Client:

Dún Laoghaire-Rathdown County Council (DLRCC)

Project:

# Druids Glen Road

# Phase 3 – Cherrywood SDZ

Report:

# Alignment Options

# Assessment Report

BARRY TRANSPORTATION egis GROUP

# Document Control Sheet

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*The contents of this report were compiled post feedback from DLRCC

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# 1. INTRODUCTION

## 1.1. Background

The Cherrywood Strategic Development Zone (SDZ) is situated approximately 8 km south of Dún Laoghaire Town Centre near Loughlinstown, between the N11 and the M50, approximately a kilometer north of where they fork from the M11 – Refer to Figure 1-1. Dún Laoghaire-Rathdown County Council (DLRCC) has been specified as the Development Agency for the Cherrywood SDZ by Government Order and as such, has prepared the Cherrywood Planning Scheme (CPS). The CPS identifies the need for a bridge feature on Druids Glen Road to link Development Area 5 (North of Carrickmines stream) to Development Area 1 (South of Carrickmines stream). The construction of this bridge is critical in addressing the infrastructure deficits required to open up land for development, and in particular housing. DLRCC was successful in its application to the Department of Housing, Local Government and Heritage (DHLGH) for state funding under the Local Infrastructure Housing Activation Fund (LIHAF) in respect of the Druids Glen Road infrastructure project within the Cherrywood SDZ lands.

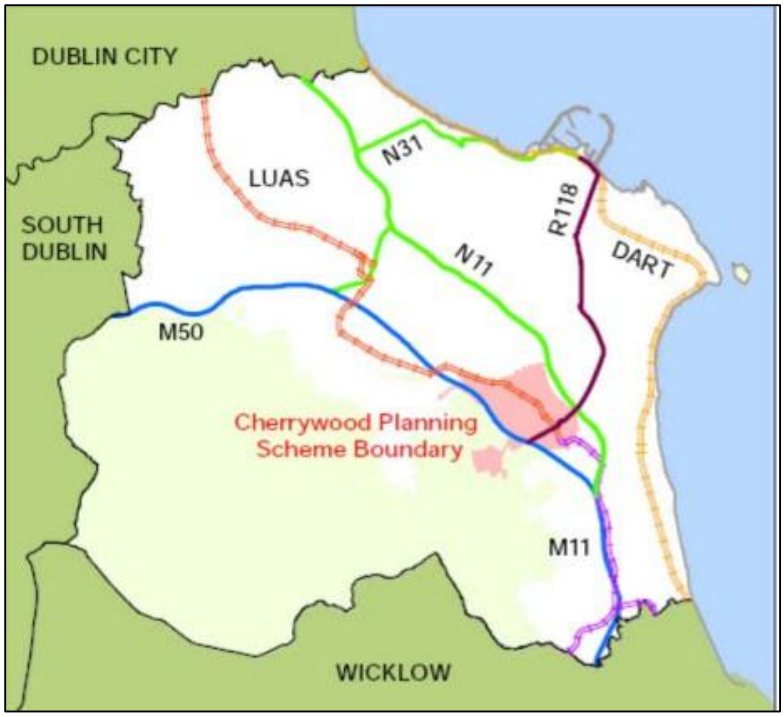


**Figure 1-1: Locality Map**

## 1.2. Project Scope

The proposed scheme is a bridge, located between junction nodes P3 (construction completed prior to this scheme) and P (future signalized junction) as shown in **Figure 1-2** and **Figure 1-3**. The bridge will span Carrickmines River and Druid's Glen Valley and will provide a vehicle and pedestrian/cycle connection between Lehaunstown and the N11. The bridge is expected to have an overall length of approximately 120m to span the valley with circa 60m of road to complete the infrastructure to point P. The road and bridge design will need to maintain the necessary road geometry to tie-in with other alignment designs at both ends. The bridge will need to be sensitively designed to span the valley with a slender structure, one that does not dominate either the valley floor or its setting and takes due regard to the ecological corridor it crosses. The overall road cross section width is 17.5m and comprises a 7.0m wide carriageway with two 3.5m traffic lanes, and a 2.25m cycleway and 3.0m wide footpath on both sides of the road as shown in **Figure 1-4**. As shown in Figure 1-2, the Emerging Study Area encompasses the road connections and its surroundings which facilitate the connection provided by the proposed bridge scheme. The scheme includes (but is not limited to) the following elements:

- Alterations to construct road at P3 to achieve compliant tie-in gradients to existing road networks
- New signalized 'protected' junction at Junction P (Druids Glen/Barrington Road).
- Landscaping work and boundary treatment.
- Drainage, SUDS, and attenuation.
- Earthworks and pavement.
- Signing and road markings.
- Public lighting.
- Accommodation Works.
- Utility services provision (including watermains, foul sewers, storm drainage, gas, power, and communications ducting, etc.) as required.

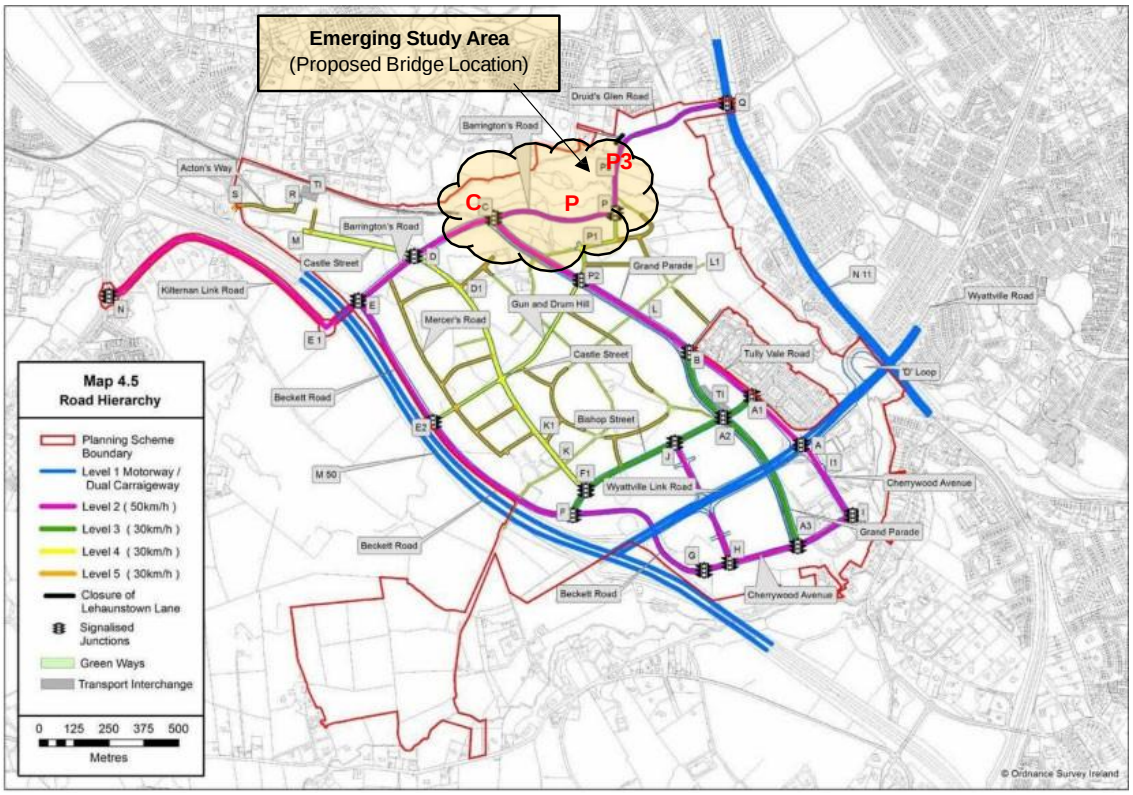


**Figure 1-2: Map of Cherrywood SDZ Planning Scheme and emerging study area**

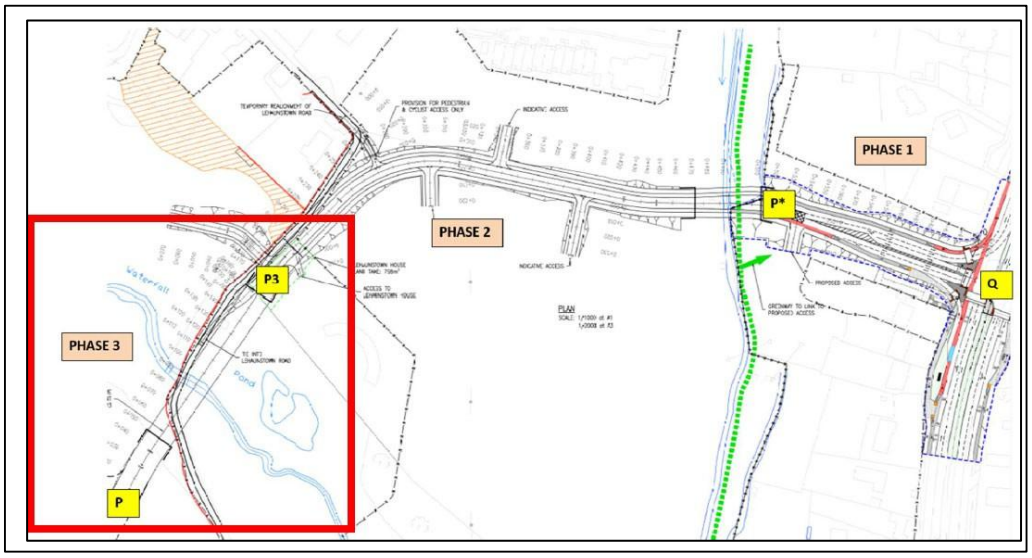


**Figure 1-3 Location of proposed bridge (P3 - P) on Druids Glen Road**

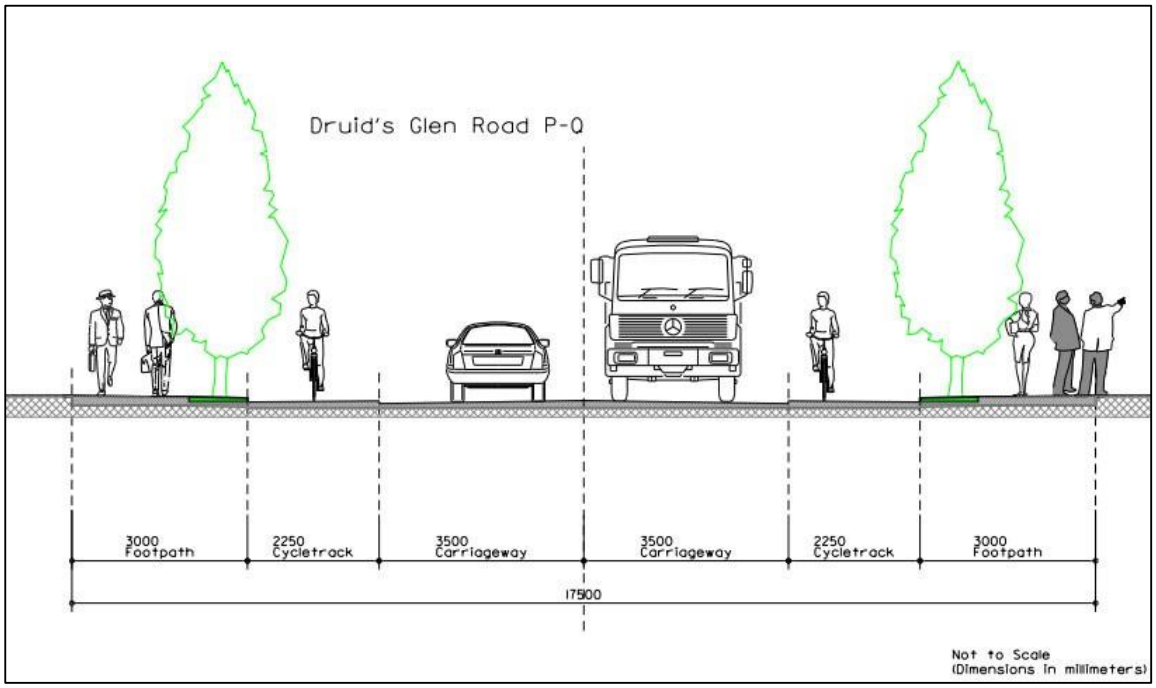


**Figure 1-4: Indicative Cross Section of Proposed Druids Glen Road Phase 3 Bridge, (Source: Cherrywood Planning Scheme, Chapter 4 Physical Infrastructure, Page 44)**

## 1.3. Purpose

As stated in the project brief/tender services requirements, Barry Transportation was assigned to review the Arup Technical Note 'Druids Glen Road Peer Review' dated 3rd April 2023 in relation to the vertical alignment of the Druids Glen Road from Point P3 to Pont C.

Based on the review and as recommended in the 'Conclusions and next Steps' section of the above-mentioned technical note, Barry Transportation shall undertake an Options Assessment Report which shall consider:

1. Longitudinal gradients on connecting roads/accesses (assess whether max. 5% slopes and accessible travel routes can be achieved on all connecting roads/accesses).

2. The grading impacts on adjacent plots and nature zones.

3. Ensure bridge structure is of an appropriate height, considering hydrological, environmental, and cost implications.

4. Conceptual engineering solutions which may be implemented to overcome design issues identified in (items 1-3) e.g. retaining walls, utility relocation.

5. Order-of-magnitude cost to quantify the cost implications of the design alternatives.

Barry Transportation shall evaluate the potential alignment options for the Druids Glen Road project based on the above requirements while remaining cognisant of the requirements of the Transport Appraisal Framework (TAF) which is outlined in the Project Outline Document (POD). The POD is a document which has informed this document by way of (inter alia) setting out the project objectives, considers alternatives early in the project lifecycle, identifies risks associated with the project and develops an appropriate appraisal plan and governance plan. Ultimately, the POD shall inform a decision on whether to proceed with the emerging preferred option.

The Alignment Options report shall assess each option against the project objectives associated with the seven TAF criteria (Transport User Benefits and Other Economic Impacts, Accessibility Impact, Social Impact, Land Use Impacts, Safety Impacts, Climate Change Impacts and Local Environmental). Alignment options that fail to meet any objectives or are not considered viable will not progress into the MCA assessment.

To adhere to the criteria of the POD, a detailed assessment methodology, such as a multicriteria analysis (MCA), will be used to differentiate between options, effectively serving as a sifting assessment. Three assessment criteria will be used at this stage, namely, Engineering, Environmental and Economic.

The Purpose of this report is to finalise and agree with DLRCC the emerging preferred option for Druids Glen Road Phase 3. Thereafter, a Bridge Options Appraisal Report (an assessment of the bridge types) shall follow.

# 2. PROJECT NEEDS

As identified in the CPS and previous investigations undertaken, the Cherrywood SDZ lands integrate significant transport (strategic link between the M50 and N11) and social infrastructure (parks and schools), With reference to the CPS, the needs/benefits of the project are influenced by the following:

- Chapter 4 - Physical Infrastructure, Section 4.2 Transportation :
  The overall SDZ for the Cherrywood Area envisages developing the area as a network of interconnected urban villages and employment/mixed use quarters where walking and cycling will be a convenient alternative to the private car. The strategy of the plan is to limit car usage by making alternative modes of access more attractive. The first phase of development will be directed towards areas with convenient access to Luas stops in order to foster sustainable travel patterns from the outset. It is an objective to develop and support a culture of sustainable travel into and within the Planning Scheme. Development in the Planning Scheme shall constrain work related commuting so as to achieve a transport modal split of 45% trips by car drivers (maximum) and 55% trips by public transport, walking, cycling and other sustainable modes (minimum) as per Government policy (see the Department of Transport's 'Smarter Travel, A Sustainable Transport Future 2009-2020').

- Chapter 4 - Physical Infrastructure, Section 4.2.6 Future Roads Strategy:
  It is an objective to implement the road infrastructure (including segregated pedestrian / cycle routes) proposed in this Planning Scheme to facilitate access to and within the area by all travel modes. The Druids Glen Road Bridge scheme is essential, as it will provide the only continuous connection over Carrickmines River improving links between Cherrywood and Cabinteely thereby improving travel times to the N11 and eventually the M50 for motorist, cyclist and pedestrians.

- Chapter 4 - Physical Infrastructure, Section 4.2.7 Internal Road Proposals:
  The network of internal roads is based around the creation of a circular route to distribute traffic within the area and onto the adjacent highway network. From the existing Tully Vale Road, Grand Parade will run northwards alongside the Luas as far as the existing underpass where it will intersect with Barrington's Road coming from the N11 and leading to the new bridge over the M50.

- Chapter 4: Physical Infrastructure, Section 4.2.9 Pedestrian and Cycle Movement Strategy:
  It is an objective to prioritise walking and cycling in the internal route hierarchy, to create a network of walking and cycling routes within the Planning Scheme and to improve circulation and permeability. All proposed access points, routes, mews and streets must connect logically with the existing street network to aid legibility, permeability and walkability and also must complement local user desire lines. The proposed scheme enhances safety for active modes by incorporating segregated pedestrian and cycling facilities, improving connectivity for all modes across the Cherrywood site, reduces emissions through more efficient connections, and promotes a healthier community by encouraging active transportation. Links to the wider pedestrian / cyclist network related to this scheme will include:
  - Druid's Glen Road to the N11 at Cabinteely and onward connection with the Kilbogget Park greenway, which extends northwards to Deansgrange and is proposed to be extended to Blackrock.
  - Lehaunstown Lane maintained as a green route connecting across the Carrickmines river to Brennanstown in the north and across the M50 to Rathmichael in the south.
  - A proposed walking route through the Carrickmines Valley from Carrickmines through to the linear park. This new wooded route will be developed in conjunction with park and open space development.

- Chapter 7 - Sequencing and Phasing of Developments:
  The provision of infrastructure and services in a timely manner is crucial to the achievement of the vision for Cherrywood. In this regard, the proposed scheme (Point P3 – Point P) relates to part of the phasing requirement regarding Barrington's Road Druids Glen Road (Point P3 – Point P – Point C) which is required to commence work prior to granting permission for residential development in Growth Area 2 and Growth Area 3 that exceeds 2,300 units and is to be completed to a standard to be taken in charge prior to the occupation of the respective residential development. The benefits of the proposed scheme result in economic growth resulting from the unlocked development areas.

# 3. PROJECT OBJECTIVES

As mentioned in Section 2.5 Need for the Scheme of the POD, the overall SDZ for the Cherrywood SDZ envisages developing the area as a network of interconnected urban villages and employment/mixed use quarters where walking and cycling will be a convenient alternative to the private car. Currently, there is no suitable route to travel between Development Area 5 and 1 of the CPS, as the existing connection of Lehaunstown Lane is too narrow (4m) to cater to all users. It is a strategic objective of the CPS for Lehaunstown Lane to be maintained as a green route connecting across the Carrickmines river to Brennanstown in the north and across the M50 to Rathmichael in the south, Lehaunstown Lane is evolving into a strategic greenway and pedestrian/cycle route that has now been closed to vehicular traffic for active use only at its intersection with Grand Parade and just before its intersection with Brennanstown Road. Hence the objectives of the scheme, Druids Glen Road Phase 3 project, aims to Improve connectivity and accessibility while facilitating mode shift.

In addition to the Project's Scope, the Planning Scheme's overarching approach to active travel and land use and transport planning has been utilised to help inform the development of a series of Project Objectives under the themed criteria heading suggested in theTransport Appraisal Framework (TAF) criteria outlined in Table 3-1: Project Objectives

| TAF Categories | Objectives |
|---|---|
| Transport User Benefits and Other Economic Impacts | • Provide infrastructure that will improve connectivity and reduce travel time within the Cherrywood development by all modes. |
| Accessibility Benefits | • Provide access to services such as employment, education and recreation via a high-level bridge linking Development Area 5 and 1 which forms part of a link between the M50 and N11. |
| Social Impact | • Provide infrastructure that can be accessed by transport users with different mobility needs |
| Land Use Impacts | • Provide a road layout and bridge that is buildable and will tie-in to and complement the Cherrywood Road network, future road network and zone lands. |
| Safety Impacts | • Provide segregated pedestrian and cycling facilities.<br>• Deliver a high-quality compliant design.<br>• Provide safer facilities for active travel through segregated pedestrian and cycling facilities. |
| Climate Change Impacts | • Provide infrastructure that will encourage mode shift and emissions reduction. |
| Local Environmental Impacts | • Ensure overall environmental compliance and compliance with the Cherrywood Planning Scheme including its Biodiversity Plan.<br>• Provide a sensitively designed, visually slender structure that does not dominate either the valley floor or its setting.<br>• Provide a sensitive design that will not result in significant effects on ecology that is of local importance or higher either during construction or operation. |

**Table 3-1: Project Objectives**

# 4. DESIGN GUIDANCE

The design and assessment of options will be done in accordance with guidance set-out in the Design Manual for Urban Roads (DMURS), SI 608 2022 Building Regulations (Part M Amendment) Regulations 2022, National Investment Framework for Transport in Ireland (NIFTII), the Cycle Design Manual (2023), the Traffic Signs Manual and Traffic Management Guidelines. It will prioritise the user hierarchy set out in DMURS and NIFTI which promote sustainable forms of transport.

These guidance documents reference gradient thresholds, curvature thresholds, and height and width requirements for road infrastructure, including specifications for all vulnerable users, as well as other guidelines to ensure a safe and reliable design. The key constraints arising from these documents are detailed in Section 4.1 of the Constraints Report (File name: Constraints Report, Barry Transportation/EGIS, January 2025) and have been followed during the preparation of the options presented in this report.

# 5. EXISTING CONDITIONS, CONSTRAINTS AND OPPORTUNITIES

This report should be read in conjunction with the Critical Review Report (File name: Critical Review Report, Barry Transportation/EGIS, August 2024) And the Constraints Report (File name: Constraints Report, Barry Transportation/EGIS, January 2025).

The compilation of these reports included a comprehensive study of all information received before and after the tender including identifying gaps and constraints, for the proposed scheme in the study area. With particular reference to the Arup Technical Note 'Druids Glen Road Peer Review' (2023) and the Review conducted by Barry Transportation on this Technical note - The outcomes from the Peer review reflected the following constraints, assumption, comments and recommendations.

**Key constraints (both natural and non-natural):**

- Geology and bedrock levels.
- Gradient requirements.
- Access to residential zone lands (including potential land take).
- Clearance under bridge for linear park.
- Tie in with P, C and Lehaunstown Lane.
- Conceptual engineering solutions.
- Potential impact on interface with zoned land and scope for successful integration of development regarding frontage and urban design etc.
- Prescription of horizontal alignment under the Planning Scheme.

**Assumptions:**

- Assume design speed of 50 km/h as per Figure 1 – Map 4.5 Road Hierarchy.
- Assume design standard for the alignment is the Design Manual for Urban Roads and Streets (DMURS).
- Road cross sections not shown but are referenced to Planning Scheme Figure 4.4.
- The maximum longitudinal gradient of 5% is the maximum allowable in DMURS.
- The Phase 2 Point P3 tie-in point is not fully fixed.

**Comments for Study 1 (Configuration 4):**

- The crest curve of 50 K-Value Ch. 30-180 can be reduced to a minimum of 4.7 K-Value, which would either allow for the subsequent 5% gradient to be reduced or lower alignment levels.
- The 5% longitudinal gradient appears to carry through the junction at point P without any reduction of the gradient to allow for a dwell area. This is not desirable and may lead to overshoots at the junction stop line.
- The sag curve of 4.7 K-Value Ch. 490-540 is less than the minimum 6.4 K-Value stated in DMURS.

**Comments for Study 2 (Configuration 6):**

- The crest curve of 52.6 K-Value Ch. 90-230 can be reduced to a minimum of 4.7 K-Value, which would either allow for the subsequent 4.11% gradient to be reduced or lower alignment levels.
- Reduced gradients and a dwell area appear to be used at the junction at point P.
- The sag curve of 5.1 K-Value Ch. 550-600 is less than the minimum 6.4 K-Value stated in DMURS.

**Initial Recommendations:**

An alignment tending towards Configuration 6 is desirable as it has benefits in terms of:

- Reduced earthworks footprint, and potential for rock breaking/blasting
- Environmental impact, especially from earthworks
- Providing greater clearance over Lehaunstown Lane
- Negatives:

1. Visual impact of higher, longer bridge
2. Cost of bridge, but offset by cost of earthworks from Point P to C

The sag curve at tie-in with Phase 2 needs to be reviewed to achieve min. standard of 6.4 K-Value which could be achieved by:

1. Moving tie-in with DBFL Alignment beyond Ch.230.86, a review of the Phase 2 tie-in point is inevitable in any case.
2. Increasing the gradient over the bridge to 5% and lowering the alignment slightly at Point P

# 6. OPTIONS ASSESSMENT METHODOLOGY

Desktop analysis, surveys, site visits and engineering judgement have been conducted to ensure that the optimal project alternative is identified for progression.

## 6.1 Modal and Interventions Hierarchies

As part of the POD, Section 4: Modal and Service Delivery High Level Options for Consideration different modal and intervention hierarchies were assessed using the project objectives, NIFTI and the CPS. Five modal options were assessed:

1. Active travel only
2. Public Transport (PT) only
3. Active travel and PT
4. Multimodal
5. Vehicles only

The analysis showed that a multimodal solution would have the strongest alignment with all project objectives that relate to providing connectivity and access to all users, while also aligning strongly with NIFTI with the provisions of segregated active travel facilities and the CPS which prescribes that the Druid's Glen Road (including the completed Phase 1 and 2 elements) will consist of a 2-lane carriageway with cycle tracks and footpaths

The following interventions hierarchies were assessed:

1. Maintain – Do Nothing
2. Optimized or Improve – Do Minimum
3. New – Do Something

The analysis showed that a Do-Something solution for this area would have the strongest alignment with the project objectives and the CPS, since the construction of the Druids Glen Road is identified under the Cherrywood Planning Scheme as being part of an new route onto the N11 that is essential to access the north-east area of Cherrywood; will link with and form part of a wider pedestrian/cyclist network; and is also identified as an important phasing and sequencing requirement for the opening of lands with regards to the permission and occupation of housing. In the context of that, Do-nothing or Do-minimum approach regarding Lehaunstown Lane serving as a multimodal route would not sufficiently align with the Project Objectives and the CPS. This in the context the CPS has identified that the alignment, width and character of this winding narrow lane could not serve significant increases in traffic but is to be maintained as a strategic green route that permeates Cherrywood while connecting Brennanstown to the north with Rathmichael to the south. Therefore, a Do-Nothing or Do-Minimum option would not provide the level of connectivity or mode shift required by the project.

## 6.2 Overview

A two-step process was applied to appraise the feasibility of the proposal and undertake a comprehensive options assessment process, to ensure that the optimal project alternative is identified for progression. This two-step process is:

- Step 1: Assessing the options against the project objectives.
- Step 2: A fit for purpose multicriteria analysis (MCA) using a range of technical criteria based on Engineering, Environment and Economy to robustly assess options and ultimately determine the preferred solution, the methodology for each assessment is described in more detail below.

## 6.3 Step 1: Alignment with Project Objectives

Each option was assessed against the project objectives (Table 3-1) using criteria derived from in TAF Module 7. Options that do not meet any objective were considered as not aligning with the project's goals and will not progress through to the MCA assessment.

| TAF Categories | Objectives | Assessment Criteria (Derived From TAF Module 7) |
|---|---|---|
| **Transport User Benefits and Other Economic Impacts** | • Provide infrastructure that will improve connectivity and reduce travel time within the Cherrywood development by all modes. | Travel times and enabling future development |
| **Accessibility Impact** | • Provide access to services such as employment, education and recreation via a high-level bridge linking Development Area 5 and 1 which forms part of a link between the M50 and N11. | Access to key services |
| **Social Impact** | • Provide infrastructure that can be accessed by transport users with different mobility needs | Transport users with different mobility needs |
| **Land Use Impacts** | • Provide a road layout and bridge that is buildable and will tie-in to and complement the Cherrywood Road network, future road network and zoned lands. | Connection to zoned lands |
| **Safety Impacts** | • Provide segregated pedestrian and cycling facilities.<br>• Deliver a high-quality compliant design.<br>• Provide safer facilities for active travel through segregated pedestrian and cycling facilities. | Change in safety for users |
| **Climate Change Impacts** | • Provide infrastructure that will encourage mode shift and emissions reduction. | Mode shift and Emissions reduction |
| **Local Environmental** | • Ensure overall environmental compliance and compliance with the Cherrywood Planning Scheme including its Biodiversity Plan.<br>• Provide a sensitively designed, visually slender structure that does not dominate either the valley floor or its setting.<br>• Provide a sensitive design that will not result in significant effects on ecology that is of local importance or higher either during construction or operation. | Visual Quality |

**Table 6-1: Project Objectives Assessment Criteria**

## 6.4 Step 2: Multicriteria Analysis

The options were compared using Multi-Criteria Analysis (MCA) in line with the Department of Transport's "Transport Appraisal Criteria," published by the Department of Transport (DTTAS) in June 2023, to assess the bridge alignment concerning existing and proposed infrastructure.

Each of the proposed options has been assessed against the various options assessment criteria and assigned a colour grade, based on a 7-colour palette shown in Table 6.2.

| Colour | Description |
|---|---|
| | Major or highly positive compared to other options |
| | Moderately positive compared to other options |
| | Minor or slightly positive compared to other options |
| | Not significant or neutral |
| | Minor or slightly negative compared to other options |
| | Moderately negative compared to other options |
| | Major or highly negative compared to other options |

**Table 6-2: Seven-Point Grading Scale**

The Criteria and Sub-criteria used to assess the various options are outlined in the table below. The impacts to be measured are not quantitative but establish the parameters for comparison.

| Assessment Criteria | Sub-Criteria | | Impacts to be measured |
|---|---|---|---|
| **Engineering** | **1** | Traffic Assessment & Route Cross-section. | Improve connectivity and network |
| | **2** | Technical Standards | Adherence to DMURS requirements regarding Sag and Crest Curves Minimum Horizontal Radi, Relaxations, Departures, etc. |
| | 2.1 | Gradient P to P3 | With a desirable gradient of 5% and maximum gradient of 8% |
| | 2.3 | Gradient C to P | With a desirable gradient of 5% and maximum gradient of 8% |
| | 2.3 | Gradient P to Lehaunstown Lane | With a desirable gradient of 5% and maximum gradient of 8% |
| | **3** | Principal Junctions and Interchanges, Access Control and interaction with Existing Road Network | |
| | 3.1 | Principal Junctions and Interchanges | Tie-into existing Point P3 |
| | 3.2 | Principal Junctions and Interchanges | Tie-into existing Lehaunstown Lane |
| | 3.3 | Principal Junctions and Interchanges | Tie-into Point C |
| | 3.4 | Access Control and Interaction with Existing Road Network | Impact on access to residential zone lands north of the P3 (adjacent to Phase 2) |
| | 3.5 | Access Control and Interaction with Existing Road Network | Impact on access to pond |
| | **4** | Structures | Road Bridge clearance above green route Network on Lehanstown Lane, clearance above stream and greenway access towards Brennanstown Road from the north end of Lehaunstown Lane. |
| | **5** | Geology and Earthworks | Impact on existing ground conditions due to raising or lowering levels compared to the NGL. Quantify earthworks volumes (Cut and Fill). |
| | **6** | Construction | Comparative ease of construction and Traffic Management |
| | **7** | Comparative Service Conflicts | Impact on Existing and Proposed Services |
| | **8** | Comparisons on Land & Property | |
| | 8.1 | Adherence to CPS Alignment & Zoning Arrangement | Adherence to horizontal alignment under Cherrywood Planning Scheme / Adherence to zoning arrangement |
| | 8.2 | Impact on Property Frontages | Consider the need for large slopes or retaining structures due to CUT or FILL |
| **Environment** | **1** | Human Beings including compatibility with development policy. | Height of alignment in relation to the clearance provided above Lehaunstown Lane. |
| | **2** | Flora & Fauna | Comparative impact on designated sites/species and other areas of ecology that are of local importance or higher importance in Druids Glen Ecological Corridor and Buffer Zone. |

| | | | |
|---|---|---|---|
| | **3** | Water Resources | Comparative impact on watercourses, flood zones, water supplies and aquatic ecology. |
| | **4** | Geology & Hydrogeology | Comparative impact on vulnerable rocks and soils and aquifers. |
| | **5** | Air Quality | Comparative impact on the air quality environment. |
| | **6** | Noise | Comparative impact of the noise climate. |
| | **7** | Landscape & Visual | Comparative impact on landscape, views and obstructions. |
| | **8** | Archaeology & Cultural Heritage | Impact on Stone wall and other archaeology & cultural heritage features. |
| **Economy** | **1** | Capital cost | High level cost estimate based on alignment and bridge design (including earthworks, retaining walls, ramps, etc.) |

**Table 6-3: Assessment Parameters**

# 7. ALIGNMENT OPTION ASSESSMENT

Several feasible options were developed to identify the alignment that best meets the project objectives within the given constraints. This section of the report discusses each of these options in detail.

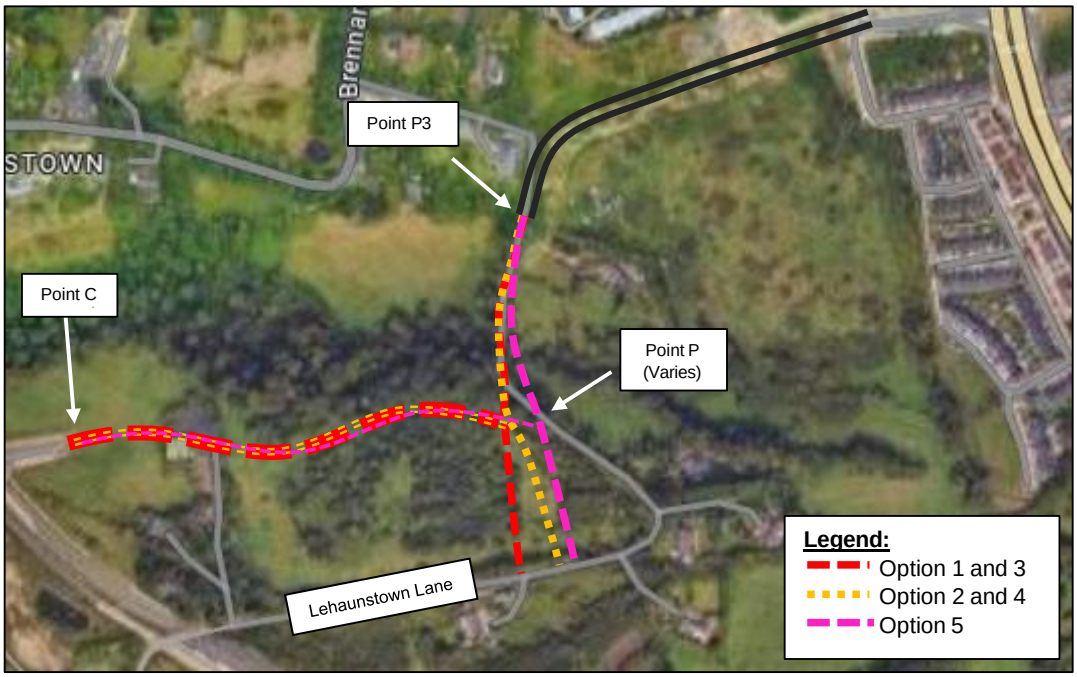


**Figure 7-1: Plan Alignment Options**

**Option 1:** This Option proposes to maintain the plan alignment as per the CPS between Point C and Point P, Point P to Point P3 and Point P to Lehaunstown Lane. Additionally, tie-in levels to the existing infrastructure at Point C and Lehaunstown Lane is maintained. There is a level difference of approximately 2.28m at Point P3.

**Option 2:** This Option proposes to maintain the plan alignment as per the CPS between Point C and Point P while maintaining the tie-in levels to the existing infrastructure at Point C. However, the suggested tie in point between Point P and Lehaunstown Lane would involve a connecting section of road that differs in terms of alignment when compared to that indicated throughout the CPS. This Option proposes to maintain the plan alignment as per the CPS between Point P and Point P3 but there is a level difference of approximately 0.25m at Point P3.

**Option 3:** This Option proposes to maintain the plan alignment as per the CPS between Point C and Point P, Point P to Point P3 and Point P to Lehaunstown Lane. Tie-in levels to the existing infrastructure at Point C and Lehaunstown Lane is maintained but there is level difference of approximately 1.2m at Point P3.

**Option 4:** This Option acknowledges the reconstruction activities required at P3 therefore this option proposes to tie-in as close as possible to Point P3 with minimal reconstruction. There is a level difference of approximately 0.1m at Point P3. In doing so, taking cognisance of the project constraints and DMURS thresholds, the suggested tie in point between Point P and Lehaunstown Lane would involve a connecting section of road that differs in terms of alignment when compared to that indicated throughout the CPS. This Option proposes maintaining the plan alignment as per the CPS between Point C and Point P while maintaining the tie-in to the existing infrastructure at Point C.

**Option 5:** This Option suggests an alignment which differs from the horizontal road's alignment indicated throughout the CPS as the location of Point P is relocated to the east and subsequent tie in point with Lehaunstown Lane to the south also shifts further to the east. While Point C remains fixed, the horizontal alignment of the section of road between the revised Point P and C would differ slightly compared to the

CPS. There is a level difference of approximately 0.25m at Point P3. Additionally, this option proposes a curved bridge alignment.

All 5 options were assessed against the TAF criteria (Project Objectives) shown in Table 7-1 while the Multi-Criteria Analysis (MCA) was conducted as shown in Table 7-2. Given the subjective nature of the MCA process, the rationale behind each decision is explained in further detail.

## 7.1 Options Alignment Assessment against Project Objectives

| TAF Categories | | Assessment Criteria | Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|---|---|
| 1 | Transport User Benefits and Other Economic Impacts | • Travel times and enabling future development | ALIGN | ALIGN | ALIGN | ALIGN | ALIGN |
| 2 | Accessibility Impact | • Access to key services | ALIGN | ALIGN | ALIGN | ALIGN | ALIGN |
| 3 | Social Impact | • Transport users with different mobility needs | ALIGN | ALIGN | ALIGN | ALIGN | ALIGN |
| 4 | Land Use Impacts | • Connection to zoned lands | ALIGN | NOT ALIGNED | ALIGN | NOT ALIGNED | NOT ALIGNED |
| 5 | Safety Impacts | • Change in safety for users | ALIGN | ALIGN | ALIGN | ALIGN | ALIGN |
| 6 | Climate Change Impacts | • Mode shift and Emissions reduction | ALIGN | ALIGN | ALIGN | ALIGN | ALIGN |
| 7 | Local Environmental | • Visual Quality | ALIGN | ALIGN | ALIGN | ALIGN | ALIGN |

**Table 7-1: Project Objectives Comparison**

Overall, all options align with Project Objectives 1, 2, 3, 5, 6, and 7. All options will improve travel times and provide essential access into the north-east area of Cherrywood while promoting use of the N11 and opening up a multimodal connection between Development Areas 5 and the remaining Development Areas in Cherrywood. The improved connectivity will also enable future development of zone lands within Cherrywood including within Development Area 1. All options would be capable of accommodating traffic lanes, segregated cycle lanes and footpaths and will therefore align with the Social, Safety and Climate Change objectives. Similarly, all options align with the visual quality objectives. However, due to the change in alignment from the CPS, Options 2, 4, and 5 have significant impacts on TAF Criterion 4, concerning Land Use Impacts. Options 2, 4, and 5 will continue to be assessed at a high level notwithstanding the fact that they are likely to require an amendment to the Cherrywood Planning Scheme for which there would be an element of uncertainty regarding the outcome and duration of time for a decision on amendments to be made.

All 5 options are therefore brought forward for Multi-Criteria Analysis (MCA) to evaluate the options from technical, environmental, and economic perspectives.

## 7.2 Options Alignment Assessment using MCA

| Assessment Criteria | Sub-Criteria | | Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|---|---|
| Engineering | 1 | Traffic Assessment & Route Cross-section. | | | | | |
| | 2 | 2.1 Technical Standards: Gradient P to P3 | | | | | |
| | | 2.2 Technical Standards: Gradient C to P | | | | | |
| | | 2.3 Technical Standards: Gradient P to Lehaunstown Lane | | | | | |
| | 3 | 3.1 Principal Junctions and Interchanges: Tie into P3 | | | | | |
| | | 3.2 Principal Junctions and Interchanges: Tie in at Lehaunstown Lane | | | | | |
| | | 3.3 Principal Junctions and Interchanges: Tie in at Point C | | | | | |
| | | 3.4 Access Control/Interaction with residential zoned lands north of P3 | | | | | |
| | | 3.5 Access Control and Interaction to Pond | | | | | |
| | 4 | Structures | | | | | |
| | 5 | Geology and Earthworks | | | | | |
| | 6 | Construction | | | | | |
| | 7 | Comparative Service Conflicts | | | | | |
| | 8 | 8.1 Adherence to CPS Alignment & Zoning Arrangement | | | | | |
| | | 8.2 Impact on property frontages | | | | | |
| Environment | 1 | Human Beings. | | | | | |
| | 2 | Flora & Fauna | | | | | |
| | 3 | Water Resources | | | | | |
| | 4 | Geology & Hydrogeology | | | | | |
| | 5 | Air Quality | | | | | |
| | 6 | Noise | | | | | |
| | 7 | Landscape & Visual | | | | | |
| | 8 | Archaeology & Cultural Heritage | | | | | |
| Economy | 1 | Capital cost | | | | | |

**Table 7-2: MCA Analysis**

## Option 1

This Option proposes to maintain the plan alignment as per the CPS between Point C and Point P, Point P to Point P3 and Point P to Lehaunstown Lane. Additionally, tie-in levels to the existing infrastructure at Point C and Lehaunstown Lane is maintained. Since this option aligns with the CPS, the impact on zone lands is negligible. Additionally, the elevation at Point P is close to the natural ground level (NGL) in this option, resulting in minimal cut and minimal impact on property frontages. The details and impacts of this proposed alignment option are explained further.

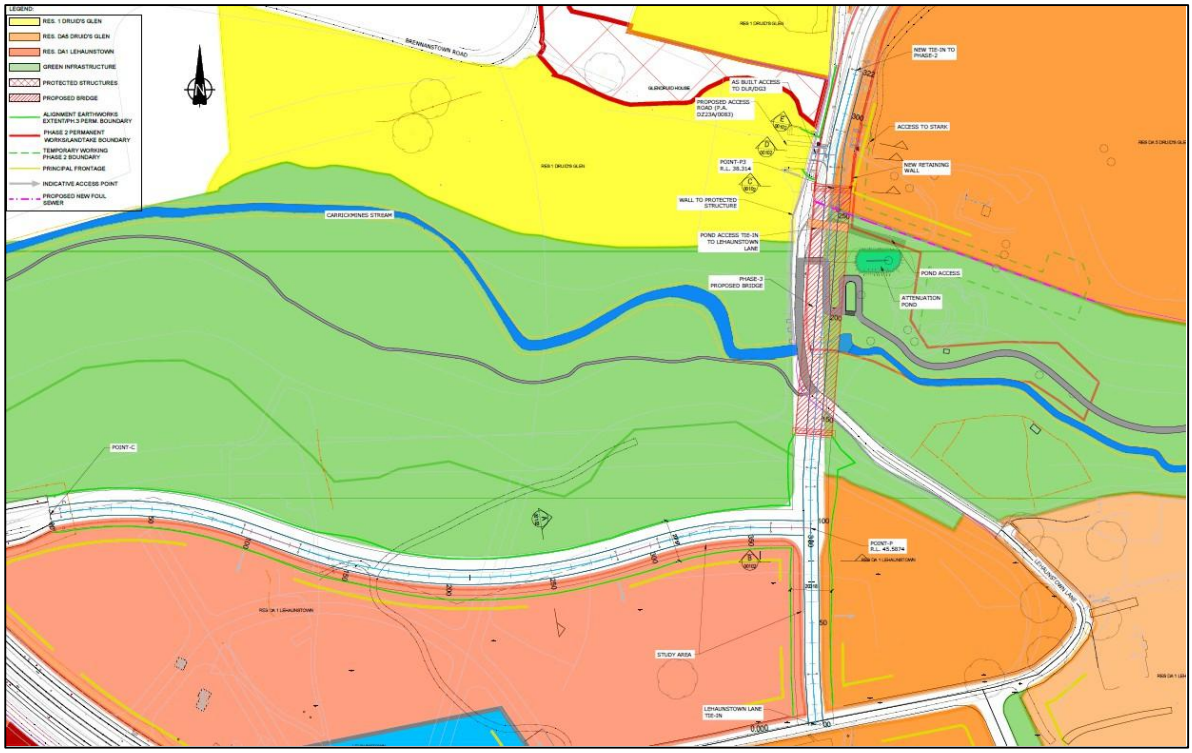


**Figure 7-2: Option 1 Plan Layout**

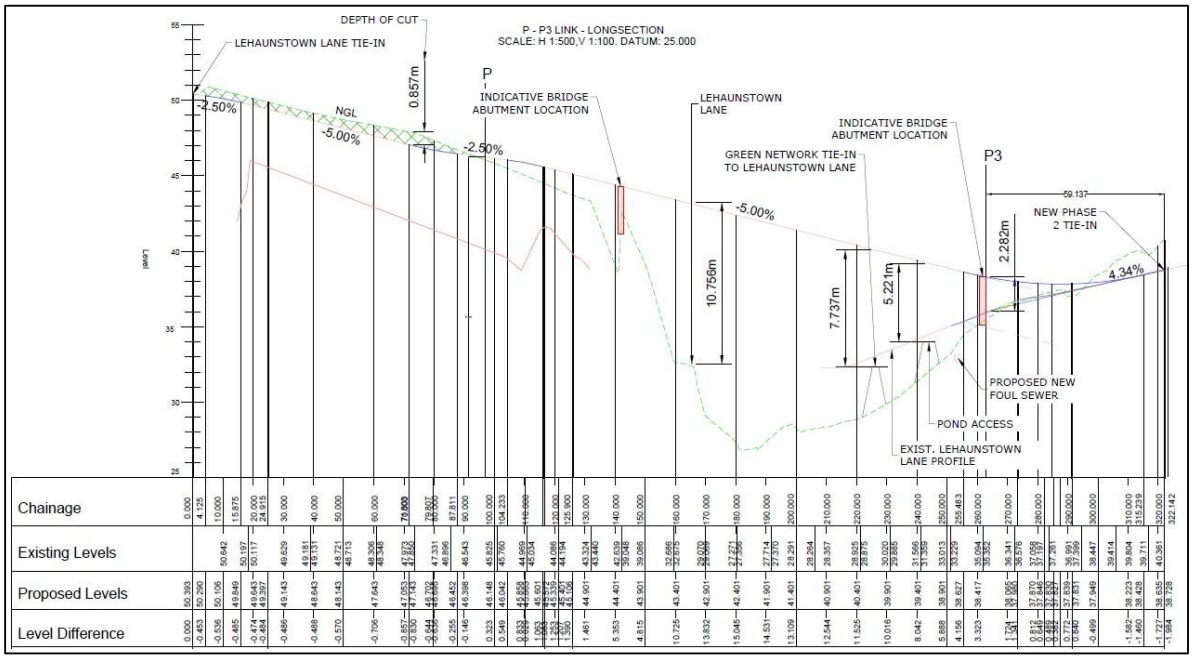


**Figure 7-3: Long section between Lehaunstown Lane tie-in (south) and Point P3**

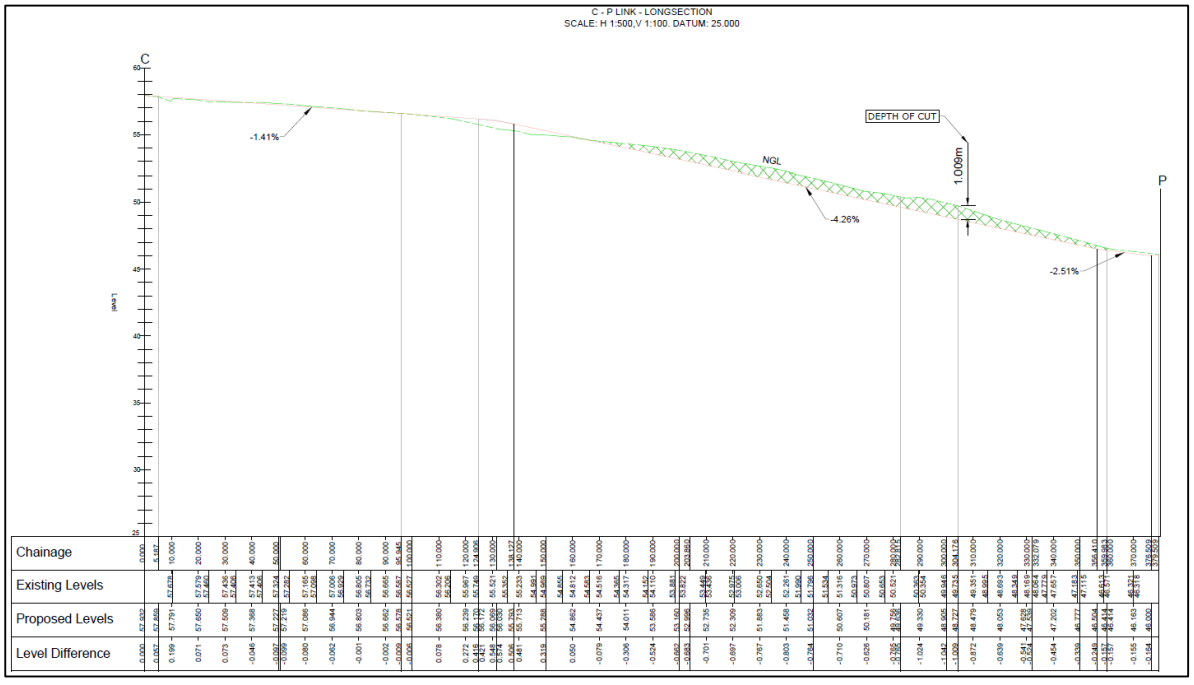


**Figure 7-4: Long section between Point C and Point P**

## Engineering

**Traffic Assessment & Route Cross-section:** This option meets the schemes objectives by facilitating connectivity through the zoned lands within Cherrywood including within Development Area 1development by providing facilities for vehicles and vulnerable users.

**Technical Standards:**
**Point P to Point P3:** Connection is achievable, within the project constraints (max gradient of 5%) and within DMURS constraints (max gradient of 8%) using a max. 5% gradient (Figure 7-3).

**Point C to Point P:** Connection is achievable, within the project constraints (max gradient of 5%) and within DMURS constraints (max gradient of 8%) using a max. 4.26% gradient (Figure 7-4).
**Point P to Lehaunstown Lane:** Connection is achievable, within the project constraints (max gradient of 5%) and within DMURS constraints (max gradient of 8%) using a max. 5% gradient (Figure 7-3).
**Sag and Crest:** The K-value within the scheme is 4.7 for crest curves and 6.4 for sag curves which is in accordance with DMURS threshold at the prescribed design speed of 50km/h.

**Principal Junctions and Interchanges, Access Control and interaction with Existing Road Network:** The design of the road and bridge alignment was guided by several surveys: the Topographical and Geomatic UAV Survey conducted by Murphy Geospatial in 2020 and 2019 for Cherrywood R034 Lands at Lehaunstown, a Topographical Survey at Stark Lands, and the Setting Out Survey Details for Cabinteely and Glenamuck Road carried out in 2022. These surveys fed into the design produced by DBFL which was reviewed by ARUP (Technical Note: Druid's Glen Road Peer Review by Arup, issued 3 April 2023). In this report, ARUP presented constraints, impacts, recommendations, and the next steps related to the levels for the road and bridge alignment based on the information available at the time of the review. Consequently, the alignment proposed in this report, along with the associated drawings, incorporates previous surveys as well as the Phase 2 As-built alignment (extracted from C549-Road Levels Rev01.pdf).

The plan alignment adheres to the CPS and the vertical alignment from Point C to Point P and from Point P to Lehaunstown Lane is kept close to the NGL which avoids excessive earthworks and ties in seamlessly to the existing road at Point C.

In this option, the choice to tie-in to existing road levels at Point C and Lehaunstown Lane, while designing close to the NGL, ensures minimum earthworks along these 2 alignments but the vertical alignment thresholds places point P at a high elevation. The impact of this higher elevation is discussed further.

The alignment of the bridge adheres to the CPS although in attempting to design within the project constraints, the tie-in to Phase 2 at Point P3 results in 2.28m level difference. To accommodate this level difference the vertical alignment requires a realignment of 59m beyond the proposed tie-in point. Since Phase 2 has been completed prior to the implementation of this scheme, the impact of this option shall result in the partial reconstruction of the Phase 2 as-built road.

Subsequently, with reference to Figure 7-5 the amended tie-in beyond Point P3 will have significant benefits to the residential land access on the west side of the road within Phase 2 (Residential Development Area 5). Since the ground level on the west side is higher than the proposed alignment, the levels under Option 1 at the proposed access point to the lands south of Glendruid House will be closer to the natural ground level compared to the as-built Phase 2 access point. At the east side access, referred to Figure 7-6, the proposed alignment is only 0.5m higher than the existing ground level, therefore it can be constructed with a minimum projection beyond the current Phase 2 Permanent Works/Land take boundary, but still fully within the extent of the access tie-in section, constructed as part of Phase 2 works. The 59m of reconstruction works beyond Point P3 are balanced out by minimizing additional earthworks at the future access roads. This Option is also the only Option which can facilitate the access road to the pond on the east side of the alignment, north of Carrickmines Stream. The level difference of 5.2 m (demonstrated in Figure 7-3) would allow the pond access for maintenance vehicles, such as tracked (~13T) excavators, rigid trucks, etc., crossing underneath the bridge with a clearance of 3 to 3.5 m and tie-in to the existing Lehaunstown Lane.

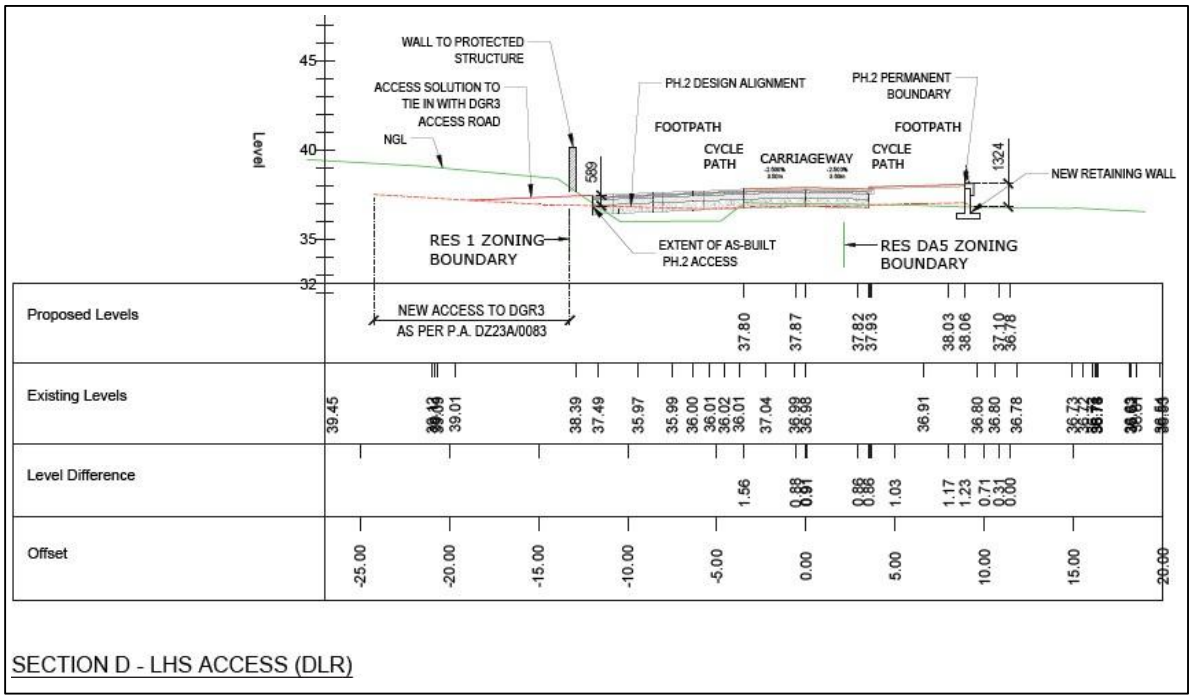


**Figure 7-5: Cross sections at Phase 2 future Access roads (Section D-D)**

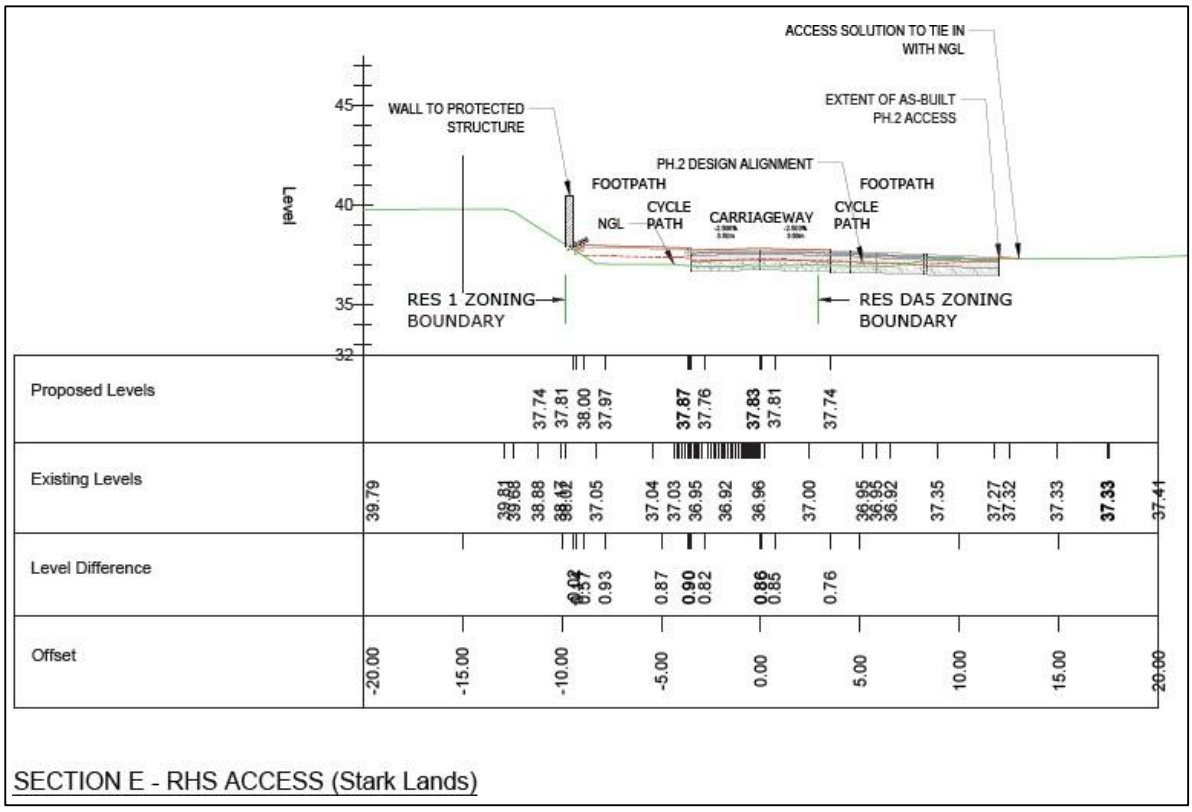


**Figure 7-6: Cross sections at Phase 2 future Access roads (Section E-E)**

**Structures:** Active travel facilities across the Druids Glen buffer are permitted as part of the Cherrywood Green Routes Network and would pass under the proposed bridge across Lehaunstown Lane. This option introduces a level difference of 2.28m above the proposed Point P3 therefore the higher alignment creates a significant clearance of 7.74m over the Green Route network on Lehaunstown Lane. Although this report

does not cover the bridge deck depth design, typical bridge deck depth design options were considered. This Option allows for generous clearance over Lehaunstown Lane and is regarded as more advantageous compared to other alternatives.

With reference to Figure 7-7, this Option requires a short section of retaining wall (or an extended wing wall) behind the north bridge abutment (at Point P3), on the east side, approx. 5 m long. This retaining wall ties into the wing wall at its south end and continues to the proposed RHS access road tie-in at the north end. On the west side of the alignment, adjacent to the existing Lehaunstown lane, there will be a standard bridge wing wall (approx. 5 m long), followed by an embankment for the LHS access road tie-in. A temporary tie-in to Lehaunstown Lane can be constructed from the Phase 2 as-built LHS access road tie-in to facilitate connectivity during the bridge construction. Furthermore, short section of Lehaunstown Lane near the LHS access tie-in may be regarded to facilitate greenway access towards Brennanstown Road as per CPS.

It is important to note that despite the higher level at Point P3, this option does not have a negative impact on the wall to protected structure to west.

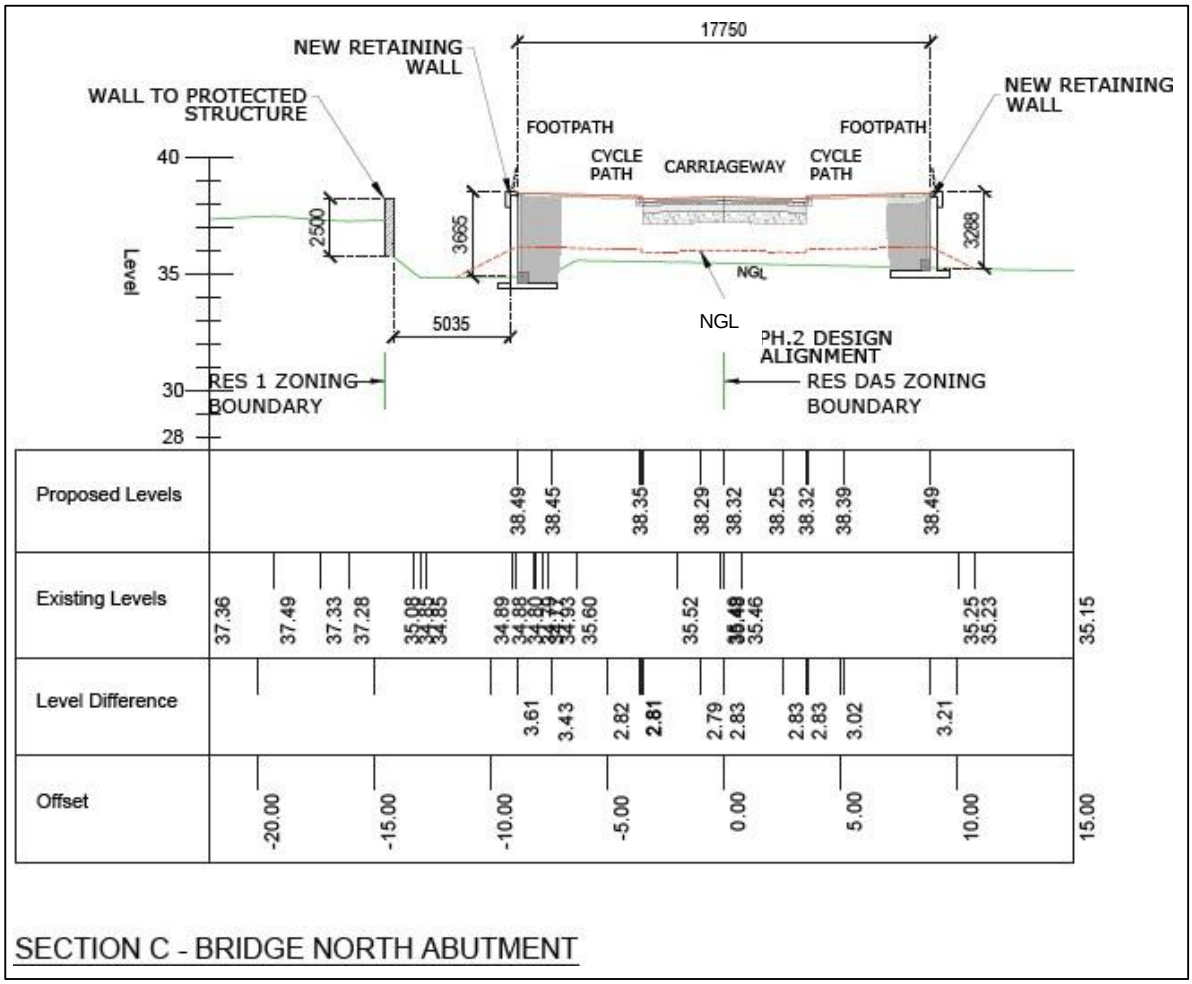


**Figure 7-7: Cross section at Point P3 (Section C-C)**

**Geology and Earthworks:** This Option results in a cut of up to 0.86m between Lehaunstown Lane and Point P as well as a cut of up to 1.01m between Point C and Point P. Compared to the other Options, this Option is ranked as highly positive, as the vertical alignment closely follows the natural ground level (NGL), therefore there is minimal impact on existing ground conditions due to minimal cut/fill requirements.

**Construction:** It should be noted that the heritage stone wall shall be demarcated for protection during the

construction of a retaining wall at Point P3. While this Option may be within close proximity to a heritage site, construction can occur through due diligence and a reasonable construction methodology.

A suitable traffic management plan will be required to deal with works occurring along Lehaunstown Lane.

**Comparative Service Conflicts:** All existing and proposed services have been reviewed, the proposed alignment has no effect on proposed or existing services, including the proposed foul sewer (450mm to 1100mm) as per Map 4.4 of CPS.

**Comparisons on Land & Property:** The proposed alignment remains within the boundaries of the CPS, ensuring a reduced impact on future development. The design stays close to the NGL, with a maximum cut of 1m, however there is potential for encroachment onto property frontages due to the required cut and filling along the scheme. The maximum extent of the proposed scheme is approximately 20.5m wide at Ch. 250.000 between Point C and Point P (see Figure 7-8), while the maximum extent of the proposed scheme is approximately 19.7m wide at Ch. 80.000 between Lehaunstown Lane and Point P. As illustrated in Figure 7-8 and Figure 7-9, the impact of the embankments in Option 1 are minor compared to those in Option 3, resulting in minimal impact on property frontages. Furthermore, Figure 7-5 shows that the height difference at P3 allows for a smooth transition to the proposed accesses in Phase 2.

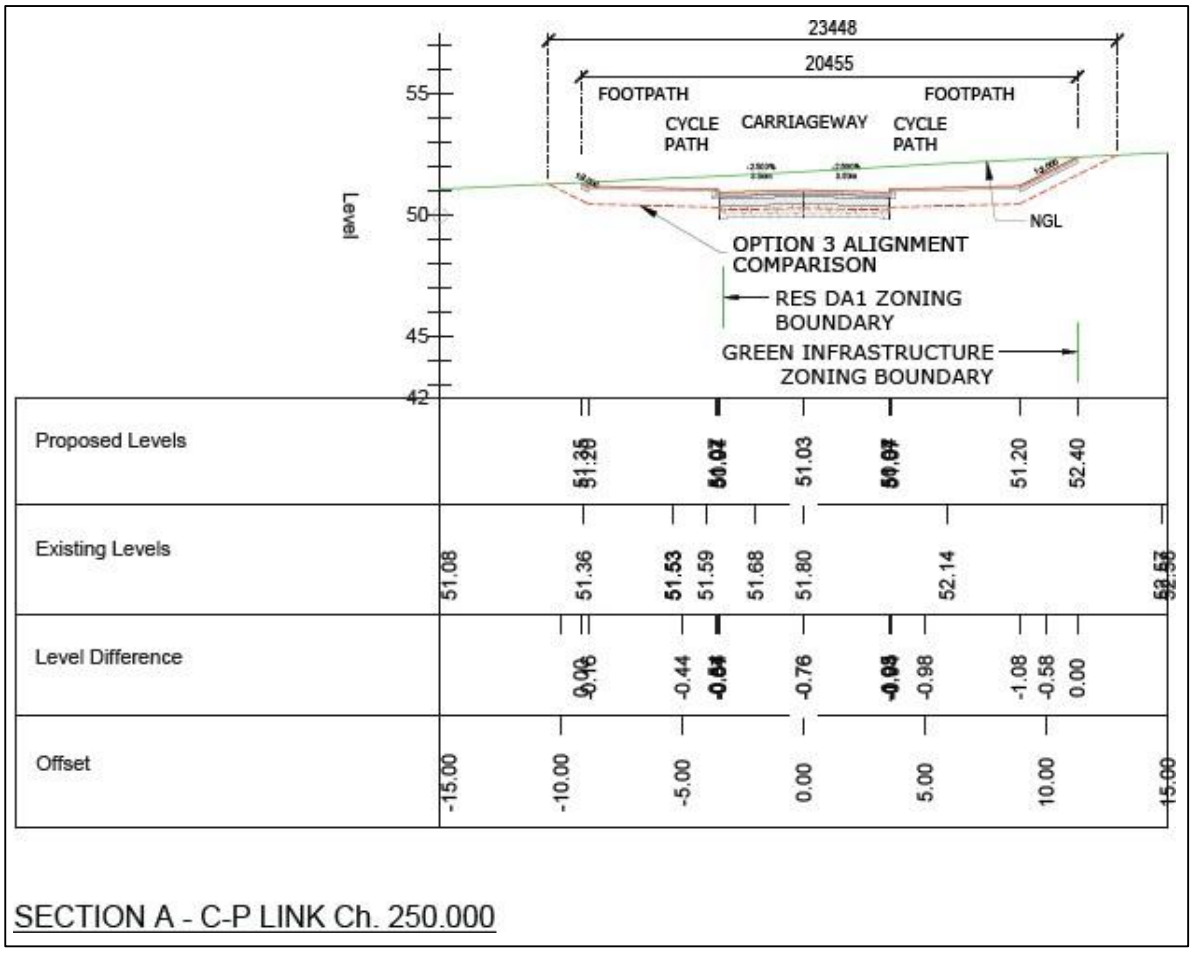


**Figure 7-8: Maximum Extent of Earthworks between Point C and Point P (Ch. 250.000 Section A-A)**

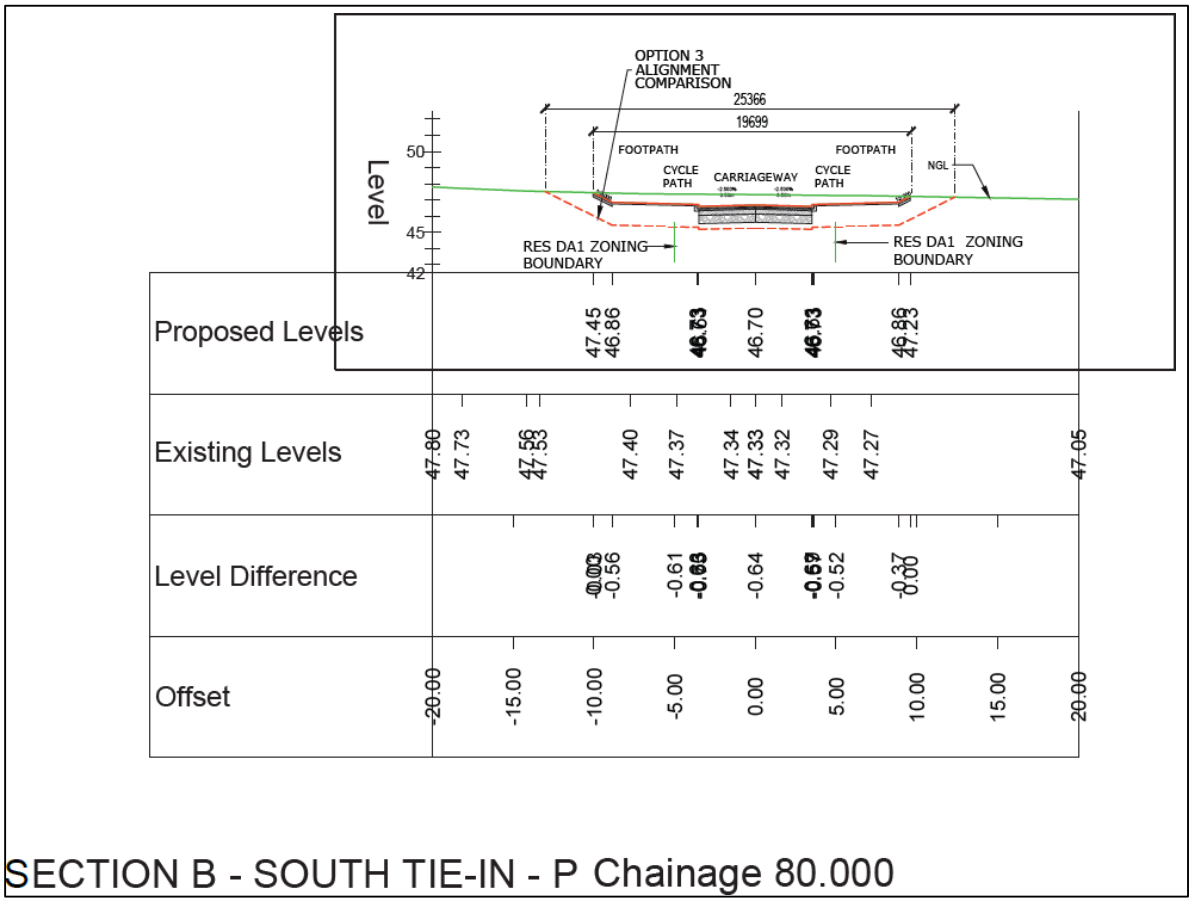


**Figure 7-9: Maximum Extent of Earthworks between Point P and Lehaunstown Lane (Ch. 80.000 Section B-B)**

## Environmental

**Human Beings:** The proposed height change at the tie-in Point P3 offers significant benefits by providing a generous clearance of 7.74m over the Green Route network on Lehaunstown Lane. This clearance enhances the sense of safety and openness.

**Flora & Fauna:** With regards to Flora, it should be noted that the clearance of woodland occurs across all options. However, this option is considered to have a major negative impact compared to Option 5, which results in a significantly reduced removal of mature trees. However, this option performs better when compared to the other options as the vertical alignment closely follows the natural ground level (NGL), resulting in reduced impacts to existing flora and reduces disruption to sensitive terrain. The disruption of the woodland clearance is offset by the reduced cut for this option therefore this option is considered slightly negative.

With regards to the fauna, the removal of woodland and vegetation has potential to cause disturbance to bats, birds and mammals (loss of foraging areas and impacts during operation due to light spill from public lighting) which could be confirmed by way of Ecological Impact Assessment and survey work at a later stage in the project - making all options equal in this regard.

**Water Resources:** The route alignment for the proposed scheme traverses the Carrickmines River, making all options equal in this regard. The route alignment is outside the Flood Zones shown in the OPW CFRAM Flood Map for the Shanganagh-Carrickmines River and the DLRCC Strategic Flood Risk Assessment 2022-2028 Flood Zone, this is the same across all options.

**Geology & Hydrogeology:** This Option results in a cut of up to 0.86m between Lehaunstown Lane and Point P as well as a cut of up to 1.01m between Point C and Point P. Compared to the other Options, this

Option is ranked as highly positive, as the vertical alignment closely follows the natural ground level (NGL), resulting in minimal impact on vulnerable rocks, soils and aquifers.

**Air Quality and Noise:** A bridge connecting the developments is required by the CPS therefore, slight changes to the alignment of the proposed scheme do not affect air quality or noise levels, making all options equal in this regard.

**Landscape & Visual:** The vertical alignment closely follows the natural ground level (NGL) in this Option. Any changes to the existing landform are expected to be imperceptible. The Natural Green Space at Druid's Glen is also expected to have a lower level of impact compared to the other options because of the reduced requirement for earthworks. Part of the wall to protected structure is expected to be obscured; however, the impact will be minor as assessed by the Cultural Heritage specialist, this is the same for all options. The visual impact on the wall to protected structure and demesne is expected to be very minor or barely noticeable. The landscape setting of the Brennanstown Dolmen/Portal Tomb could potentially be negligibly affected subject to further confirmation, should this option be selected, by way of Landscape and Visual Impact Assessment at a later stage of the project. The landscape setting is a wooded valley with mature woodland and the bridge would be approximately 500m distant along the valley. The impact is likely to be negligible and similar across all options. The level of vegetation clearance is expected to be similar for all options. The slight variation in the location of the tie in point P and Lehaunstown Lane is expected to vary the level of visual impact. Nonetheless, this high-level assessment does not account for proposed mitigation. Overall, when it comes to the level of visual impact because of vegetation clearance, little to no difference is expected between the options. Once the preferred alignment is selected, the landscape and visual impact of the feature bridge will be assessed during the bridge appraisal stage.

**Archaeology & Cultural Heritage:** The proximity of the proposed alignment to the wall to protected structure is a potential constraint on construction, and the effects on Glen Druid demesne will be minor, however all options preserve the stone wall's heritage. Option 1 has an indirect positive effect on the wall to protect structure because construction of the access road to the land on the west side would require a shorter section of the wall to be demolished. There are no perceived impacts on the Brennanstown Dolmen/Portal Tomb (RMP 026-007) as it is situated outside of the SDZ and is bound to the south by the Carrickmines stream and a significant stand of trees, this is similar across all options. Where the options cross greenfield land they have the potential to impact on previously unrecorded archaeological remains, however this is similar across all options.

## Economy

The capital cost involves several contributing factors, including bridge length, retaining wall construction, rebuilding costs to tie in at Point P3 and earthworks. This Option requires a slight increase in bridge length to span the higher level which results in rebuilding costs at Point P3 and the construction of a higher retaining wall. However, the earthworks along this alignment are minimal due to the levels remaining close to the NGL.

The ranking of options resulting from relative differences in construction cost is provided in Table 7-3 and it is based on the limited information available at this phase of the project.

| | OPTION 1 | OPTION 2 | OPTION 3 | OPTION 4 | OPTION 5 |
|---|---|---|---|---|---|
| **Rank (Lowest to Highest)** | 4 | 3 | 1 | 2 | 5 |

**Table 7-3: High-level Relative Cost Comparison**

Option 1 ranks 4th in terms of cost-effectiveness. The increased cost of reconstruction at Point P3 is balanced by the reduced cost of earthworks.

## Option 2

This Option attempts to lower the elevation of Point P to reduce the impact at the tie-in at Point P3. In doing so, and taking cognisance of the project constraints, the suggested tie in point between Point P and Lehaunstown Lane would involve a connecting section of road that differs in terms of alignment when compared to that indicated throughout the Cherrywood Planning Scheme. The potential need to amend the Cherrywood Planning Scheme needs to be considered by DLRCC separately. Additionally, such a Planning Scheme amendment process involves significant assessment work and could result in significant delays to implementing the scheme. This Option proposes to maintain the plan alignment as per the CPS between Point C and Point P while maintaining the tie-in levels to the existing infrastructure at Point C. The details and impacts of this proposed alignment option are explained further.

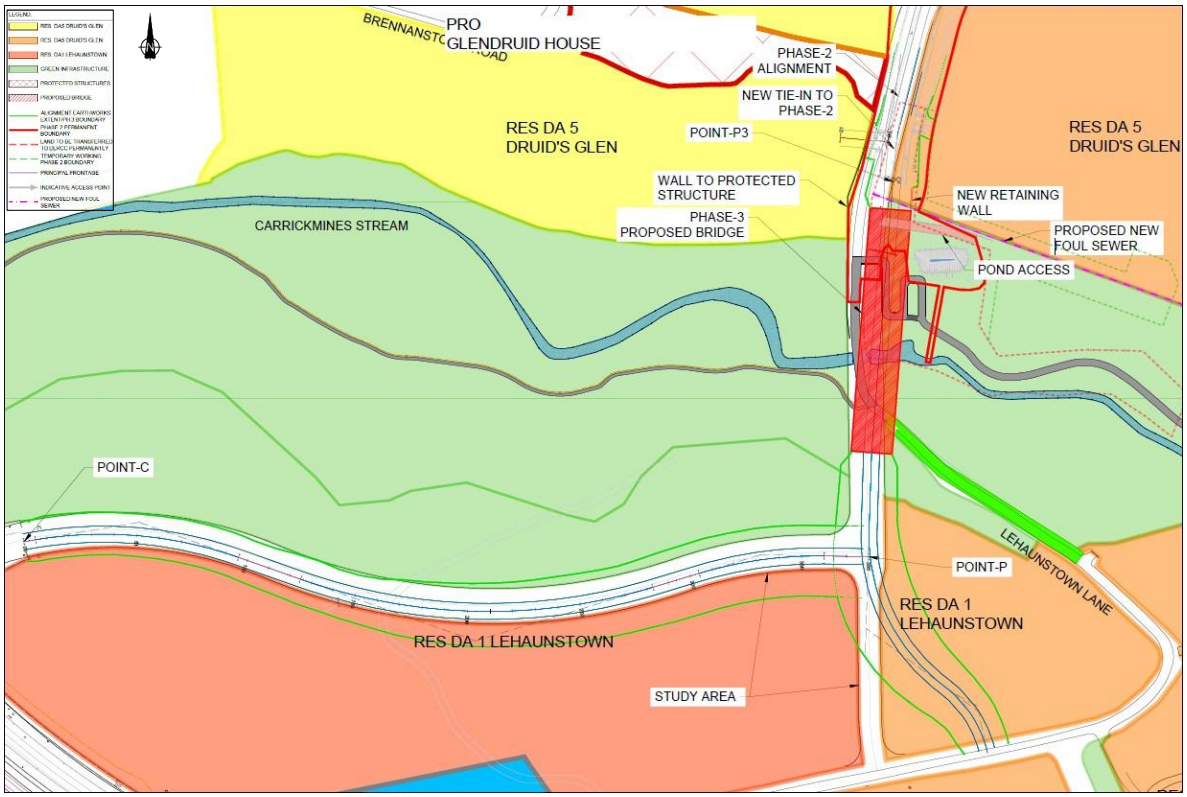


**Figure 7-10: Option 2 Plan Layout**

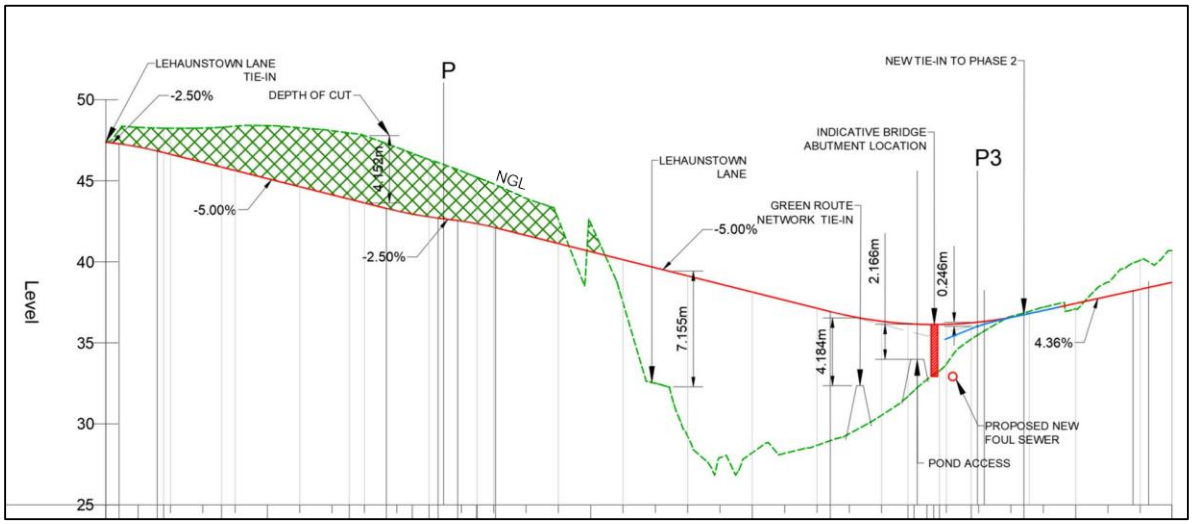


**Figure 7-11: Long section between Point P and Point P3**

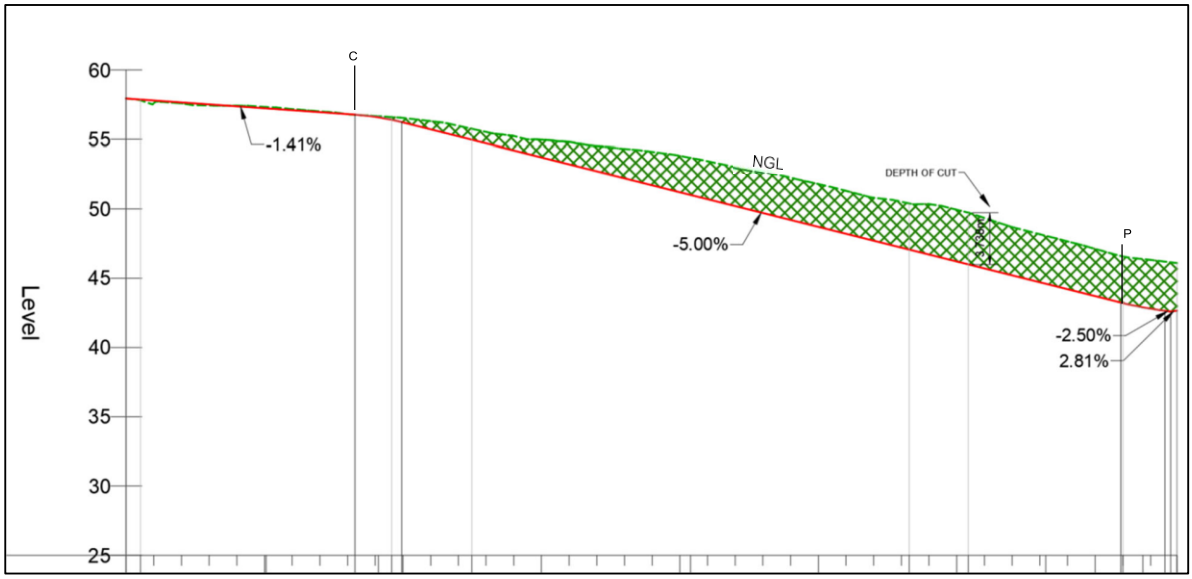


**Figure 7-12: Long section between Point C and Point P**

## Engineering

**Traffic Assessment & Route Cross-section:** This option meets the objectives by facilitating connectivity through the zoned lands within Cherrywood including within Development Area 1 development by providing facilities for vehicles and vulnerable users.

**Technical Standards:**
**Point P to P3:** Connection is achievable, within the project constraints (max gradient of 5%) and within DMURS constraints (max gradient of 8%) using a max. 5% gradient (Figure 7-11).
**Point C to P:** Connection is achievable, within the project constraints (max gradient of 5%) and within DMURS constraints (max gradient of 8%) using a max. 5% gradient (Figure 7-12).
**Point P to Lehaunstown Lane:** Connection is achievable, within the project constraints (max gradient of 5%) and within DMURS constraints (max gradient of 8%) using a max. 5% gradient (Figure 7-11).
**Sag and Crest:** The K-value within the scheme is 4.7 for crest curves and 6.4 for sag curves which is in accordance with DMURS threshold at the prescribed design speed of 50km/h.

**Principal Junctions and Interchanges, Access Control and interaction with Existing Road Network:** The design of the road and bridge alignment was guided by several surveys: the Topographical and Geomatic UAV Survey conducted by Murphy Geospatial in 2020 and 2019 for Cherrywood R034 Lands at Lehaunstown, a Topographical Survey at Stark Lands, and the Setting Out Survey Details for Cabinteely and Glenamuck Road carried out in 2022. These surveys fed into the design produced by DBFL which was reviewed by ARUP (Technical Note: Druid's Glen Road Peer Review by Arup, issued 3 April 2023). In this report, ARUP presented constraints, impacts, recommendations, and the next steps related to the levels for the road and bridge alignment based on the information available at the time of the review. Consequently, the alignment proposed in this report, along with the associated drawings, incorporates previous surveys as well as the Phase 2 As-built alignment (extracted from C549-Road Levels Rev01.pdf).

In this Option the vertical alignment from Point C to Point P is below the NGL which will result in additional earthworks but places Point P at a lower elevation. With Point P at this lower elevation, to achieve the 5% gradient (project constraint) to Lehaunstown Lane the plan alignment from Point P to Lehaunstown Lane differs from the CPS, creating the tie-in point approximately 49m away from the CPS tie in point.

The alignment of the bridge adheres to the CPS but even with the lower tie-in at Point P (approx. 3.7m below the NGL) the tie-in into Phase 2 at Point P3 results in a +0.25m level difference. To accommodate this level difference the vertical alignment requires realignment of 15m beyond the existing Phase 2 tie-in point. Since Phase 2 was completed prior to the implementation of this scheme, the impact of this option shall result in the reconstruction of the Phase 2 as-built road within a short distance (15 m).

The alignment level at the crossing with the pond access road is too low to provide sufficient clearance underneath the bridge deck, since the level difference is only 2.2m. The implication is that Option 2 would require realignment of the pond access road to the north and that would require additional land currently zoned for residential development.

**Structures:** Active travel facilities across the Druids Glen buffer are proposed as part of the Green Route Network, which passes under the proposed bridge. The level difference between the proposed alignment over Lehaunstown Lane is 7.15m south of the existing bridge and 4.18 m at the tie-in of the proposed Green Route network into Lehaunstown Lane north of the existing bridge. Although this report does not cover the bridge deck depth design, typical bridge deck depth design options were considered. It should be noted that this option may still achieve approx. 3 m clearance at the Green Route network tie-in. Additionally, the reduced alignment level of this option would result in a shorter length of the bridge by approx. 12 m.

The proposed alignment can be constructed without adversely affecting the wall to protected structure on the west side of the existing Lehaunstown Lane as indicated on the cross-section below. A short retaining wall or an extended wing wall will be required on the west side of the proposed alignment behind north abutment to contain the road embankment and to facilitate the greenway access from the existing Lehaunstown Lane towards Brennanstown Road as per CPS.

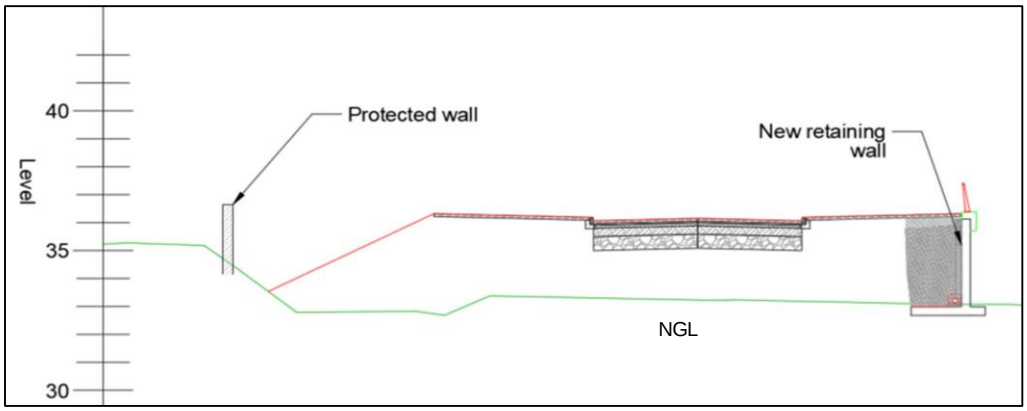


**Figure 7-13: Cross section at Point P3**

**Geology and Earthworks:** This option results in a cut of up to 4.15m between Lehaunstown Lane and Point P as well as a cut of up to 3.74m between Point C and Point P. Compared to Option 4, this option is ranked as major negative. This option has significant disadvantages as the vertical alignment is approx. 4m below the NGL, and at these depths it is likely to disrupt the natural bedrock.

**Construction:** The heritage stone wall west of the existing Lehaunstown Lane will be protected during bridge construction by restricting construction traffic in its vicinity, applying due diligence and a reasonable construction methodology.

A suitable traffic management plan will be required to deal with works occurring along Lehaunstown Lane.

**Comparative Service Conflicts:** The reduced bridge length of this option would result in positioning the north bridge abutment in proximity to the proposed foul sewer (450mm to 1100mm as per Map 4.4 of CPS) and as such it may create a conflict with services.

**Comparisons on Land & Property:** The suggested tie in point between Point P and Lehaunstown Lane would involve a connecting section of road that differs in terms of alignment when compared to that indicated throughout the Cherrywood Planning Scheme – dividing two differing land use zoning (Res 2 and Res 3). The potential need to amend the Cherrywood Planning Scheme needs to be considered by DLRCC separately. Additionally, the proposed design requires significant excavation between Point C and Point P, which will likely affect property frontages due to the need for large slopes or retaining structures.

## Environmental

**Human Beings:** The proposed height change at the tie-in Point P3 offers some disadvantages by providing an unreliable clearance of 7.15m over the future active travel path on Lehaunstown Lane. This clearance reduces the sense of safety and openness.

**Flora & Fauna:** With regards to Flora, it should be noted that the clearance of woodland occurs across all options. However, this option is considered to have a major negative impact compared to Option 5, which results in a significantly reduced removal of mature trees. Additionally, this Option has significant disadvantages, as the vertical alignment is below the NGL, requiring substantial cuts of up to 4m along the section between Point C and Point P. Furthermore, the alignment from Point P to Lehaunstown Lane also necessitates a substantial cut of 3.7m. Earthworks of this magnitude severely disrupt existing flora and significantly impact sensitive terrain.

With regards to the fauna, the removal of woodland and vegetation has potential to cause disturbance to bats, birds and mammals (loss of foraging areas and impacts during operation due to light spill from public lighting) which could be confirmed by way of Ecological Impact Assessment and survey work at a later stage in the project - making all options equal in this regard.

**Water Resources:** The route alignment for the proposed scheme traverses the Carrickmines River, making all options equal in this regard. The route alignment is outside the Flood Zones shown in the OPW CFRAM Flood Map for the Shanganagh-Carrickmines River and the DLRCC Strategic Flood Risk Assessment 2022-2028 Flood Zone, this is the same across all options.

**Geology & Hydrogeology:** This Option results in a cut of up to 4.15m between Lehaunstown Lane and Point P as well as a cut of up to 3.74m between Point C and Point P. This Option is ranked as a major negative, as the vertical alignment is approx. 4m below the natural ground level (NGL), resulting in major impact on vulnerable rocks, soils and aquifers.

**Air Quality and Noise:** A bridge connecting the developments is required by the CPS therefore, slight changes to the alignment of the proposed scheme do not affect air quality or noise levels, making all options equal in this regard.

**Landscape & Visual:** This option's vertical alignment is below the NGL. This is expected to result in changes to the existing landform. Locally these changes can be considered medium to high. For this reason, the Natural Green Space at Druid's Glen is also expected to have a similar level of change and associated impact. As with other options, part of the wall to protected structure is expected to be obscured; however, the impact will be minor as assessed by the Cultural Heritage specialist, this is the same for all options. The visual impact on the wall to protected structure and demesne is expected to be very minor or barely noticeable. The landscape setting of the Brennanstown Dolmen/Portal Tomb could potentially be negligibly affected subject to further confirmation, should this option be selected, by way of Landscape and Visual Impact Assessment at a later stage of the project. The landscape setting is a wooded valley with mature woodland and the bridge would be approximately 500m distant along the valley. The impact is likely to be negligible and similar across all options. The level of vegetation clearance is expected to be similar for all options. The slight variation in the location of the tie in point P and Lehaunstown Lane is expected to vary the level of visual impact. Nonetheless, this high-level assessment does not account for proposed mitigation. Overall, when it comes to the level of visual impact because of vegetation clearance, little to no difference is expected between the options. Once the preferred alignment is selected, the landscape and visual impact of the feature bridge will be assessed during the bridge appraisal stage.

**Archaeology & Cultural Heritage:** The proximity of the proposed alignment to the wall to protected structure is a potential constraint on construction, and the effects on Glen Druid demesne will be minor; however, all options preserve the stone wall's heritage. Due to the level difference at Point P3, the alignment and the lands on the west side, would indirectly have a bigger impact on the heritage wall because a longer section of the wall would need to be demolished to construct the access road to the lands behind. There are no perceived impacts on the Brennanstown Dolmen/Portal Tomb (RMP 026-007) as it is situated outside of the SDZ and is bound to the south by the Carrickmines stream and a significant stand of trees, this is similar across all options. Where the options cross greenfield land they have the potential to impact on previously unrecorded archaeological remains, however this is similar across all options.

## Economy

The capital cost involves several contributing factors, including the bridge length, retaining wall construction, rebuilding costs to tie in at Point P3, and earthworks. Due to the lower level at Point P3, this Option requires the construction of a lower retaining wall and reduced rebuilding costs at Point P3. However, substantial earthworks are expected along with this alignment, with cuts of up to 4 meters.

Ranking of options considering relative differences in construction costs is provided in Table 7-4 and is based on the limited information currently available at this phase of the project.

| | OPTION 1 | OPTION 2 | OPTION 3 | OPTION 4 | OPTION 5 |
|---|---|---|---|---|---|
| **Rank (Lowest to Highest)** | 4 | 3 | 1 | 2 | 5 |

**Table 7-4: High-level Relative Cost Comparison**

Option 2 ranks 3rd in terms of cost-effective. The increased costs of earthworks counterbalance the savings achieved from the reduced rebuild at Point P3.

## Option 3

This Option attempts to tie-in at a lower elevation at Point P3 compared to Option 1 thus resulting in a shorter tie-in distance and lower level at Point P. The plan alignment from Point P to Point C and Point P to Lehaunstown Lane remains according to the CPS. Additionally, tie-in levels to the existing infrastructure at Point C and Lehaunstown Lane is maintained. Since this Option maintains alignment with the CPS, the impact on zone lands is reduced between the Phase 2 tie in point and point P3, however, with a lower elevation at Point P, the extent of cut between Point C and P and between Point P and Lehaustown Lane will be increased. The details and impacts of this proposed alignment option are explained further.

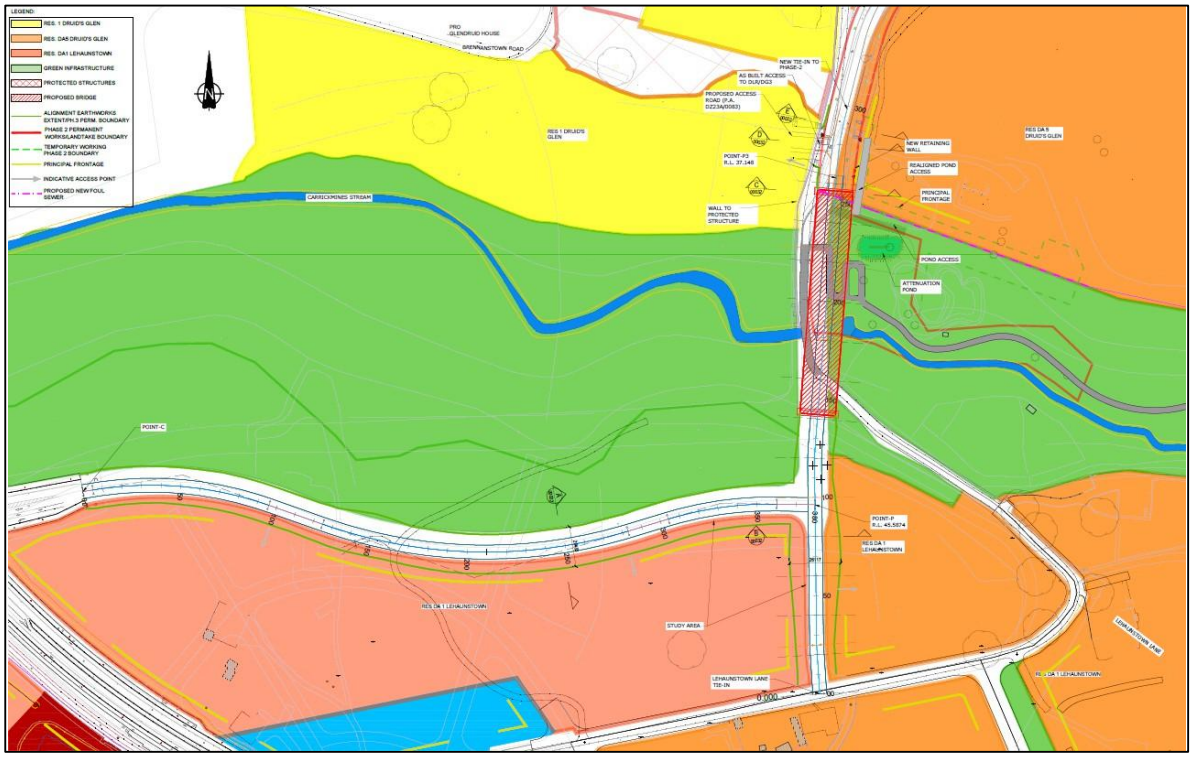


**Figure 7-14: Option 3 Plan Layout**

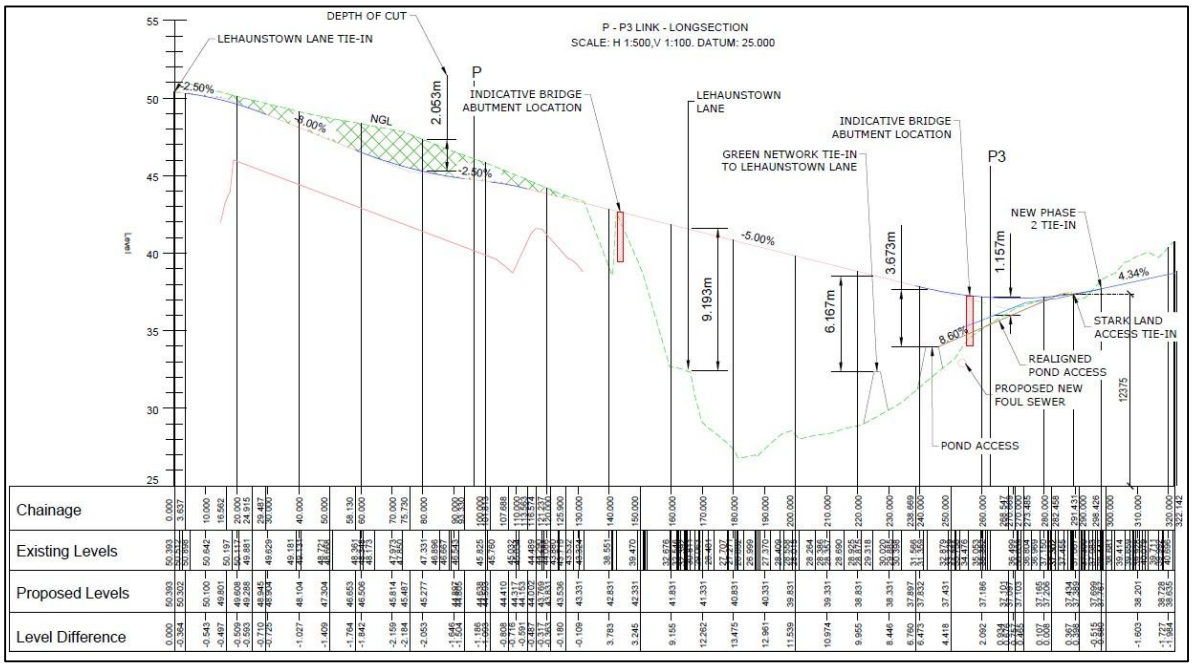


**Figure 7-15: Long section between Point P and Point P3**

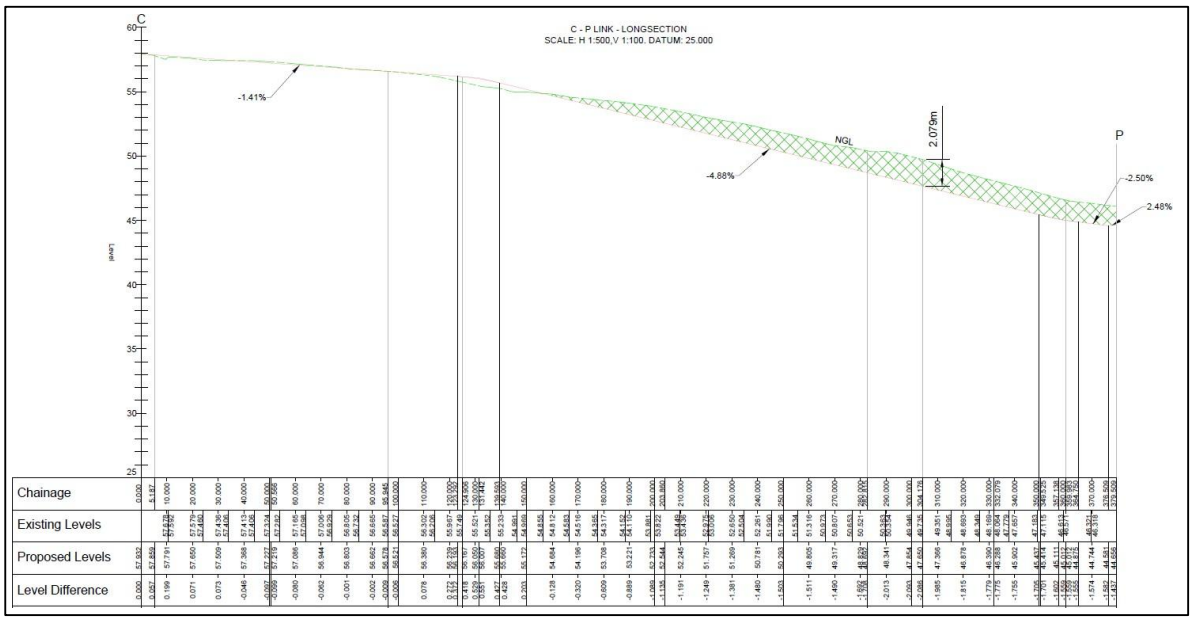


**Figure 7-16: Long section between Point C and Point P**

## Engineering

**Traffic Assessment & Route Cross-section:** This option meets the objectives by facilitating connectivity through the zoned lands within Cherrywood including within Development Area 1 development by providing facilities for vehicles and vulnerable users.

**Technical Standards:**
**Point P to P3:** Connection is achievable, within the project constraints (max gradient of 5%) and within DMURS constraints (max gradient of 8%) using a max. 5% gradient (Figure 7-15).
**Point C to P:** Connection is achievable, within the project constraints (max gradient of 5%) and within

DMURS constraints (max gradient of 8%) using a max. 4.88% gradient (Figure 7-16).

**Point P to Lehaunstown Lane:** Connection exceeds the project constraints (max gradient of 5%) but the connection is still achievable as it is within DMURS constraints (max gradient of 8%) using a max. 8% gradient (Figure 7-15).
**Sag and Crest:** The K-value within the scheme is 4.7 for crest curves and 6.4 for sag curves which is in accordance with DMURS threshold at the prescribed design speed of 50km/h.

**Principal Junctions and Interchanges, Access Control and interaction with Existing Road Network:** The design of the road and bridge alignment was guided by several surveys: the Topographical and Geomatic UAV Survey conducted by Murphy Geospatial in 2020 and 2019 for Cherrywood R034 Lands at Lehaunstown, a Topographical Survey at Stark Lands, and the Setting Out Survey Details for Cabinteely and Glenamuck Road carried out in 2022. These surveys fed into the design produced by DBFL which was reviewed by ARUP (Technical Note: Druid's Glen Road Peer Review by Arup, issued 3 April 2023). In this report, ARUP presented constraints, impacts, recommendations, and the next steps related to the levels for the road and bridge alignment based on the information available at the time of the review. Consequently, the alignment proposed in this report, along with the associated drawings, incorporates previous surveys as well as the Phase 2 As-built alignment (extracted from C549-Road Levels Rev01.pdf).

The plan alignment adheres to the CPS from Point C to Point P and ties in seamlessly to the existing road at Point C. The vertical alignment from Point C to Point P is kept fairly close to the NGL but compared to Option 1, the gradient increases slightly from -4.26% to -4.88% resulting in an average depth of cut of 2m (within the last 200m).

The plan alignment adheres to the CPS; however, due to the lower elevation of Point P (1.4 m below NGL), the tie-in to Lehaunstown Lane results in a vertical gradient of 8% for approximately 20m, which exceeds the project threshold but is within the DMURS threshold. Therefore, this Option is less favourable in terms of accessibility compared to Option 1.

In this Option the choice to adhere to CPS road alignment and tie-in to existing road levels at Point C and Lehaunstown Lane, places point P at a level 1.5m lower than Option 1 and at approximately the same elevation as Option 2. The impact of this elevation is discussed further.

The alignment of the bridge adheres to the CPS although in attempting to design within the project constraints, the tie-in into Phase 2 at Point P3 results in a 1.2 m level difference. To accommodate this level difference the vertical alignment requires realignment of 36 m beyond the proposed tie-in point. Since Phase 2 was completed prior to the implementation of this scheme, the impact of this option shall result in the reconstruction of the Phase 2 as-built road.

With reference to Figure 7-17 the amended tie-in beyond Point P3 will have minor benefits to access on the west side of the road within Phase 2 (Residential Development Area 5) due to a smaller level difference between Druids Glen Road and the land west of it. The alignment level is only approx. 270 mm higher than Phase 2 design level and thus the levels under Option 3 at the proposed access point to the lands south of Glendruid House will be slightly closer to the natural ground level compared to the as-built Phase 2 access point and would seamlessly tie in with the access solution for Phase 2 enabling works permitted under D23A/0083. At the east side access, with reference to Figure 7-18, the proposed alignment can be constructed within the Phase 2 permanent land take boundary as the alignment level is almost identical with Phase 2 level. Therefore, both accesses (west and east) can be tied into the new alignment fully within the planned area built as part of Phase 2 and do not require any additional land acquisition. While the 36m of reconstruction works beyond Point P3 have benefits to tie-in to Phase 2 access roads, unfortunately, the level difference between the proposed Option 3 alignment and the access road to the pond on the west side of the bridge is only 3.7m. This is not sufficient to provide a crossing underneath the bridge deck. Therefore, this option would require realignment of the pond access road to the north. The realigned pond access would need to be constructed outside of the designated physical infrastructure zoned land, and it would require a steep gradient of almost 9% which is considered undesirable for service vehicles.

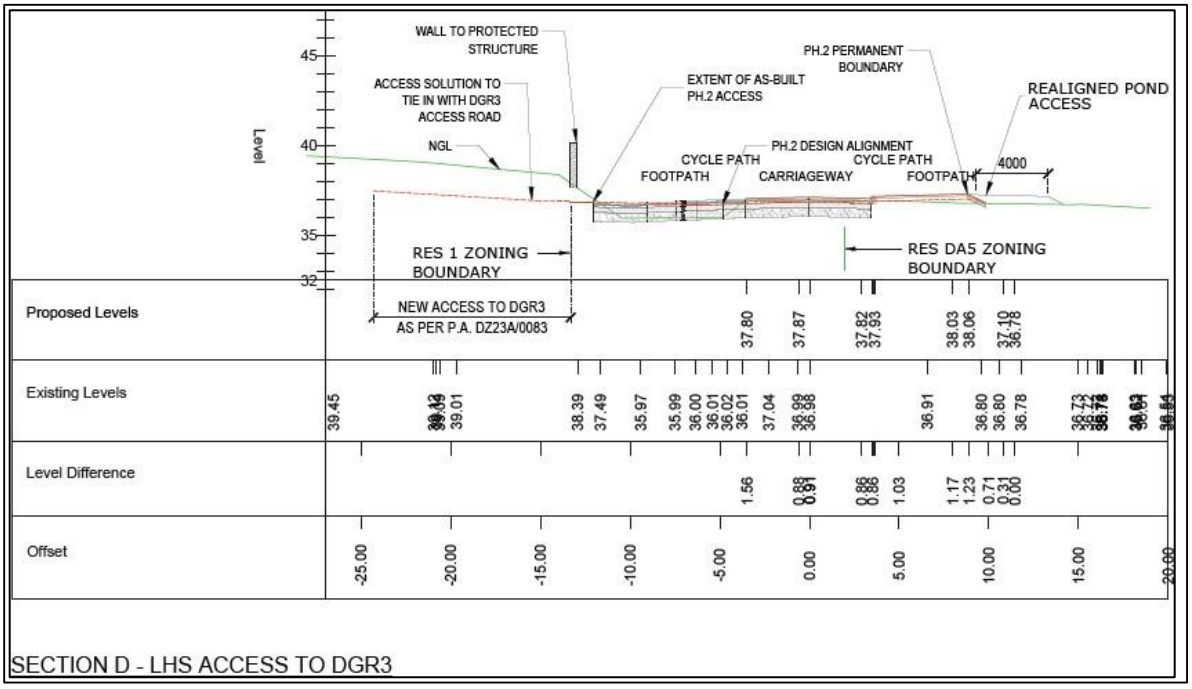


**Figure 7-17: Cross sections at Phase 2 future Access roads (Section D-D)**

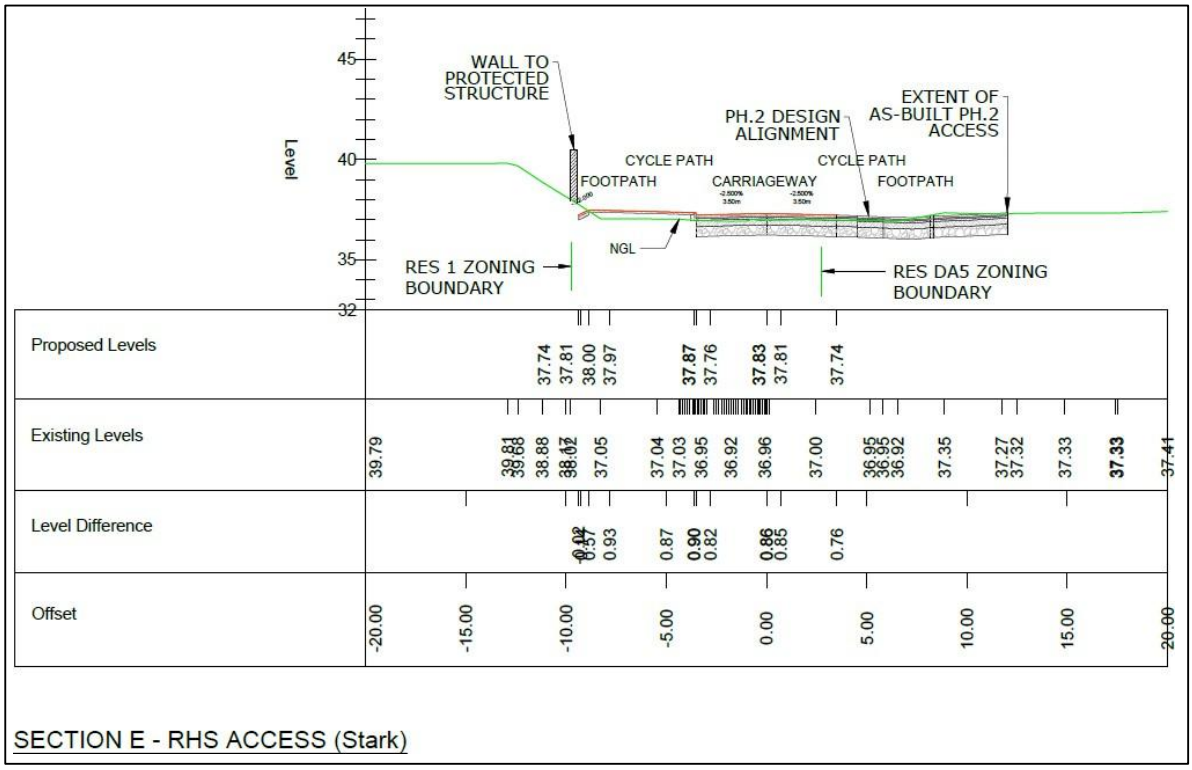


**Figure 7-18: Cross sections at Phase 2 future Access roads (Section E-E)**

**Structures:** Active travel facilities across the Druids Glen buffer are permitted as part of the Cherrywood Green Routes Network and would pass under the proposed bridge across Lehaunstown Lane. This option introduces a level difference of 1.2m above the proposed Point P3, resulting in a tie-in point 36m from Point P3 and would result in a shorter bridge length by approximately 5m compared to Options 2, 4 and 5. Consequently, the height change creates a clearance of 9.19m over the future active travel path on

Lehaunstown Lane and a 6.17 m level difference at the Green Route Network tie-in to Lehaunstown Lane north of the existing bridge. Although this report does not cover the bridge deck depth design, typical bridge deck depth design options were considered. This Option is likely to achieve the adequate clearance over Lehaunstown Lane and thus it is considered beneficial compared to options with lower clearances (Option 2, 4 & 5).

An additional structure required for this option includes a retaining wall on the east side of the road behind north bridge abutment to contain the road embankment within permanent landtake/boundary designated for Phase 2. There is sufficient distance between the new road and the existing stone heritage wall on the west side to avoid a need for a retaining structure beyond the standard bridge wing wall length (approx. 6 m). A normal or slightly steepen road embankment will not adversely affect the stability of this wall. Furthermore, a short section of Lehaunstown Lane near the LHS access tie-in may be regarded to facilitate greenway access towards Brennanstown Road as per CPS.

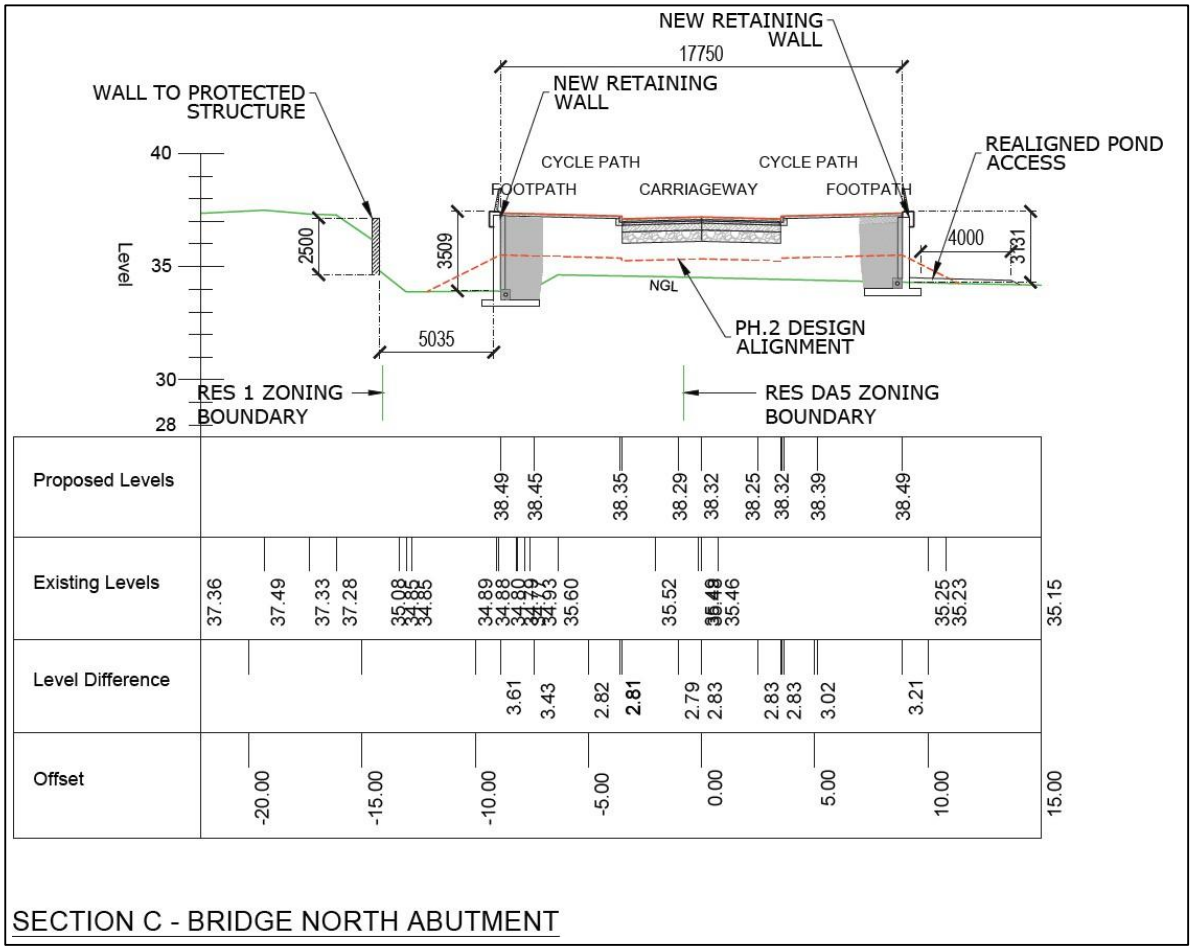


**Figure 7-19: Cross section at Point P3 (Section C-C)**

**Geology and Earthworks:** This option results in a cut of up to 2.05m between Lehaunstown Lane and Point P as well as a cut of up to 2.08m between Point C and Point P. Since Option 2, 4 and 5 experience extensive cuts, they are considered significantly negative whereas this Option is ranked as moderately negative. At these depths it is likely to come close to the natural bedrock.

**Construction:** It should be noted that the wall shall be demarcated during the construction of the bridge abutment to protect the heritage stone wall at Point P3. The importance of the wall is recognised, however, construction can occur with due diligence and a reasonable construction methodology.

A suitable traffic management plan will be required to deal with works occurring along Lehaunstown Lane.

**Comparative Service Conflicts:** The proposed alignment would lead to positioning of the north bridge abutment in the way of the proposed new foul sewer (450mm to 1100mm as per Map 4.4 of CPS) and is in direct conflict with the service.

**Comparisons on Land & Property:** The proposed alignment remains within the boundaries of the CPS, ensuring a reduced impact on future development. Although the proposed design requires excavation between Point C and Point P, with a maximum cut of up to 2m, which will likely lead to encroachment onto property frontages. The maximum extent of the proposed scheme is approximately 23.4m wide at Ch. 250.000 between Point C and Point P (see Figure 7-20), while the maximum extent of the proposed scheme is approximately 25.4m wide at Ch. 80.000 between Lehaunstown Lane and Point P. As illustrated in Figure 7-21 the impact of the embankments in Option 3 are significant compared to those in Option 1, resulting in potential impact on property frontages.

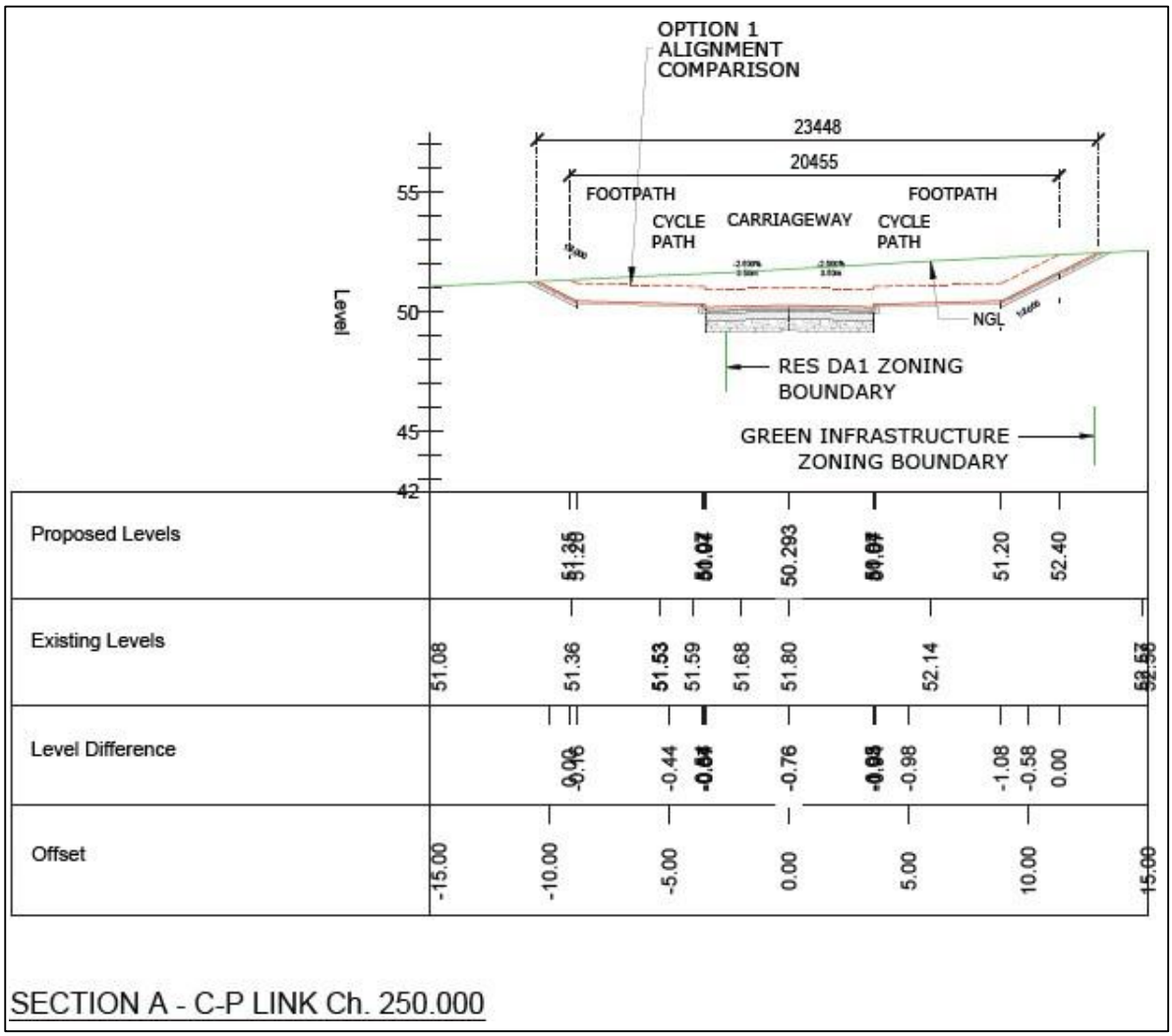


**Figure 7-20: Maximum Extent of Earthworks between Point C and Point P (Ch. 250.000 Section A-A)**

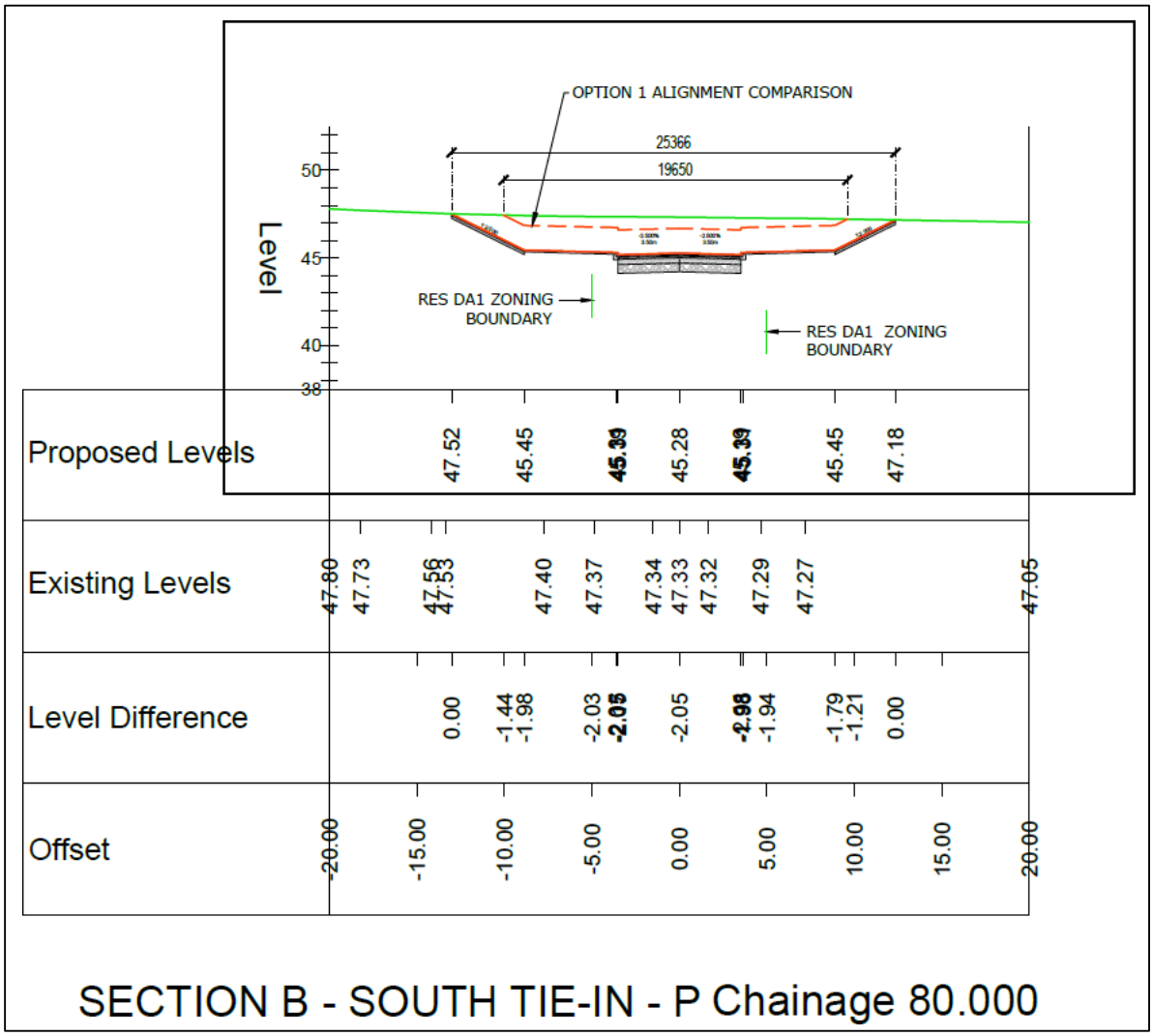


**Figure 7-21: Maximum Extent of Earthworks between Point P and Lehaunstown Lane (Ch. 80.000 Section B-B)**

## Environmental

**Human Beings:** The proposed height change at the tie-in Point P3 offers significant benefits by providing a generous clearance of 9.09 m over the future active travel path which is 6.2 m above permitted green routes network (all excluding bridge deck) on Lehaunstown Lane. This clearance enhances the sense of safety and openness.

**Flora & Fauna:** With regards to Flora, it should be noted that the clearance of woodland occurs across all options. However, this option is considered to have a major negative impact compared to Option 5, which results in a significantly reduced removal of mature trees. Additionally, this Option has significant disadvantages, as the vertical alignment is below the NGL, requiring considerable cuts of up to 2m along the section between Point C and Point P and between Point P and Lehaunstown Lane. Earthworks of this magnitude severely disrupt existing flora and significantly impact the most sensitive terrain.

With regards to the fauna, the removal of woodland and vegetation has potential to cause disturbance to bats, birds and mammals (loss of foraging areas and impacts during operation due to light spill from public lighting) which could be confirmed by way of Ecological Impact Assessment and survey work at a later stage in the project - making all options equal in this regard.

**Water Resources:** The route alignment for the proposed scheme traverses the Carrickmines River, making all options equal in this regard. The route alignment is outside the Flood Zones shown in the OPW CFRAM Flood Map for the Shanganagh-Carrickmines River and the DLRCC Strategic Flood Risk Assessment 2022-2028 Flood Zone, this is the same across all options.

**Geology & Hydrogeology:** This option results in a cut of up to 2.05m between Lehaunstown Lane and Point P as well as a cut of up to 2.08m between Point C and Point P. Since Option 2, 4 and 5 experience extensive cuts, they are considered significantly negative whereas this Option is ranked as slightly negative. Additionally, there could be an impact on vulnerable rocks, soil and aquifers.

**Air Quality and Noise:** A bridge connecting the developments is required by the CPS therefore, slight changes to the alignment of the proposed scheme do not affect air quality or noise levels, making all options equal in this regard.

**Landscape & Visual:** The vertical alignment is below the natural ground level (NGL) in this Option. This is expected to result in changes to the existing landform. Locally these changes can be negligible to low. For this reason, the Druid's Glen Ecological Buffer Zone is also expected to have a similar level of change and therefore of negative impact. As with other options, part of the wall to protect structure is expected to be obscured, however the impact will be minor as assessed by the Cultural Heritage specialist, this is the same for all options. The visual impact on the wall to protected structure and demesne is expected to be very minor or barely noticeable. The landscape setting of the Brennanstown Dolmen/Portal Tomb could potentially be negligibly affected subject to further confirmation, should this option be selected, by way of Landscape and Visual Impact Assessment at a later stage of the project. The landscape setting is a wooded valley with mature woodland and the bridge would be approximately 500m distant along the valley. The impact is likely to be negligible and similar across all options. The level of vegetation clearance is expected to be similar for all options. The slight variation in the location of the tie in point P and Lehaunstown Lane is expected to vary the level of visual impact. Nonetheless, this high-level assessment does not account for proposed mitigation. Overall, when it comes to the level of visual impact because of vegetation clearance, little to no difference is expected between the options. Once the preferred alignment is selected, the visual impact of the feature bridge will be assessed during the bridge appraisal stage.

**Archaeology & Cultural Heritage:** The proximity of the proposed alignment to the wall to protected structure is a potential constraint on construction, and the effects on Glen Druid demesne will be minor; however, all options preserve the stone wall's heritage, rendering the options equal in this regard. There are no perceived impacts on the Brennanstown Dolmen/Portal Tomb (RMP 026-007) as it is situated outside of the SDZ and is bound to the south by a stream and a significant stand of trees, this is similar across all options. Where the options cross greenfield land they have the potential to impact on previously unrecorded archaeological remains, however this is similar across all options.

## Economy

The capital cost involves several contributing factors, including the bridge length, retaining wall construction, rebuilding costs to tie in at Point P3, and earthworks. This Option has less impact on Point P3 compared to Option 1 which should result in lower rebuilding costs at Point P3 and the construction of a retaining wall. Additionally, the length of the bridge in this Option is shorter compared to Option 1 but longer compared to the other Options, Furthermore, the earthworks along this alignment are moderate (cut of up to 2m) compared to Options 2,4 and 5 which have extensive cuts and Option 1 which follows the NGL closely. Therefore, the earthworks would result in a higher cost compared to Option 1.

Ranking of options which takes into consideration relative differences in construction costs is provided in Table 7-5 and it is based on the limited information currently available at this phase of the project.

| | OPTION 1 | OPTION 2 | OPTION 3 | OPTION 4 | OPTION 5 |
|---|---|---|---|---|---|
| **Rank (Lowest to Highest)** | 4 | 3 | 1 | 2 | 5 |

**Table 7-5: High-level Cost Estimate of Proposed Scheme**

This Option (3) is the most economical option ranking 1st when compared to other options. The increased costs of earthworks counterbalance the savings achieved from the slightly shorter bridge length and reduced rebuild at Point P3.

## Option 4

This Option acknowledges the reconstruction activities required at P3 therefore this option proposes to tie-in at lower point at Point P3 with minimal reconstruction. In doing so and taking cognisance of the project constraints and DMURS thresholds, the suggested tie in point between Point P and Lehaunstown Lane would involve a connecting section of road that differs in terms of alignment when compared to that indicated throughout the Cherrywood Planning Scheme. The potential need to amend the Cherrywood Planning Scheme would need to be considered by DLRCC separately This Option proposes to maintain the plan alignment as per the CPS between Point C and Point P while maintaining the tie-in to the existing infrastructure at Point C. The details and impacts of this proposed alignment option are explained further.

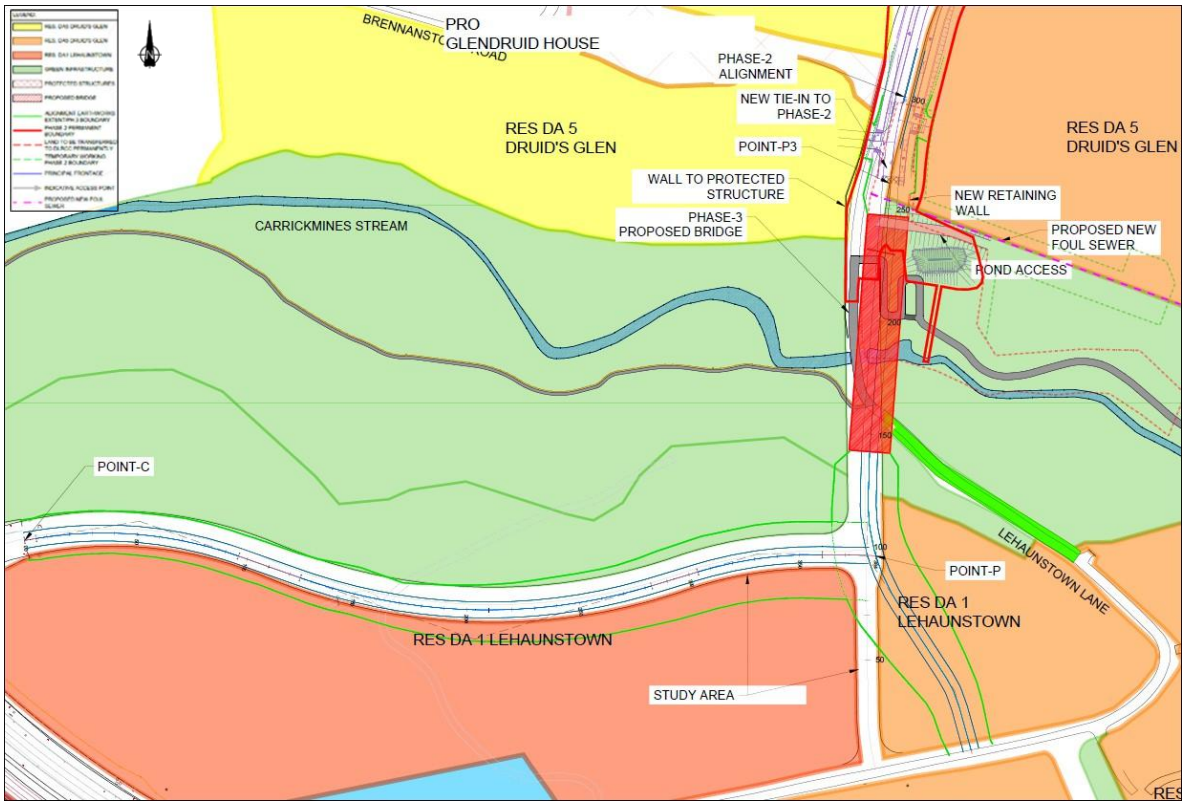


**Figure 7-22: Option 4 Plan Layout**

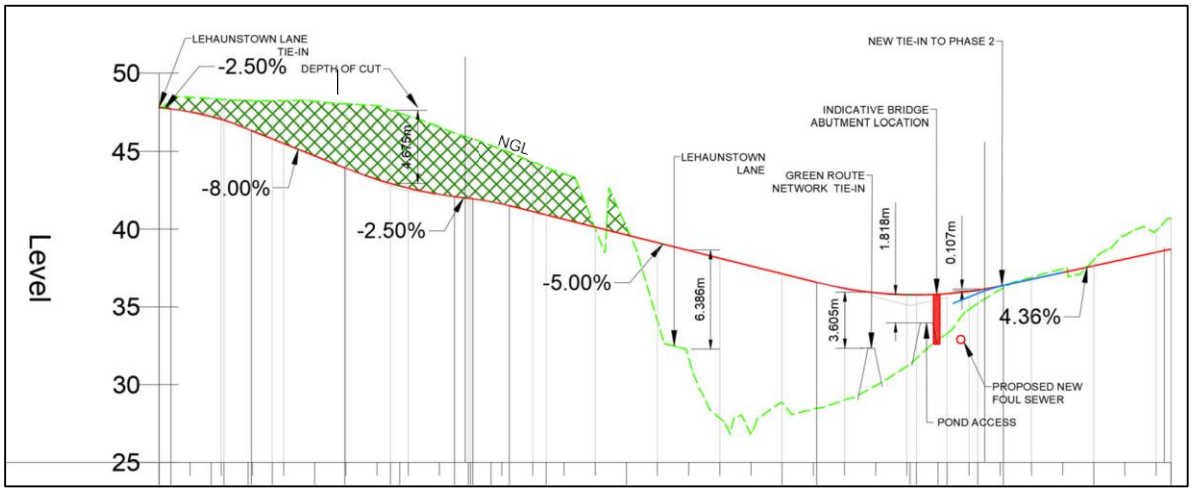


**Figure 7-23: Long section between Point P and Point P3**

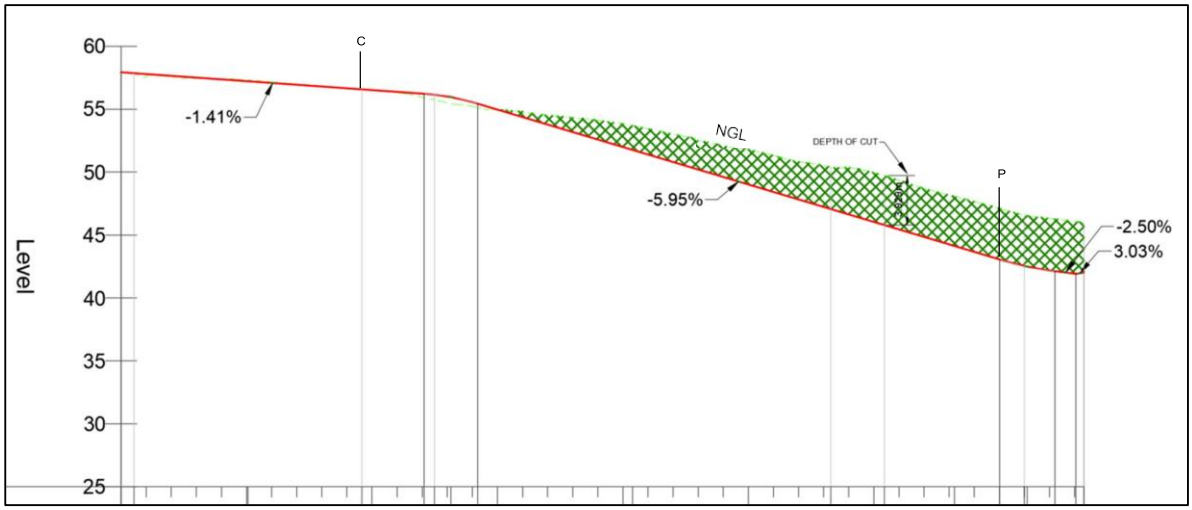


**Figure 7-24: Long section between Point C and Point P**

## Engineering

**Traffic Assessment & Route Cross-section:** This option meets the objectives by facilitating connectivity through the zoned lands within Cherrywood including within Development Area 1 development by providing facilities for vehicles and vulnerable users.

**Technical Standards:**
**Point P to P3:** Connection is achievable, within the project constraints (max gradient of 5%) and within DMURS constraints (max gradient of 8%) using a max. 5% gradient (Figure 7-23).
**Point C to P:** Connection exceeds the project constraints (max gradient of 5%) but the connection is still achievable as it is within DMURS constraints (max gradient of 8%) using a max. 5.95% gradient (Figure 7-24).
**Point P to Lehaunstown Lane:** Connection exceeds the project constraints (max gradient of 5%) but the connection is still achievable as it is within DMURS constraints (max gradient of 8%) using a max. 8% gradient (Figure 7-23).
**Sag and Crest:** The K-value within the scheme is 4.7 for crest curves and 6.4 for sag curves which is in accordance with DMURS threshold at the prescribed design speed of 50km/h.

**Principal Junctions and Interchanges, Access Control and interaction with Existing Road Network:** The design of the road and bridge alignment was guided by several surveys: the Topographical and Geomatic UAV Survey conducted by Murphy Geospatial in 2020 and 2019 for Cherrywood R034 Lands at Lehaunstown, a Topographical Survey at Stark Lands, and the Setting Out Survey Details for Cabinteely and Glenamuck Road carried out in 2022. These surveys fed into the design produced by DBFL which was reviewed by ARUP (Technical Note: Druid's Glen Road Peer Review by Arup, issued 3 April 2023). In this report, ARUP presented constraints, impacts, recommendations, and the next steps related to the levels for the road and bridge alignment based on the information available at the time of the review. Consequently, the alignment proposed in this report, along with the associated drawings, incorporates previous surveys as well as the Phase 2 As-built alignment (extracted from C549-Road Levels Rev01.pdf).

The alignment of the bridge adheres to the CPS but even with the lower tie-in at Point P (approx. 4m below the NGL) the tie-in into Phase 2 at Point P3 results in a 0.1m level difference. At this level difference the vertical alignment can be easily accommodated within 5m beyond the current tie-in at Point P3. Therefore, this option would not affect LHS and RHS access road tie-in points which are further away. On the other hand, the level difference between the proposed alignment and the pond access road is only 1.8m and the access road may potentially clash with the bridge abutment. This has an implication on the pond access road which would require realignment to the north and consequently require additional land currently zoned for residential development.

With the generated level for Point P, maintaining a fixed level at Point C and adhering to the CPS plan alignment from Point C to Point P the vertical gradient exceeds the project constraints but is still within the DMURS threshold. Additionally, the level of Point P and maintaining DMURS threshold of 8% results in a shift of the tie -in at Lehaunstown Lane by approximately 43m.

**Structures:** Active travel facilities across the Druids Glen buffer are proposed as part of the Green Route Network, which passes under the proposed bridge. This option introduces a level difference of +0.1m above the proposed Point P3. The provided clearance over the future active travel path on Lehaunstown Lane is 6.4 m and at the tie-in to Lehaunstown Lane north of Carrickmines Stream it is 3.6 m. Although this report does not cover the bridge deck depth design, typical bridge deck depth design options were considered. For this Option, even with a leaner bridge deck option, there is inadequate clearance hence this option is not viable as it poses an obstruction for accompanying greenway facilities. However, Option 4 still facilitates greenway access the north end of Lehaunstown Lane to Phase 2 alignment.

**Geology and Earthworks:** This option results in a cut of up to 4.68m between Lehaunstown Lane and Point P as well as a cut of up to 3.93m between Point C and Point P. Compared to the other Options, this option is the worst and is ranked as highly negative. At these depths it is likely to disrupt the natural bedrock.

**Construction:** While this option may be within proximity to a heritage site, construction can occur with due diligence and no impact on the protected stone wall.

A suitable traffic management plan will be required to deal with works occurring along Lehaunstown Lane.

**Comparative Service Conflicts:** All services have been reviewed; the proposed alignment would result in a position of north bridge abutment in proximity to the proposed new foul sewer (450mm to 1100mm as per Map 4.4 of CPS) and create a potential clash.

**Comparisons on Land & Property:** The suggested tie in point between Point P and Lehaunstown Lane would involve a connecting section of road that differs in terms of alignment when compared to that indicated throughout the Cherrywood Planning Scheme – dividing two differing land use zoning (Res 2 and Res 3). The potential need to amend the Cherrywood Planning Scheme needs to be considered by DLRCC separately. Additionally, the proposed design requires significant excavation between Point C and Point P, which will likely affect property frontages due to the need for large slopes or retaining structures.

## Environmental

**Human Beings:** The proposed height change at the tie-in Point P3 has significant disadvantages by providing an unreliable clearance of 3.6 m (excluding deck) above the permitted section of the Cherrywood Green route network that would pass under the proposed bridge on Lehaunstown Lane. This clearance is insufficient for pedestrians and cyclists therefore diminishing the sense of safety and openness.

**Flora & Fauna:** With regards to Flora, it should be noted that the clearance of woodland occurs across all options. However, this option is considered to have a major negative impact compared to Option 5, which results in a significantly reduced removal of mature trees. Additionally, this Option has significant disadvantages, as the vertical alignment is below the NGL, requiring substantial cuts of up to 4 meters along the section between Point C and Point P. Additionally, the alignment from Point P to Lehaunstown Lane also necessitates a significant cut. Earthworks of this magnitude severely disrupt existing flora and significantly impact the most sensitive terrain.

With regards to the fauna, the removal of woodland and vegetation has potential to cause disturbance to bats, birds and mammals (loss of foraging areas and impacts during operation due to light spill from public lighting) which could be confirmed by way of Ecological Impact Assessment and survey work at a later stage in the project - making all options equal in this regard.

**Water Resources:** The route alignment for the proposed scheme traverses the Carrickmines River, making all options equal in this regard. The route alignment is outside the Flood Zones shown in the OPW CFRAM Flood Map for the Shanganagh-Carrickmines River and the DLRCC Strategic Flood Risk Assessment 2022-2028 Flood Zone, this is the same across all options.

**Geology & Hydrogeology:** This option results in a cut of up to 4.68m between Lehaunstown Lane and Point P as well as a cut of up to 3.93m between Point C and Point P. This option has significant disadvantages, as the vertical alignment is approx. 4m below the natural ground level (NGL), resulting in significant impact on vulnerable rocks, soils and aquifers.

**Air Quality and Noise:** A bridge connecting the developments is required by the CPS therefore, slight changes to the alignment of the proposed scheme do not affect air quality or noise levels, making all options equal in this regard.

**Landscape & Visual:** This option's vertical alignment is below the natural ground level (NGL). This is expected to result in changes to the existing landform. Locally these changes can be medium to high. For this reason, the Natural Green Space at Druid's Glen is also expected to have a similar level of change and therefore of impact. As per all options, part of the wall to protect structure is expected to be obscured. This is in line with the assessment of the Cultural Heritage specialist, and it is expected to be similar for all options. This impact on the wall to protected structure and demesne is expected to be very minor or barely noticeable. The landscape setting of the Brennanstown Dolmen/Portal Tomb could potentially be negligibly affected subject to further confirmation, should this option be selected, by way of Landscape and Visual Impact Assessment at a later stage of the project. The landscape setting is a wooded valley with mature woodland and the bridge would be approximately 500m distant along the valley. The impact is likely to be negligible and similar across all options. The level of vegetation clearance is expected to be similar for all options. The slight variation in the location of the tie in point P and Lehaunstown Lane is expected to vary the level of visual impact. Nonetheless, this high-level assessment does not account for proposed mitigation. Overall, when it comes to the level of visual impact because of vegetation clearance, little to no difference is expected between the options. Once the preferred alignment is selected, the visual impact of the feature bridge will be assessed during the bridge appraisal stage.

**Archaeology & Cultural Heritage:** The proximity of the proposed alignment to the wall to protected structure is a potential constraint on construction, and the effects on Glen Druid demesne will be minor; however, all options preserve the stone wall's heritage, rendering the options equal in this regard. There are no perceived impacts on the Brennanstown Dolmen/Portal Tomb (RMP 026-007) as it is situated outside of the SDZ and is bound to the south by a stream and a significant stand of trees, this is similar across all options. Where the options cross greenfield land they have the potential to impact on previously unrecorded archaeological remains, however this is similar across all options.

## Economy

The capital cost involves several contributing factors, including the bridge length, retaining wall construction, rebuilding costs to tie in at Point P3, and earthworks. Due to the lower level at Point P3, this Option requires the construction of a lower retaining wall compared to Option 2 and reduced rebuild costs at Point P3. However, substantial earthworks are expected along with this alignment, with cuts of up to 4.6 meters.

Ranking of options which considers relative differences in construction costs is provided in Table 7-6 and it is based on the limited information currently available at this phase of the project.

| | OPTION 1 | OPTION 2 | OPTION 3 | OPTION 4 | OPTION 5 |
|---|---|---|---|---|---|
| **Rank (Lowest to Highest)** | 4 | 3 | 1 | 2 | 5 |

**Table 7-6: High-level Cost Estimate of Proposed Scheme**

Option 3 is considered the most cost-effective with Option 4 ranking 2nd.The substantial costs of earthworks counterbalance the savings achieved from the reduced rebuild at Point P3

## Option 5

This Option suggests an alignment which differs from the horizontal road alignment indicated throughout the CPS as the location of Point P is relocated to the east and subsequent tie in point with Lehaunstown Lane to the south also shifts further to the northeast. While Point C remains fixed, the horizontal alignment of the section of road between the revised Point P and C would differ slightly compared to the CPS. Additionally, this option proposes a curved bridge alignment. The potential need to amend the Cherrywood Planning Scheme needs to be considered by DLRCC separately. The details and impacts of this proposed alignment option are explained further.

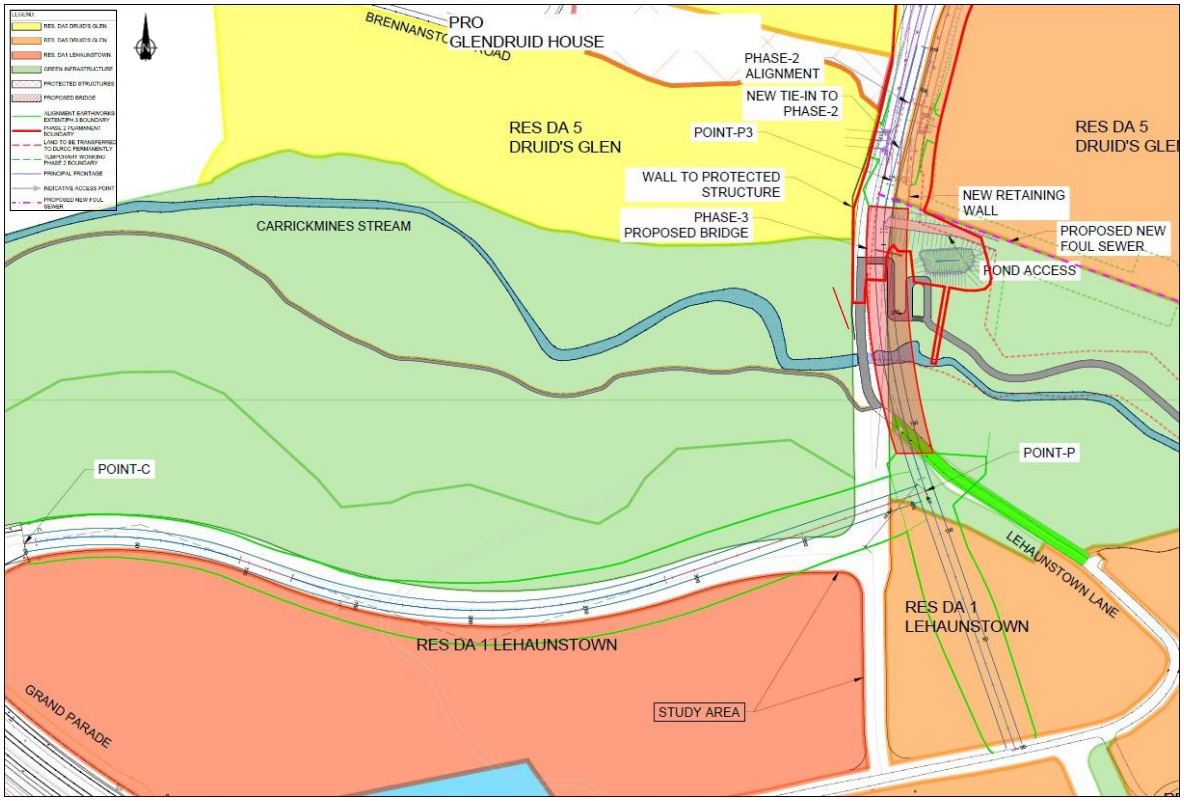


**Figure 7-25: Option 5 Plan Layout**

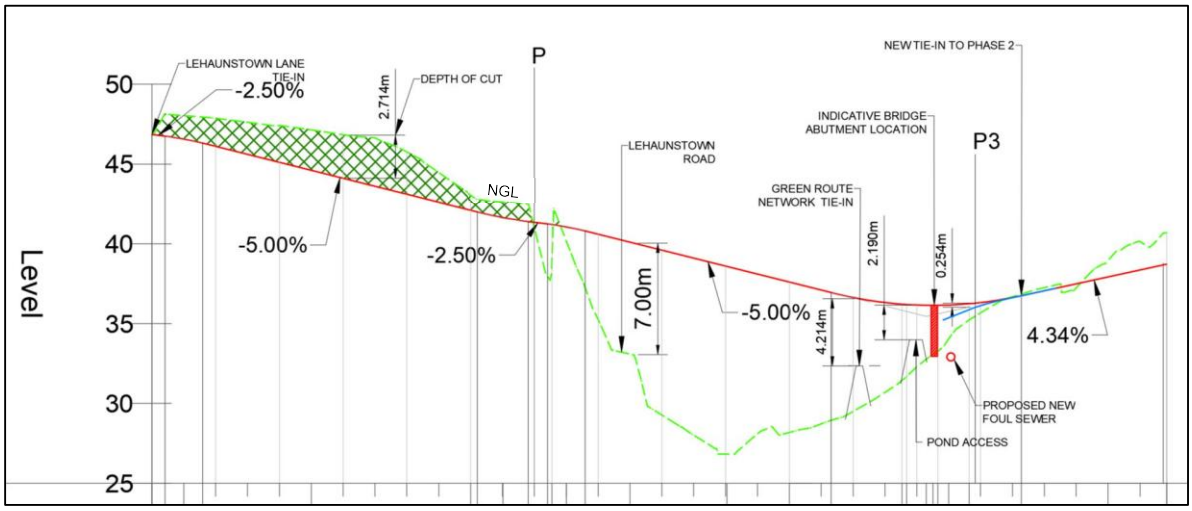


**Figure 7-26: Long section between Point P and Point P3**

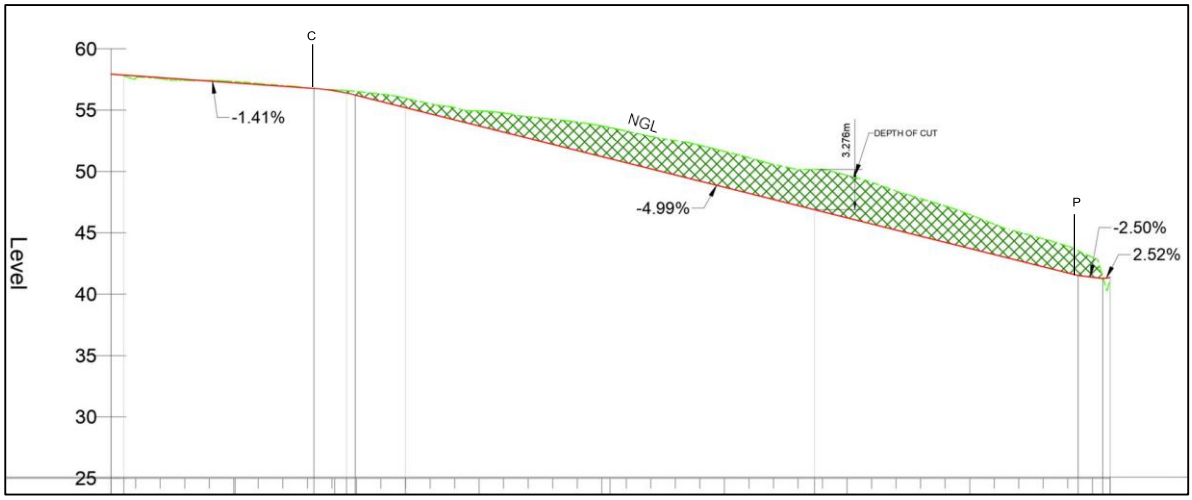


**Figure 7-27: Long section between Point C and Point P**

## Engineering

**Traffic Assessment & Route Cross-section:** This option meets the objectives by facilitating connectivity through the zoned lands within Cherrywood including within Development Area 1 development by providing facilities for vehicles and vulnerable users.

**Technical Standards:**
**Point P to P3:** Connection is achievable, within the project constraints (max gradient of 5%) and within DMURS constraints (max gradient of 8%) using a max. 5% gradient (Figure 7-26).
**Point C to P:** Connection is achievable, within the project constraints (max gradient of 5%) and within DMURS constraints (max gradient of 8%) using a max. 5% gradient (Figure 7-27).
**Point P to Lehaunstown Lane:** Connection is achievable, within the project constraints (max gradient of 5%) and within DMURS constraints (max gradient of 8%) using a max. 5% gradient (Figure 7-26).
**Sag and Crest:** The K-value within the scheme is 4.7 for crest curves and 6.4 for sag curves which is in accordance with DMURS threshold at the prescribed design speed of 50km/h.

**Principal Junctions and Interchanges, Access Control and interaction with Existing Road Network:** The design of the road and bridge alignment was guided by several surveys: the Topographical and Geomatic UAV Survey conducted by Murphy Geospatial in 2020 and 2019 for Cherrywood R034 Lands at Lehaunstown, a Topographical Survey at Stark Lands, and the Setting Out Survey Details for Cabinteely

and Glenamuck Road carried out in 2022. These surveys fed into the design produced by DBFL which was reviewed by ARUP (Technical Note: Druid's Glen Road Peer Review by Arup, issued 3 April 2023). In this report, ARUP presented constraints, impacts, recommendations, and the next steps related to the levels for the road and bridge alignment based on the information available at the time of the review. Consequently, the alignment proposed in this report, along with the associated drawings, incorporates previous surveys as well as the Phase 2 As-built alignment (extracted from C549-Road Levels Rev01.pdf).

In this Option the vertical alignment from Point C to Point P is below the NGL which places Point P at a lower elevation (approx. 2m below the NGL) and the tie-in into Phase 2 at Point P3 results in a 0.25m level difference. Due to the curved bridge and with Point P at this shift, lower elevation and maintaining 5% gradient to Lehaunstown Lane, the Phase 3 tie-in point to Phase 2 is approx. 14 m beyond point P3.

The access road to the pond is currently at a level 2.2m lower than the proposed alignment. Therefore, it would not be possible to maintain access to the pond in its current alignment and the road would require realigning to the north and consequently an additional land currently zoned for residential development.

**Structures:** Active travel facilities across the Druids Glen buffer are proposed as part of the Green Route Network, which passes under the proposed bridge. The clearance over the Green Route Network on Lehaunstown Lane is 7.0m, and at the tie-in to Lehaunstown Lane north of Carrickmines Stream it is 4.2m. Although this report does not cover bridge deck depth design, typical bridge deck depth design options were considered, and this option would likely not provide sufficient clearance for passing cyclists. Still, Option 5 facilitates greenway access from the north end of Lehaunstown Lane to Phase 2 alignment.

Currently the change of alignment does not require a retaining wall to protect the historical stone wall on the eastern edge of the bridge although this may change at preliminary design if this option is explored further.

**Geology and Earthworks:** This option results in a cut of up to 2.71m between Lehaunstown Lane and Point P as well as a cut of up to 3.23m between Point C and Point P. Compared to Options 1 and 3, this option is ranked as significantly negative. At these depths it is likely to disrupt the natural bedrock

**Construction:** While this option may be within proximity to a heritage site, construction can occur with due diligence and no impact on the protected stone wall.

A suitable traffic management plan will be required to deal with works occurring along Lehaunstown Lane.

**Comparative Service Conflicts:** All services have been reviewed; the proposed alignment would result in the bridge north abutment position in a proximity of the new proposed foul sewer (450mm to 1100mm as per Map 4.4 of CPS) with a potential clash.

**Comparison on Land & Property:** The proposed alignment does not adhere to the CPS therefore this option offers significant disadvantages as the proposed alignment affects future developments. Requesting a change to the CPS road alignment will have time and cost implications for this scheme and the CPS as well as uncertainty regarding outcome. The potential need to amend the Cherrywood Planning Scheme would need to be considered by DLRCC separately Additionally, the proposed design requires significant excavation between Point C and Point P, which will likely affect property frontages due to the need for large slopes or retaining structures.

## Environmental

**Human Beings:** The proposed height change at the tie-in Point P3 offers some disadvantages by providing a clearance of 4.21m (excluding bridge deck) over the future active travel path on Lehaunstown Lane. This clearance reduces the sense of safety and openness.

**Flora & Fauna:** With regards to Flora, it should be noted that the clearance of woodland occurs across all options. However, Option 5 results in a significantly reduced removal of mature trees. On the other hand. this Option has significant disadvantages, as the vertical alignment is below the NGL, requiring substantial cuts of less than 3m along the section between Point C and Point P. Additionally, the alignment from Point

P to Lehaunstown Lane also necessitates a substantial cut. Earthworks of this magnitude severely disrupt existing flora and significantly impact the most sensitive terrain. Therefore, with the reduced clearance of the woodland but significant cut, this option is considered moderately negative compared to the other Options.

With regards to the fauna, the removal of woodland and vegetation has potential to cause disturbance to bats, birds and mammals (loss of foraging areas and impacts during operation due to light spill from public lighting) which could be confirmed by way of Ecological Impact Assessment and survey work at a later stage in the project - making all options equal in this regard.

**Water Resources:** The route alignment for the proposed scheme traverses the Carrickmines River, making all options equal in this regard. The route alignment is outside the Flood Zones shown in the OPW CFRAM Flood Map for the Shanganagh-Carrickmines River and the DLRCC Strategic Flood Risk Assessment 2022-2028 Flood Zone, this is the same across all options

**Geology & Hydrogeology:** This Option results in a cut of up to 2.71m between Lehaunstown Lane and Point P as well as a cut of up to 3.23m between Point C and Point P. This option has major disadvantages, as the vertical alignment is approx. 3m below the natural ground level (NGL), resulting in major impact on vulnerable rocks, soils and aquifers.

**Air Quality and Noise:** A bridge connecting the developments is required by the CPS therefore, slight changes to the alignment of the proposed scheme do not affect air quality or noise levels, making all options equal in this regard.

**Landscape & Visual:** This option's vertical alignment is below the natural ground level (NGL). This option is also extending the length of the Point C to Point P alignment. This is expected to result in changes to the existing landform. Locally these changes can be medium to high. For this reason, the Natural Green Space at Druid's Glen is also expected to have a similar level of change and therefore of impact. As per all options, part of the wall to protect structure is expected to be obscured. This is in line with the assessment of the Cultural Heritage specialist, and it is expected to be similar for all options. This impact on the wall to protected structure and demesne is expected to be very minor or barely noticeable. The landscape setting of the Brennanstown Dolmen/Portal Tomb could potentially be negligibly affected subject to further confirmation, should this option be selected, by way of Landscape and Visual Impact Assessment at a later stage of the project. The landscape setting is a wooded valley with mature woodland and the bridge would be approximately 500m distant along the valley. The impact is likely to be negligible and similar across all options. The level of vegetation clearance is expected to be similar for all options. The slight variation in the location of the tie in point P and Lehaunstown Lane is expected to vary the level of visual impact. Nonetheless, this high-level assessment does not account for proposed mitigation. Overall, when it comes to the level of visual impact because of vegetation clearance, little to no difference is expected between the Options. Once the preferred alignment is selected, the visual impact of the feature bridge will be assessed during the bridge appraisal stage.

**Archaeology & Cultural Heritage:** The proximity of the proposed alignment to the wall to protected structure is a potential constraint on construction and the effects on Glen Druid demesne will be minor. Currently this alignment does not require a retaining wall to protect the historical stone wall on the eastern edge of the bridge although this may change at preliminary design as this option is explored further. All options preserve the stone wall's heritage, rendering the options equal in this regard. There are no perceived impacts on the Brennanstown Dolmen/Portal Tomb (RMP 026-007) as it is situated outside of the SDZ and is bound to the south by a stream and a significant stand of trees, this is similar across all options. Where the options cross greenfield land they have the potential to impact on previously unrecorded archaeological remains, however this is similar across all options.

## Economy

The capital cost involves several contributing factors, including the bridge length, retaining wall construction, rebuilding costs to tie in at Point P3, and earthworks. The curvature of the bridge necessitates a slight increase in the cost of the bridge due to the complexities experienced during construction. Additionally, the shift in position may require the construction of a low retaining wall and shall incur rebuild costs at Point P3 due to the angled connection. Furthermore, substantial earthworks are expected along this alignment, with cuts of up to 3.5 meters.

Ranking of options considering relative differences in construction costs is provided in Table 7-7 and it is based on the limited information currently available at this phase of the project.

| | OPTION 1 | OPTION 2 | OPTION 3 | OPTION 4 | OPTION 5 |
|---|---|---|---|---|---|
| **Rank (Lowest to Highest)** | 4 | 3 | 1 | 2 | 5 |

**Table 7-7: High-level Cost Estimate of Proposed Scheme**

Option 3 is considered the most cost-effective with Option 5 ranking 5$^{th}$. It incurs increased costs due to extensive earthworks, additional expenses from the curved bridge length, and the necessity for a rebuild at Point P3.

## Summary and Viability of Options

| Assessment Criteria | Sub-Criteria | | Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|---|---|
| Engineering | 1 | Traffic Assessment & Route Cross-section. | | | | | |
| | 2 | 2.1 Technical Standards: Gradient P to P3 | | | | | |
| | | 2.2 Technical Standards: Gradient C to P | | | | | |
| | | 2.3 Technical Standards: Gradient P to Lehaunstown Lane | | | | | |
| | 3 | 3.1 Principal Junctions and Interchanges: Tie into P3 | | | | | |
| | | 3.2 Principal Junctions and Interchanges: Tie in at Lehaunstown Lane | | | | | |
| | | 3.3 Principal Junctions and Interchanges: Tie in at Point C | | | | | |
| | | 3.4 Access Control/Interaction with residential zoned lands north of P3 | | | | | |
| | | 3.5 Access Control and Interaction to Pond | | | | | |
| | 4 | Structures | | | | | |
| | 5 | Geology and Earthworks | | | | | |
| | 6 | Construction | | | | | |
| | 7 | Comparative Service Conflicts | | | | | |
| | 8 | 8.1 Adherence to CPS Alignment & Zoning Arrangement | | | | | |
| | | 8.2 Impact on property frontages | | | | | |
| Environment | 1 | Human Beings. | | | | | |
| | 2 | Flora & Fauna | | | | | |
| | 3 | Water Resources | | | | | |
| | 4 | Geology & Hydrogeology | | | | | |
| | 5 | Air Quality | | | | | |
| | 6 | Noise | | | | | |
| | 7 | Landscape & Visual | | | | | |
| | 8 | Archaeology & Cultural Heritage | | | | | |
| Economy | 1 | Capital cost | | | | | |

## Option 1 and Option 3:

Options 1 and 3 are comparable considering that these are the only two options that are in full alignment with the Project Objectives as per the Step 1 Assessment of Options carried out in Chapter 7.

**Option 1** appears to be the most viable with majority of the sub-criteria having Major Positive attributes compared to the other options. The main area of concern related to this option is the impact of the tie-in at Point P3 since the tie-in to Phase 2 at Point P3 results in 2.28m level difference. To accommodate this level difference the vertical alignment requires a realignment of 59m beyond the proposed tie-in point. Since Phase 2 has been completed prior to the implementation of this scheme, the impact of this option shall result in the partial reconstruction of the Phase 2 as- built road.

This Option requires a short section of retaining wall (or an extended wing wall) behind north bridge abutment (at Point P3), on the east side, approx. 5 m long. This retaining wall ties into the wing wall at its south end and continues to the proposed RHS access road tie-in at the north end. On the west side of the alignment, adjacent to the existing Lehaunstown lane, there will be a standard bridge wing wall (approx. 5 m long), followed by an embankment for the LHS access road tie-in. Option 1 vertical alignment may facilitate a temporary tie-in to the existing Lehaunstown Lane from Phase 2 at the location of LHS access so that it may remain open as per CPS during the bridge construction. It is important to note that despite the higher level at Point P3, this option does not have a negative impact on the wall to protect structure to the west. These construction activities increase the cost of the scheme, but it is worth noting that the impact on the environment due to adhering close to the NGL is reduced when compared to the other options.

**Option 3** is viable in the context where the horizontal alignment exhibits the majority moderate and minor positive attributes compared to the other options. It should be noted that the tie-in into Phase 2 at Point P3 results in a 1.2m level difference. Accommodating this level difference the vertical alignment will result in a tie-in point that is 36m from Point P3. Since Phase 2 was completed prior to the implementation of this scheme, the impact of this option shall result in the reconstruction of the Phase 2 as-built road. This Option has reduced rebuild impact at Point P3 compared to Option 1.

With a height difference of +1.2m at P3, a retaining wall on the east side of the road behind north bridge abutment to contain the road embankment within designated land is required. There is sufficient distance between the new road and the existing stone heritage wall on the west side to avoid a need for a retaining structure beyond the standard bridge wingwall length (approx. 6 m). This option may facilitate a permanent tie-in of the existing Lehaunstown Lane into the LHS access road, although present space constraints would require departures from design standards for junctions. A normal or slightly steepen road embankment will not adversely affect the stability of this wall. The cost of construction activities for these structures at Point P3 should be lower than Option 1.

The level difference between the proposed alignment and the access road to the pond on the west side of the bridge is only 3.7 m. This is not sufficient to provide a crossing underneath the bridge deck. New ramp/pond access alignment would require additional land taken from residential zoned lands located beyond the permanent Phase 2 land take and would have a gradient of 9%, which is not considered ideal for service vehicles, thus reducing the viability of this option (steep gradient approx. 15% over 25 m length and limited visibility splays).

The main areas of concern related to this Option compared to Option 1 is the impact on the NGL, this Option presents a moderate level of cutting, with 2.05 meters between Lehaunstown Lane to Point P and 2.08 meters between Point C and Point P. It is categorized as "Minor Negative" due to its higher cuts than Option 1 but less than Options 2, 4, and 5. The depth of the cut negatively impacts the environment compared to Option 1. Additionally, Option 3 experiences are challenges related to access to temporary pond (lack of head room) and insufficient headroom

height above the proposed Linear Park Green Route. In comparison, Option 3 is cheaper than Option 1 but the negative impacts on flora and limitations at points of access outweigh the cost.

## Option 2 and Option 4:

Option 2 and 4 are comparable with the exception of a proposed realignment between point P and Lehaunstown Lane which have the potential to require an amendment to the CPS, which creates uncertainty regarding timeframe and outcome.

**Option 2** appears to have mostly moderate to major negative attributes compared to the other options. The main positive attribute is the tie-in at P3 occurs at a lower level (+0.25m), to accommodate this level difference the vertical alignment requires realignment of 15m beyond the existing Phase 2 tie-in point. Since Phase 2 was completed prior to the implementation of this scheme, the impact of this option shall result in the reconstruction of the Phase 2 as-built road within a short distance of 15m. The proposed alignment can be constructed without adversely affecting the wall to protected structure (boundary wall) on the west side of the existing Lehaunstown Lane as indicated on the cross-section below. A short retaining wall or an extended wing wall will be required on the west side of the proposed alignment behind the north abutment to contain the road embankment within designated land.

The negative aspect of this option is the plan alignment from Point P to Lehaunstown Lane differs from the CPS (creating the tie-in point approximately 49m away from the CPS tie in point) which impacts the zoning arrangement of the CPS between P and Lehaunstown Lane and the distribution of lands zoned Res 2 and Res 3. Additionally, the alignment level at the crossing with the pond access road is too low to provide sufficient clearance underneath the bridge deck, since the level difference is only 2.2 m. The implication is that Option 2 would require a new ramp/pond access alignment would require additional land taken from residential zone lands located beyond the permanent Phase 2 land take and would have a gradient of 9%, which is not considered ideal for service vehicles, thus reducing the viability of this option. This option may facilitate a permanent tie-in of the existing Lehaunstown Lane into the LHS access road, although present space constraints would require departures from design standards for junctions.

In this Option, the lower height at Point P3 and Point P involves more extensive cutting, with 4.15 meters between Lehaunstown Lane to Point P and 3.74m between Point C and Point P. This option is considered "Moderately negative" compared to Option 4 because it requires less cut than Option 4. The substantial depth of the cut negatively impacts the environment and negatively impacts Property Frontages.

**Option 4** appears to have mostly major negative attributes compared to the other options. The main positive attribute is the tie-in at P3 occurs at a lower level (0.1m), to accommodate this level difference the vertical alignment requires realignment of 5m beyond the existing Phase 2 tie-in point. Therefore, this option would not affect LHS and RHS access road tie-in points which are further away. On the other hand, the level difference between the proposed alignment and the pond access road is only 1.8m and the access road may potentially clash with the bridge abutment. New ramp/pond access alignment would require additional land taken from residential zoned lands located beyond the permanent Phase 2 land take and would have a gradient of 9%, which is not considered ideal for service vehicles, thus reducing the viability of this option.

The negative aspect of this option is the plan alignment from Point P to Lehaunstown Lane differs from the CPS (creating the tie-in point approximately 20m away from the CPS tie in point due to the increased gradient of 8%) which impacts the zoning agreement of the CPS between P and Lehaunstown Lane and the distribution of lands zoned Res 2 and Res 3.

In this Option, the lower height at Point P3 and Point P requires the most significant cuts, with 4.68 meters between Lehaunstown Lane to Point P and 3.93 meters between Point C and Point P. It is ranked as "Major Negative" due to the extensive earthworks needed, making it the least favourable option. The significant depth of the cut negatively impacts the environment and negatively impacts Property Frontages more than Option 2.

The construction activities to the north of Point P3 and at Point P3 are fairly minimal although the substantial earthwork increases the cost of the scheme. This option may be cheaper compared to Option 2 but the impact on the environment and ecology is significant.

## Option 5

**Option 5** appears to have mostly moderate to major negative attributes compared to the other options. This Option suggests a relocation of Point P with a significant realignment of road between Point P and Lehaunstown Lane and minor realignment between Point P and C. The plan alignment from Point P to Lehaunstown Lane differs from the CPS, creating the tie-in point approximately 14m away from the CPS tie in point which impacts the zoning arrangement of the CPS between P and Lehaunstown Lane and the distribution of lands zoned Res 2 and Res 3. This shift from the CPS is considered highly negative as the proposed alignment does not align with the CPS, introducing significant disadvantages, including potential impacts on future developments, property frontages, and a likely requirement for amendments to the CPS, which creates uncertainty regarding timeframe and outcome.

The existing LHS and RHS access road tie-in points in Phase 2 are not affected although the access road to the pond is currently at a level 2.2m lower than the proposed alignment. New ramp/pond access alignment would require additional land taken from residential zoned lands located beyond the permanent Phase 2 land take and would have a gradient of 9%, which is not considered ideal for service vehicles, thus reducing the viability of this option.

In this Option, the height at Point P3 and Point P result in cuts of 2.71m between Lehaunstown Lane to Point P and 3.23m between Point C and Point P. It is rated as "Moderately negative" compared to Option 4 because, while it also requires substantial cuts, they are closer to 3 meters, making it less severe than Option 4 but still more negative than Options 1 and 3. The significant depth of the cut negatively impacts the environment and negatively impacts Property Frontages (slightly less than option 2)

Due to the curvature of the bridge and unconventional tie-in at Point P3, including the substantial earthworks, result in this option being the most expensive compared to other options.

Additionally, the proposed alignment does not align with the existing Cherrywood Planning Scheme (CPS), introducing significant disadvantages, including potential impacts on future developments, property frontages, and a likely requirement for an amendment to the Planning Scheme, which creates uncertainty regarding timeframe and outcome. to the CPS.

# 8. EMERGING PREFERRED OPTION

**Option 1** maintains the plan alignment as per the CPS between Points C, P, P3, and Lehaunstown Lane, ensuring tie-in levels to existing infrastructure at Point C and Lehaunstown Lane. By aligning with the CPS, the impact on zoned lands is reduced, and the elevation at Point P closely matches the natural ground level (NGL), resulting in minimal cut and impact on property frontages. The plan also avoids significant changes to the wall to protect structure and other cultural heritage features, ensuring that impacts on these elements are kept to a minimum. This option facilitates the opening of lands up for development and an additional connection to the N11 in a manner that is consistent with the Planning Scheme's objective regarding Physical Infrastructure, Development Areas and Sequencing and Phasing Additionally, this Option meets technical standards within project constraints.

The alignment's adherence to both the CPS and DMURS standards ensures that it achieves a best fit with the existing and planned infrastructure, with minor variations to Phase 2 access points to residential zoned lands and moderate variations regarding tie in with P3 and interface with zoned residential lands that are required to fit this option within constraints regarding gradients, bedrock levels and other tie in points. The vertical alignment places Point P at a higher elevation, requiring a 50m realignment beyond Point P3, which will result in the partial reconstruction of the Phase 2 as-built road.

However, this provides significant benefits for residential land access. The amended tie-in beyond Point P3 benefits access on the west side within Phase 2, raising the level of the road closer to the natural ground level to the proposed access south of Glendruid House, while the east side access is constructible within the current Phase 2 Permanent Works/Land take Boundary with a minor elevation difference (0.5m).

Active travel facilities across the Druids Glen buffer are permitted as part of the Cherrywood Green Routes Network and would pass under the proposed bridge across Lehaunstown Lane. This option introduces a level difference of 2.28m above the proposed Point P3 therefore the higher alignment creates a significant clearance of 7.74m over the Green Route network on Lehaunstown Lane. Although this report does not cover the bridge deck depth design, typical bridge deck depth design options were considered. This Option allows for generous clearance over Lehaunstown Lane and is regarded as more advantageous compared to other alternatives.

Additionally, this Option is also the only Option which can facilitate the access road to the pond on the east side of the alignment, north of Carrickmines Stream. The level difference of 5.2 m (demonstrated in Figure 7-3) would allow the pond access for maintenance vehicles, such as tracked (~13T) excavators, rigid trucks, etc., crossing underneath the bridge with a clearance of 3 to 3.5 m and tie-in to the existing Lehaunstown Lane.

Apart from Option 5, which affects a smaller number of mature trees, it is recognized that all options have an impact on the woodlands within the Druid's Glen Ecological Buffer Zone. Although the woodlands are impacted by this option, the proposed design closely aligns with the NGL, thereby minimizing the effect on sensitive rocks, soils, and aquifers. While there are slight impacts on visual aesthetics and minor construction- related constraints due to proximity to heritage sites, these are manageable within the scope of the project.

Overall, this option offers a balanced solution that aligns with engineering requirements, environmental considerations, and economic feasibility, making it the most preferred choice for implementation.

Snippets of the emerging preferred option are shown below.

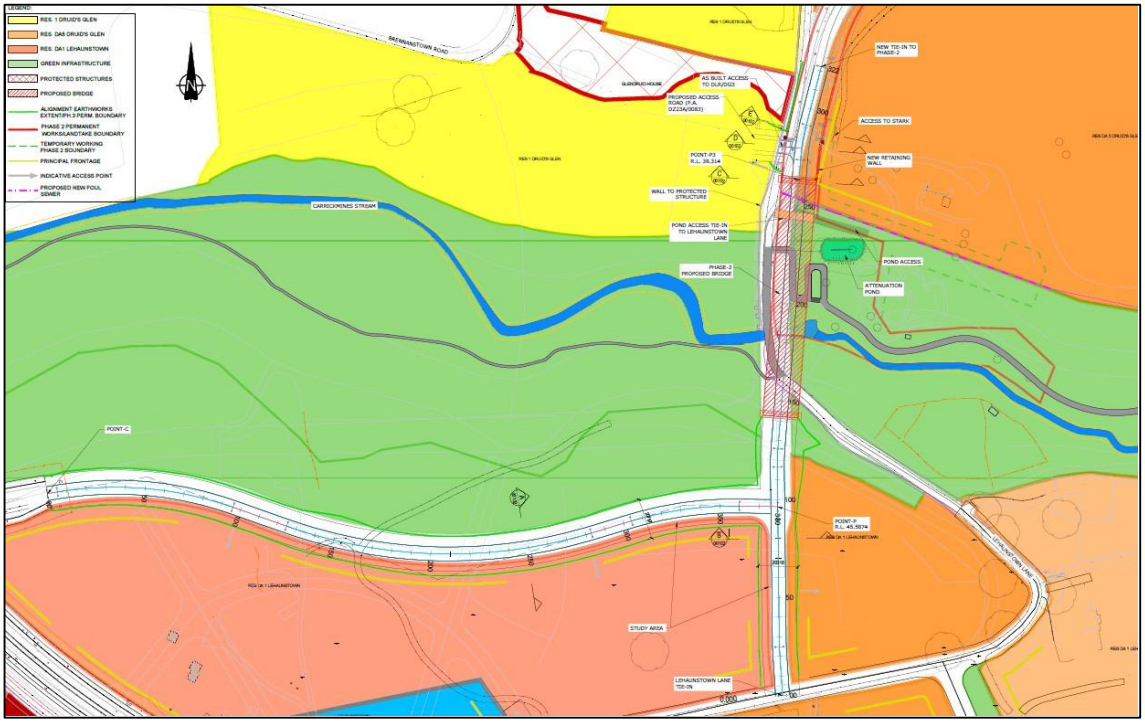


**Figure 8-1: Plan Layout (Emerging Preferred Option)**

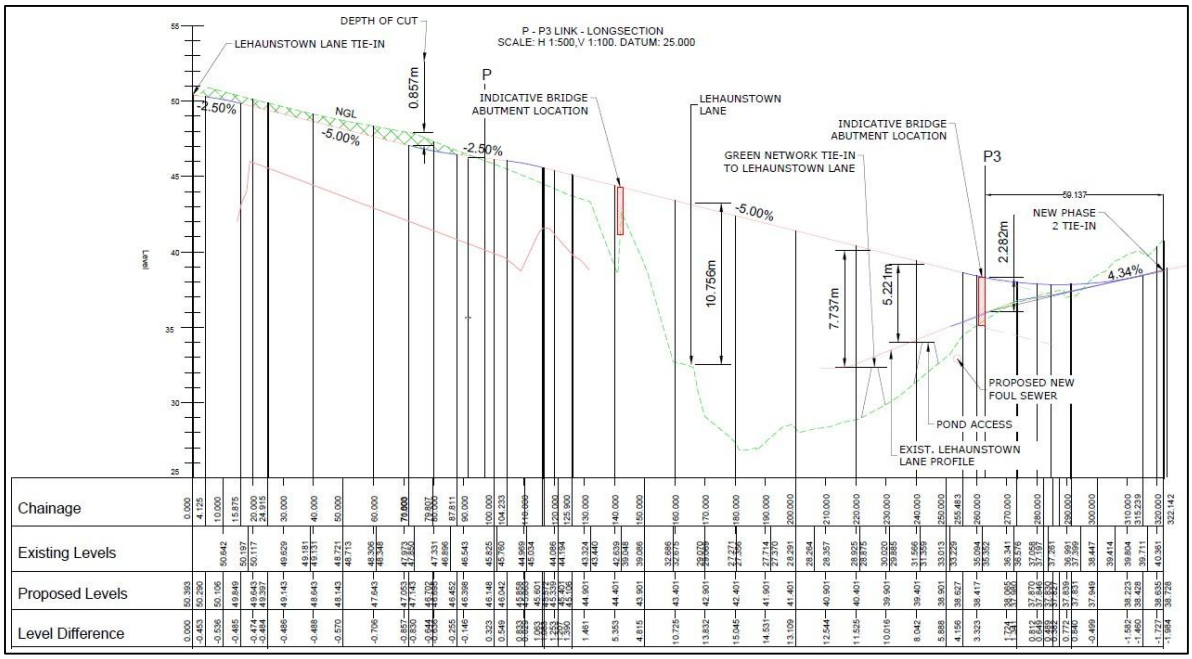


**Figure 8-2: Long section between Point P and Point P3 (Emerging Preferred Option)**

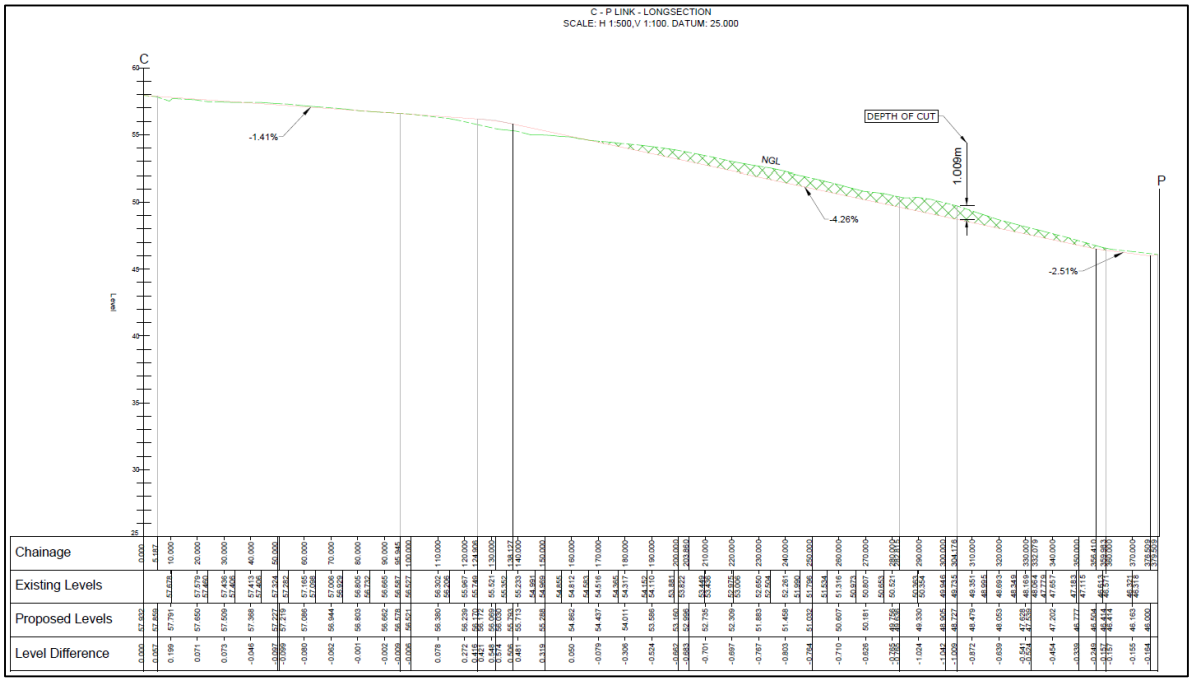


**Figure 8-3: Long section between Point C and Point P(Emerging Preferred Option)**

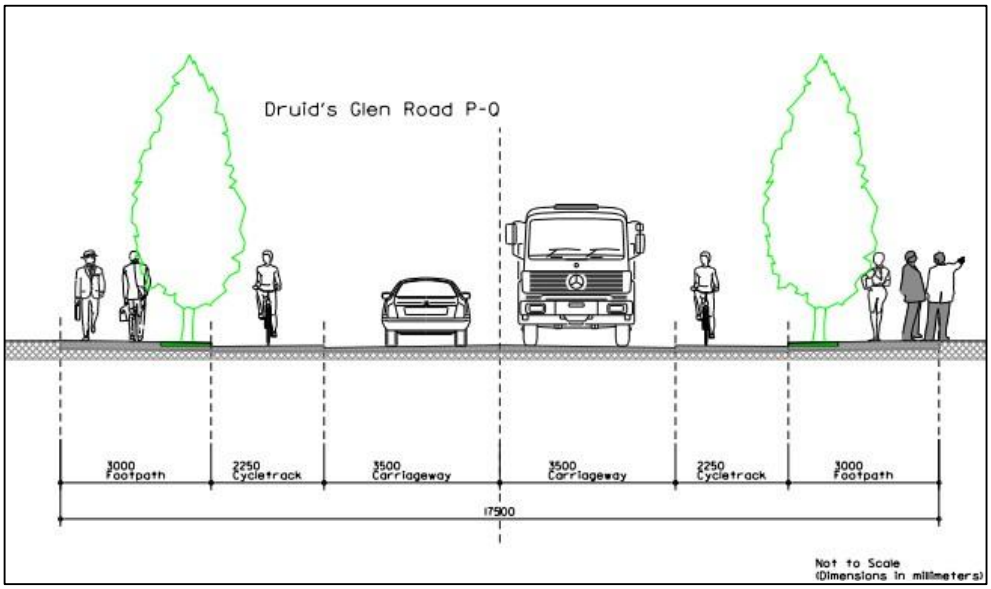


**Figure 8-4: Indicative Cross Section of Proposed Bridge**