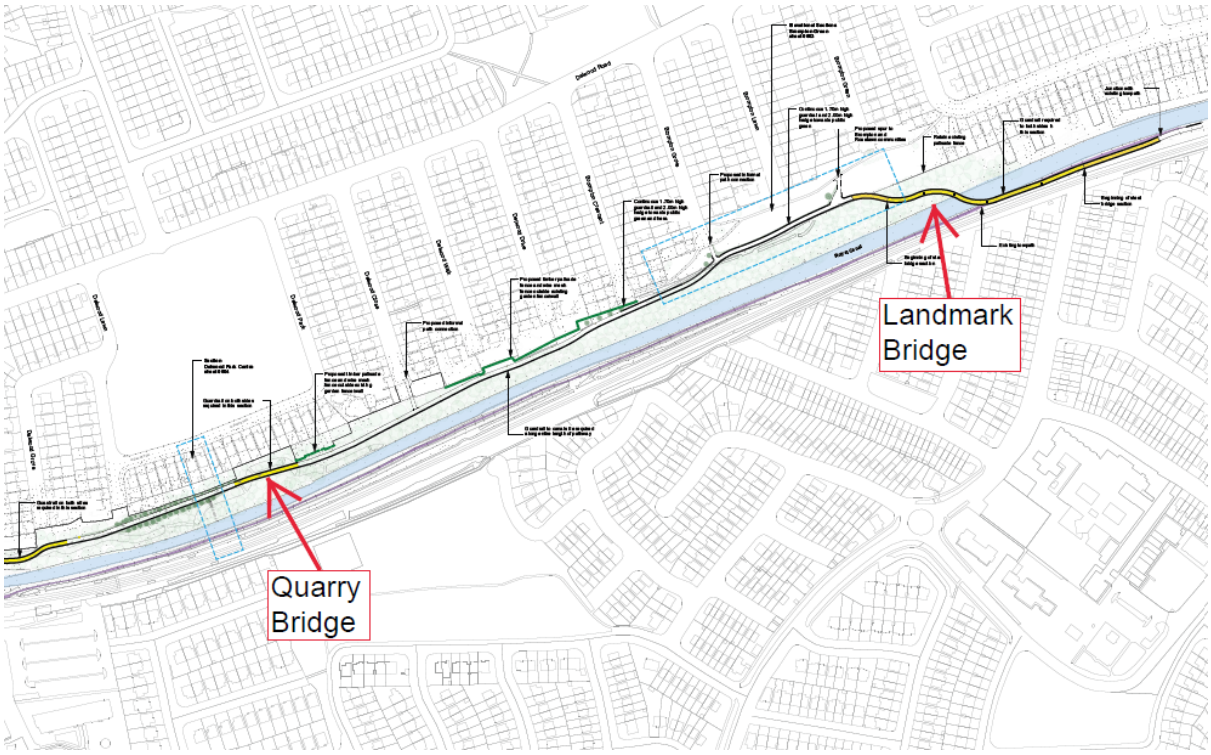


Figure 1: Bridge Locations

The report has been prepared to satisfy the planning requirement for a Structure Options Report and presents a proportionate assessment of the structural forms considered for each bridge. Given that the bridge locations, spans, alignments and functional requirements are largely defined by the selected greenway route corridor, the range of feasible structural solutions is constrained. Accordingly, this report focuses on the preferred bridge arrangements and the rationale for their selection, with consideration given to alternative structural forms where relevant.

The assessment has been undertaken broadly in accordance with the principles of DN-STR-03001 *Technical Acceptance of Road Structures*.

The bridge designs have also been considered having regard to TII DN-STR-03005, Design Criteria for Footbridges, the selected greenway route corridor, neighbouring residential amenity, constructability, lighting and construction-stage noise and vibration controls. The bridges will be developed through detailed design to provide safe shared pedestrian and cyclist use, appropriate

parapet provision, suitable surfacing and drainage, and accessible tie-ins to the adjoining greenway.

2 Landmark Bridge

2.1 Description of the Structure

The proposed structure comprises a curved steel box girder bridge carrying the shared pedestrian and cycleway over the Royal Canal. The bridge forms a landmark crossing between the northern and southern sections of the Royal Canal Urban Greenway, following a distinctive S-shaped horizontal alignment.

The superstructure consists of steel box girders supporting a composite deck approximately 4.3m wide. The bridge is supported on reinforced concrete abutments and intermediate piers founded on piled foundations, with all supports located clear of the canal navigation channel.

The bridge has been developed to provide an accessible crossing for pedestrians and cyclists while maintaining the required clearances over the canal and towpath.

2.2 Technical Evaluation

The steel box girder solution was selected as it provides the most viable structural form for the proposed bridge geometry and span arrangement. The closed box section offers high torsional stiffness, making it particularly suited to the bridge's unique curved alignment. The relatively lightweight nature of the steel superstructure reduces loads on the supporting piers and foundations, improving structural efficiency and reducing foundation requirements. The solution also allows the required spans and clearances to be achieved with a relatively shallow structural depth.



Figure 2: Illustrative Rendered View of the Landmark Bridge

Alternative options considered for the Landmark Bridge included straighter or shorter span arrangements, conventional steel girder forms and concrete or composite concrete alternatives. These options were not preferred as they would either conflict with the selected route geometry, provide a less suitable response to the canal and towpath constraints, result in a heavier structure

with greater foundation demands, or reduce the quality of the architectural design at this canal crossing. The preferred steel box girder arrangement provides the best balance of structural efficiency, buildability, appearance and control of impacts on the canal corridor.

2.3 Aesthetic Evaluation

The proposed bridge is intended to act as a landmark feature within the Royal Canal Urban Greenway. The steel box girder solution provides a slender and streamlined structural form which complements the sweeping S-shaped alignment of the bridge and creates an elegant crossing over the canal.

The relatively shallow structural depth and clean soffit profile minimise visual intrusion within the canal corridor while allowing the bridge geometry to become the primary architectural feature. Alternative concrete solutions would generally require a deeper and heavier appearance, while other structural forms would introduce additional visual complexity which could detract from the simplicity of the overall design.

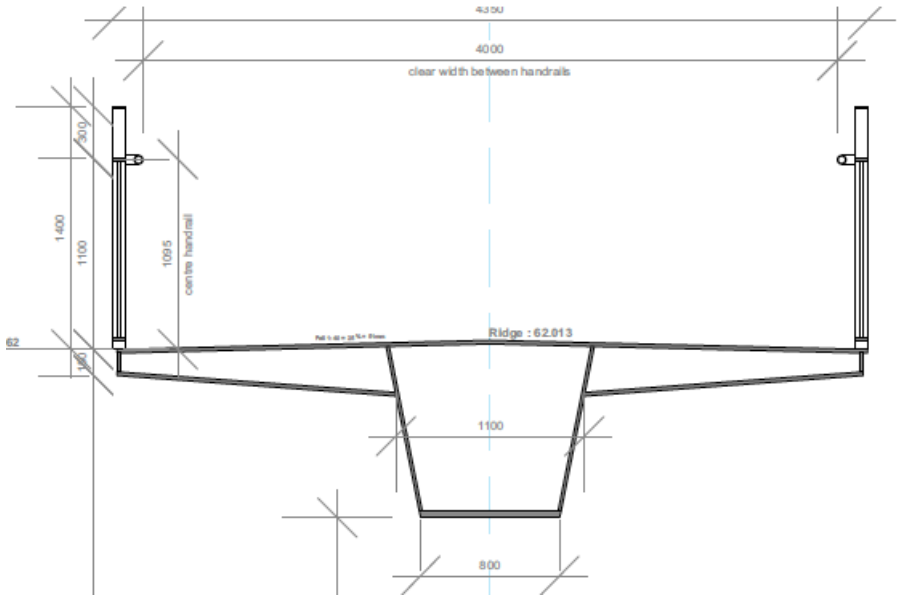


Figure 3: Landmark Bridge Cross-section

2.4 Evaluation of Durability and Maintenance Requirements

The proposed steel box girder bridge can achieve the required design life through the use of an appropriate corrosion protection system. The simple structural form facilitates inspection and maintenance activities throughout the operational life of the bridge. Overall, the solution provides a durable structure with manageable long-term maintenance requirements.

2.5 Construction and Buildability

The steel box girder solution is well suited to the constraints of the site and the proposed bridge geometry. The steel superstructure can be fabricated and erected in manageable sections. The relatively low self-weight of the structure reduces lifting requirements and foundation demands when compared with equivalent concrete solutions.

The reduced structural weight is particularly beneficial given the constrained canal-side location and the potential requirement to transport bridge components either via the northern bank access route or along the canal corridor. The proposed solution therefore offers a practical and efficient construction methodology while minimising disruption to the surrounding environment.

The Landmark Bridge superstructure will be fabricated off site and delivered in transportable sections. The approach works will be constructed in advance to provide access to the abutments and suitable crane positions. The steel sections will then be lifted into position and connected in situ, with temporary set-down areas used where required. Crane operations will be undertaken within a controlled working area, with temporary public access restrictions and protection of adjoining surfaces as necessary.



Figure 4: Illustrative Bridge Lifting Operations (One Lift)

3 Quarry Bridge

3.1 Description of the Structure

The proposed structure comprises a single-span steel beam bridge carrying the shared pedestrian and cycleway over an existing quarry on the northern side of the Royal Canal. The bridge has a straight horizontal alignment, a flat vertical profile and a span of approximately 30m between supports.

The superstructure consists of steel bridge beams supporting a 4.3m wide cast in-situ concrete deck. The bridge is designed as an integral structure, with the superstructure connected directly to reinforced concrete abutments founded on strip foundations bearing on the underlying limestone bedrock, subject to confirmation of the founding level and bearing conditions during detailed design. Approach embankments retained by precast retaining walls provide tie-ins to the adjacent Greenway route.

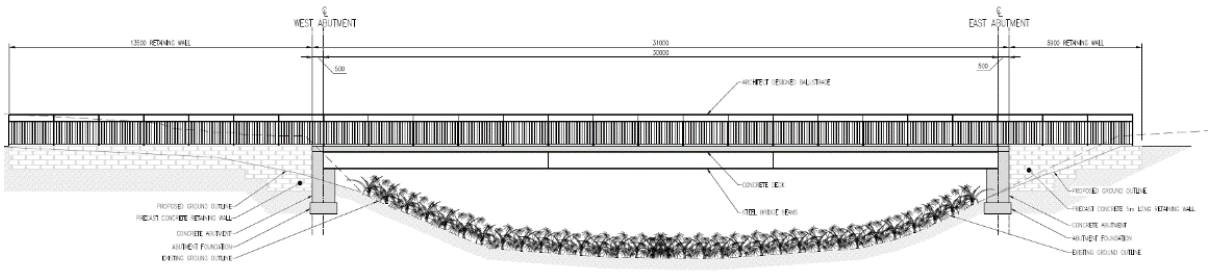


Figure 5: Quarry Bridge

3.2 Technical Evaluation

The proposed steel beam bridge provides a simple and efficient structural solution for the required 30m span across the quarry. The single-span arrangement eliminates the need for intermediate supports within the quarry and results in a straightforward load path between the superstructure and supporting abutments.

The steel beam solution benefits from a relatively low self-weight compared to an equivalent concrete beam, reducing the loads imposed on the substructure and foundations. The presence of limestone bedrock close to ground level allows the abutments to be supported on reinforced concrete strip foundations.

Alternative options considered for the Quarry Bridge included a concrete beam bridge, a multi-span arrangement with intermediate supports within the quarry, and local embankment or

retained-fill solutions to avoid a clear span. These options were not preferred as they would increase construction complexity, introduce greater intervention within the quarry, increase temporary works requirements, or result in a heavier and less adaptable structure. The preferred single-span steel solution avoids intermediate supports within the quarry and reduces the extent of works within the most constrained area.

3.3 Aesthetic Evaluation

The Quarry Bridge is primarily a functional structure, with aesthetic considerations being secondary to its operational requirements. The bridge has been designed to be simple and unobtrusive, minimising its visual impact on the surrounding woodland and quarry environment. The use of steel as the principal superstructure material also provides consistency with the proposed Landmark Bridge, contributing to a cohesive design approach across the scheme.

3.4 Evaluation of Durability and Maintenance Requirements

The proposed steel beam bridge has been developed with consideration for long-term durability and maintenance. The structure will be designed for a 120-year design life, with the primary steel elements protected by an appropriate corrosion protection system. The Quarry Bridge will be integral to the abutments, reducing future maintenance requirements and removing common sources of deterioration, namely bearings and expansion joints.

The simple single-span configuration also facilitates inspection and maintenance activities throughout the operational life of the bridge.

3.5 Construction and Buildability

Construction and buildability were key considerations in the selection of the proposed steel beam bridge solution. The bridge is located within a disused quarry adjacent to the Royal Canal, where access is constrained by existing vegetation, steep side slopes and the quarry topography. The proposed construction methodology requires the Greenway formation to be used as a haul road, allowing plant, materials and construction traffic to access both bridge abutments.

The steel beam solution is particularly suited to these site constraints as the beams can be delivered to site in sections and lifted into position from either side of the quarry. The proposed construction envisages the bridge beams being installed in three sections and bolted together in-situ, avoiding the need for large temporary works within the quarry itself.

The relatively low self-weight of steel beams, compared to equivalent concrete beams, reduces handling and lifting requirements during construction. This is particularly important given the

restricted access arrangements and the need to construct the bridge from the quarry edges. A concrete beam solution would require substantially heavier elements and crane operations.

4 Residential Amenity, Construction Controls and Lighting

The selected bridge arrangements have been considered in the context of neighbouring residential properties. At the Quarry Bridge and Delwood interface, the greenway level is locally lowered where practicable, with security fencing and defensive planting proposed between the route and rear gardens. This assists in reducing overlooking, perceived overbearing effects and visual intrusion. The Landmark Bridge is located within the canal corridor and has been developed to maintain required clearances while limiting unnecessary visual bulk.

For the Landmark Bridge and any other locations where piling or other vibration-generating works are required, the foundation solution and construction methodology will be confirmed following detailed design. The Contractor will adopt best practice controls for construction noise and vibration, including appropriate plant selection, working methods and monitoring where required, in accordance with the commitments set out in the EIAR and OCEMP.

The bridge lighting design has been developed to limit ecological and residential impacts. Warm white 2700K LED luminaires, louvres, 0% upward light ratio optics and intelligent motion control are proposed to reduce spill and unnecessary illumination. At the Landmark Bridge, low-level handrail-mounted LED modules direct light onto the bridge deck and reduce overspill onto the canal and adjoining properties. The final arrangement will be reviewed at detailed design stage against the submitted lighting calculations and layouts.

5 Conclusions & Recommendations

The proposed structural solutions for both the Landmark Bridge and Quarry Bridge have been reviewed with regard to their technical suitability, aesthetics, durability, maintenance requirements, construction methodology and overall buildability. The assessments have confirmed that steel superstructures provide the most appropriate solution for each crossing, having regard to the specific site constraints, structural requirements and intended function of the bridges.

For the Landmark Bridge, the steel box girder solution provides an efficient structural form capable of accommodating the unique S-shaped alignment while maintaining a slender appearance and achieving the required spans and clearances. The solution supports the landmark aspirations of the structure and provides flexibility in construction within the constrained canal corridor.

For the Quarry Bridge, the proposed steel beam solution provides a simple and efficient means of spanning the disused quarry. The relatively lightweight nature of the structure, together with the proposed installation methodology, results in a practical and buildable solution which minimises construction complexity and environmental disturbance.

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