AECOM Imagine it. Delivered.

Cherrywood Green Routes Network

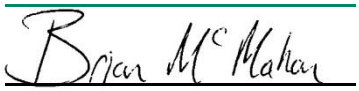
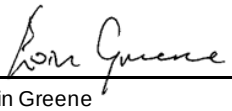
Finishes Manual

Dun Laoghaire Rathdown County Council

Project number: 60599677

March 2022

Quality information

Prepared by	Checked by	Approved by
		
Rufus Bevan Engineer	Brian McMahon Associate Director	Eoin Greene Technical Director

Revision History

Revision	Revision date	Details	Name	Position
0	12/02/21	First Draft	Brian McMahon	Associate Director
1	07/05/21	Draft	Brian McMahon	Associate Director
2	10/02/22	Draft	Brian McMahon	Associate Director
3	14/03/22	Final	Brian McMahon	Associate Director

Prepared for:

Dun Laoghaire Rathdown County Council

Prepared by:

Rufus Bevan
Engineer

AECOM Ireland Limited
4th Floor
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
Co. Dublin A96 T927
Ireland

T: +353 1 238 3100
aecom.com

Table of Contents

Figures

1 Introduction

1.1 Introduction

Cherrywood is circa 360 hectares in size and is the single largest undeveloped land-bank in Dún Laoghaire-Rathdown County Council's Administrative area. It provides an opportunity to establish a vibrant new community in a unique, strategic location. Cherrywood SDZ was designated by Government Order in 2010 to facilitate development which is of economic or social importance to the State.

In May 2010 Cherrywood was designated a Strategic Development Zone by the Government. The lands are approximately 16km south east from Dublin City Centre, 8km south of Dun Laoghaire, 3km from coastline and 4km from the Dublin Mountains. The bulk of the lands lie between the M50 and the N11 (which has a Quality Bus Corridor to the City Centre). The areas are served by 5 Luas stops along the Green Line.

Seven primary land uses have been identified: Town Centre, Village Centre, High Intensity Employment, Commercial uses, Residential, Education, Green Infrastructure. This project focuses on the proposed green infrastructure, which is set out in the Cherrywood SDZ as "*A network and hierarchy of green infrastructure will be incorporated throughout the area to form a legible, accessible and pleasant outdoor environment*." Figure 1.1 shows the proposed Green Infrastructure in the Cherrywood SDZ.

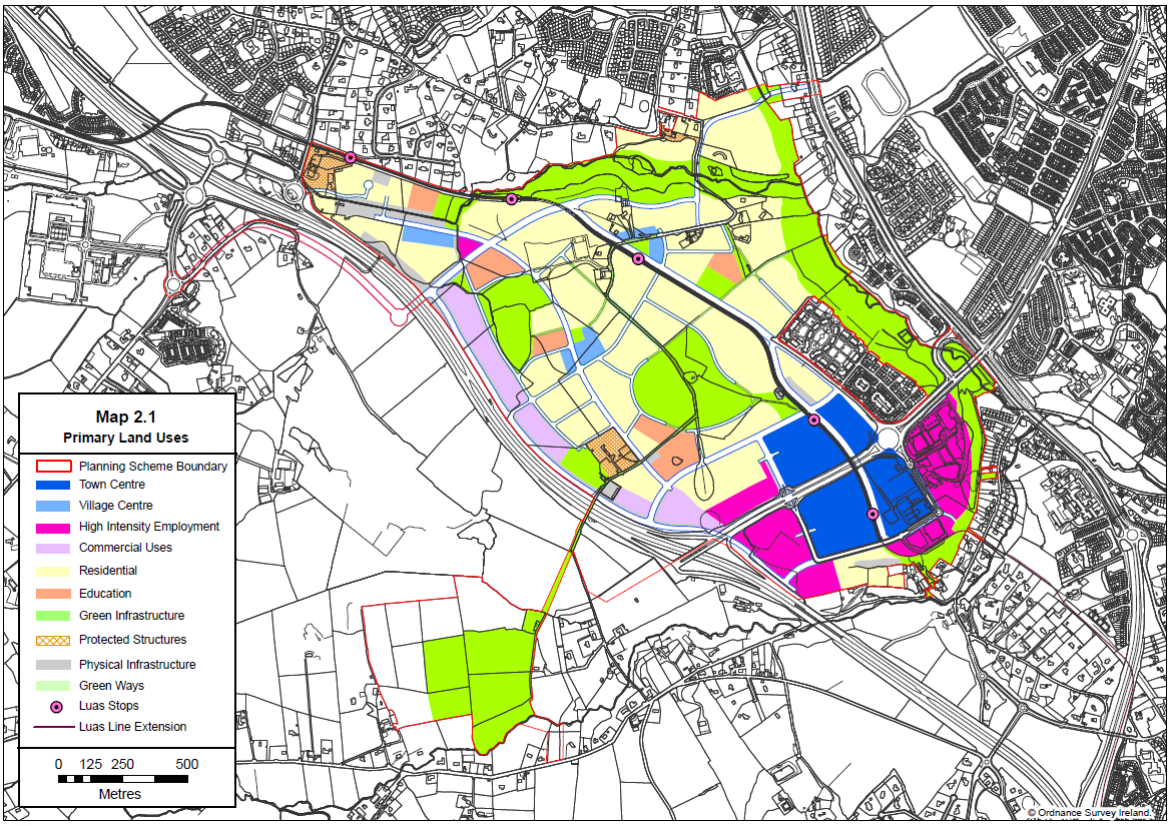


Figure 1.1 - Map of Primary Land Uses

The Cherrywood Green Routes Network looks to provide a cycling and pedestrian network within the Cherrywood Strategic Development Zone (SDZ). This will include Greenways, traffic free cycle and pedestrian links, and the associated cycle and pedestrian infrastructure to support and improve these routes.

This manual sets on the proposed details for the various construction elements of the proposed greenway. It will set out the following:

- Typical cross sections
- Recommended Surface Materials
- Construction Options

- Drainage Details
- Utility Details
- Bridge Details
- Public Lighting Details
- Landscape Details
    - Proposed Seating
    - Cycle Parking
    - Landscaping types & Planting / Finishes Details
    - Green Wall

2 Project Routing

2.1 Current Proposal

The Cherrywood Green Routes Network proposes the development of a cycle and pedestrian greenway network for the area within the Cherrywood SDZ. The proposed Network is based on the preliminary routing indicated in the Cherrywood SDZ, extending for approximately 6.0km. The Network proposes links to improve the pedestrian and cycle connections to key external desire lines, including links to the N11, Wyattville Link Road, and Brides Glen / Cherrywood Road in the south, as shown in Figure 2.1.

In the Druids Glen Woodland, an 800m long pedestrian walking route is proposed, which will comprise resurfacing of existing pathways through the woodland. This scheme will include attractive and quality outdoor spaces which will enhance the experience for local people and visitors.

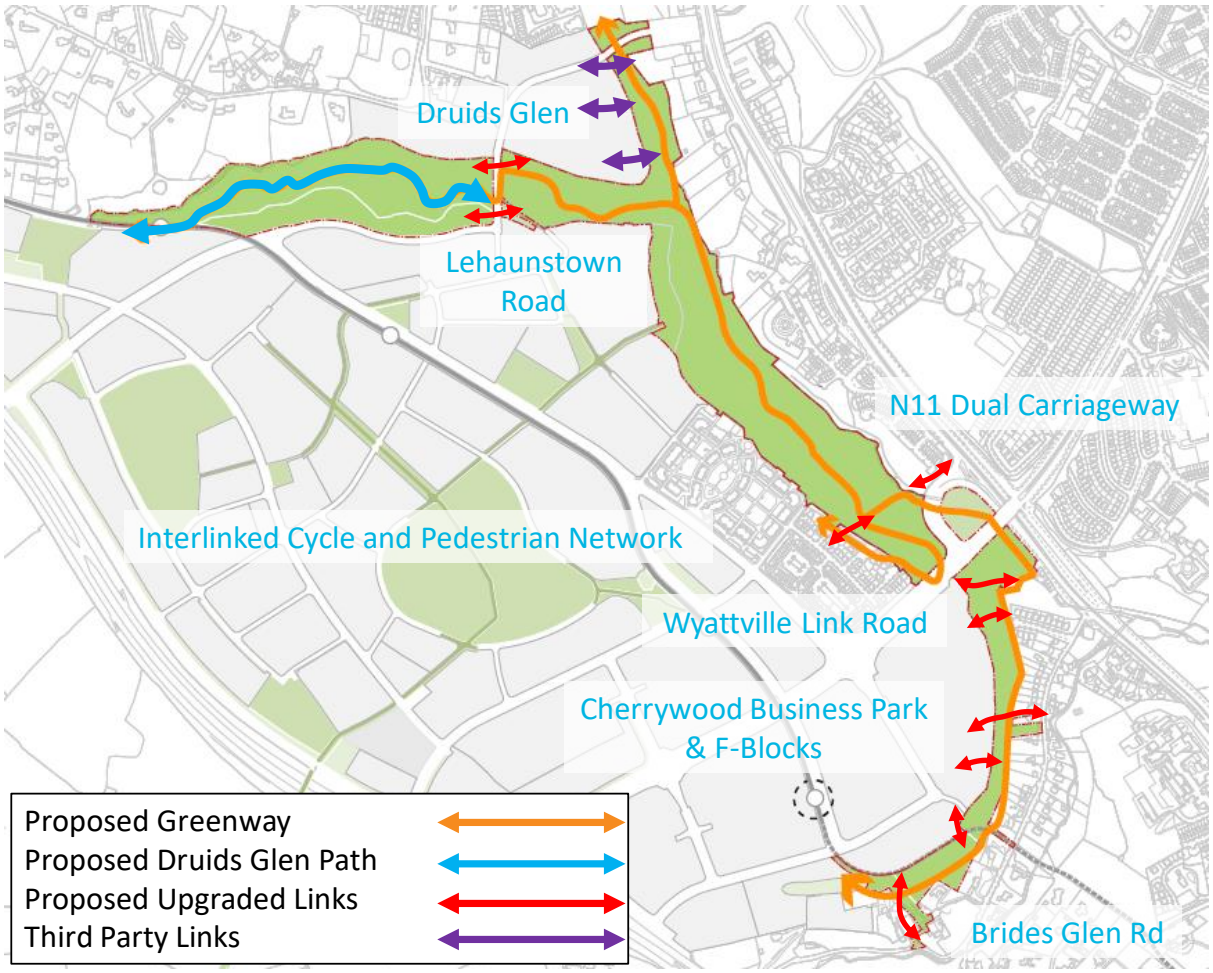


Figure 2.1: Proposed Cherrywood Green Routes Network

These routes correspond with the Natural Green Space on the Cherrywood Way, as set out in the Planning Scheme, shown in Figure 2.2 below.

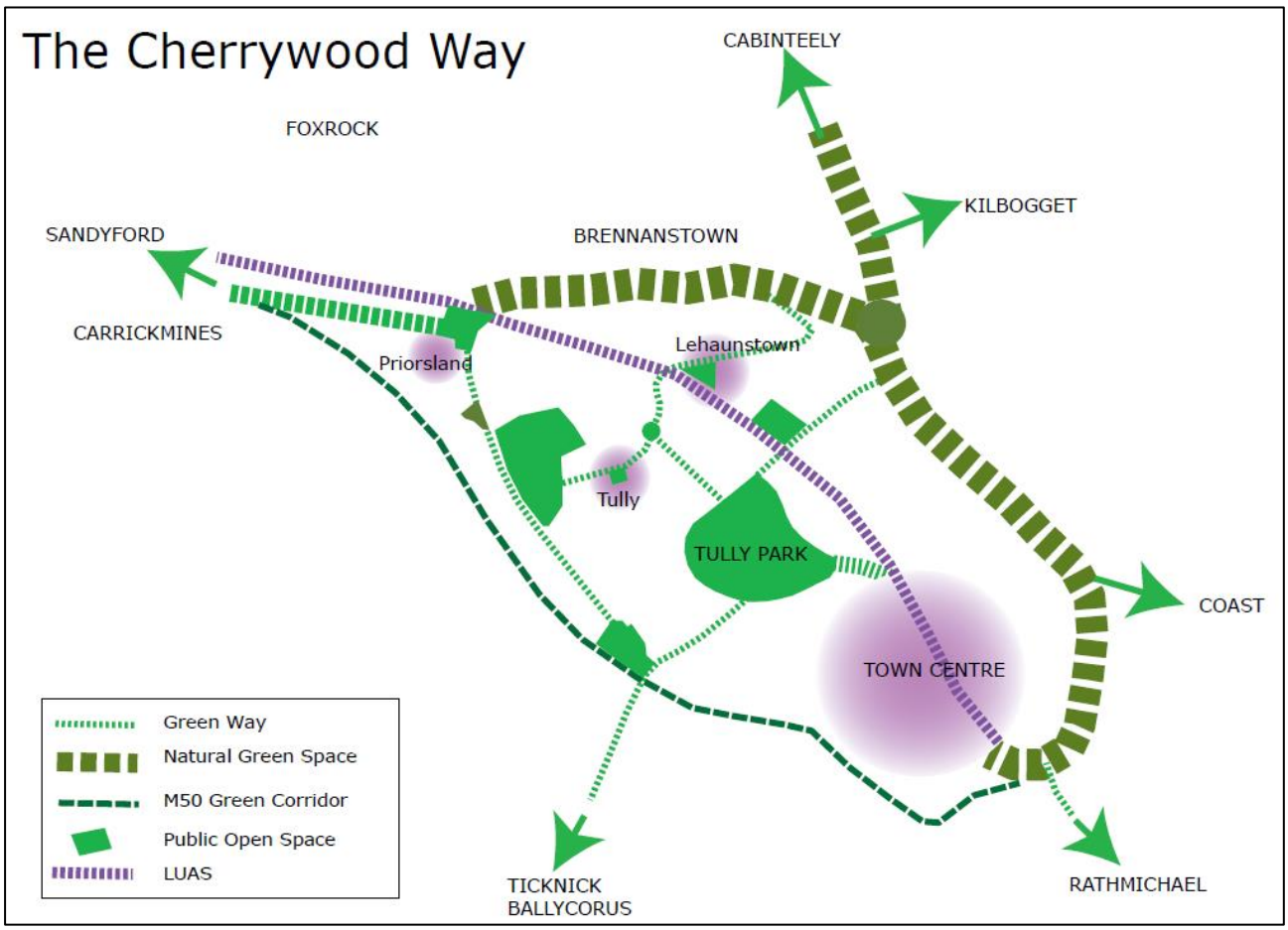


Figure 2.2 - The Cherrywood Way (Section 5.2 of the Cherrywood Planning Scheme)

3 Geometric Design

3.1 Standards

The following sections set out the typical details which are to be used along the proposed greenway and the Druids Glen pedestrian route. The following standards have been used to develop the requirements of each section of infrastructure.

The TII Publication '**DN-GEO-03047-02 – Rural Cycleway Design (Offline)**' is the design standard to be used on this project for the proposed greenway.

However, reference has also been made to the following documents, as best practice guidance.

- **NTA Cycle Manual** – the manual embraces the Principles of Sustainable Safety as this will offer a safe traffic environment for all road users including cyclists. It offers guidance on integrating the bike in the design of urban areas.
- **Sustrans Design Manual -** This publication provides guidance for the planning, design, construction and maintenance of new traffic-free cycle routes and greenways. Chapter 6 of this publication provides further guidance to effective construction and maintenance of cycle routes.
- **Footway Design -** TII Publication DN-PAV-03026 – Footway Design was used as a reference and guidance document during the scheme development.
- **Design Manual for Urban Roads and Streets –** This was used as a reference and guidance document during the scheme development.

3.1.1 NTA National Cycle Manual

In the NTA Cycle Manual, the Cherrywood Greenway would be classified as a 'Cycle Trail'. These are defined as a "*cycle facility in a non-vehicular environment, typically serving green routes, parks, waterways, shores etc. Pedestrians take priority in all cases of potential conflict*".

Typical road environments include access roads, roads for cyclists through parks, quiet streets in town centres where speeds of 30 km/h or less apply.

Cycle trails are characterised by the following:

- Few intersections with roadways.
- High comfort levels due to absence of motorised traffic.
- Combined utilitarian and leisure use.

The key issues to be considered in the design of cycle trails are:

- Need for compliance with Section 68 of Roads Act, 1993.
- Need for good visibility.
- Consistent quality with dedicated cycle signposting.
- Crossing points and intersections
- Legibility and signage – other users can read and respect the cycle facility.
- Detail design of junctions.
- Ensure continuity and coherence, no gaps.
- Not suitable for areas with kerbside loading and parking.

3.2 Greenway Geometric Alignment

3.2.1 Introduction

The guidance set out below have been used to inform the final greenway route and design.

3.2.2 Horizontal Alignment

The TII standards recommend achieving a comfortable and safe level of cycling with sufficient horizontal radii values. The provision of tight horizontal radii can compromise safety and the attractiveness of the cycleway although in some situations such as steep gradient sections, speed reduction might be necessary. The introduction of tight horizontal alignments needs to be accompanied by appropriate warning signage.

Table 3.1 presents the recommended horizontal radii that shall apply for the different design speeds.

Table 3.1 Recommended Horizontal Radii (m) for different Design Speeds

Design Speed (km/h)	Minimum Horizontal Radius (m)
10	4
30	25
50	94

3.2.3 Sight Distance

The TII standards recommended that all cycleways have a design speed of 30 km/h. A design speed of 10 km/h is acceptable (over short distances) on approaches to obstacles. For cycleways located on a long downward slope (steeper than 5% and longer than 150m), a design speed of 50 km/h should be implemented.

Table 3.2 Design Cycle Speed

Assumed Cycle Design Speed (km/h)	Characteristic
10	Obstacle
30	Standard
50	Down-hill

The distance at which a cyclist has visibility of potential hazards is an important design parameter. The greater the visibility a cyclist has, the greater their comfort and safety on the cycleway. Table 3.3 gives visibility parameters of Dynamic Sight Distance (DSD) and Stopping Sight Distance (SSD) for cycleways.

Table 3.3 Dynamic Sight Distances & Stopping Distances

Assumed Cycle Design Speed (km/h)	50 km/h	30 km/h	10 km/h
Minimum Dynamic Sight Distance (m)	110	65	15
Minimum Stopping Sight Distance (m)	60	35	15

3.2.4 Gradient

The overall gradient along a cycle route is an important design consideration. As stated in the TII Standard *"Comfort and attractiveness of a cycleway will be greatly increased if the route follows a shallow gradient*".

The gradient of a cycle facility impacts on two issues; the physical limitations of a cyclist to climb steep inclines and maintain speed, and their ability to stop when descending steep inclines. Steep gradients are not welcomed by cyclists and have the potential to put off users. Steep inclines generate high downhill speeds increasing the potential to conflict with other users who may be struggling to climb the steep gradient in the opposite direction.

Table 3.4 presents the maximum vertical gradients permissible on a cycleway.

Table 3.4 Vertical Gradient Requirements

	Gradients
Desirable Minimum	3%
One Step Below Desirable Minimum	5%
Two Steps Below Desirable Minimum	10%

The provision of gradients greater than 5% should be confined to short sections of the cycle route and should be preferably less than 100 metres in length.

It is noted that the Cherrywood SDZ planning scheme that the "area suffers from high levels of severance due to the steep topography of the river valleys". Druid's Glen, Bride's Glen, the Lehaunstown Valley, and the Linear Park beside the Cherrywood Business Park are all steep-sided valleys, created by created by the Carrickmines, the Cabinteely and Bride's Glen Rivers.

It is proposed to reprofile the steepest section of the existing walkway, between the Cherrywood Road access and the F-Block lands, with a ramp approximately 260m long, which is necessary to overcome a level difference of approximately 14m to facilitate a universally accessible gradient of 5%.

3.2.5 Headroom

Headroom restrictions may result in cyclists banging their heads, therefore impacting on the safety and comfort of the route users. The desirable minimum headroom along cycleways is 2.7 metres; however, over short distances a reduced head height of 2.4 metres is acceptable. Where minimum headroom is unavailable cyclists will be advised to dismount.

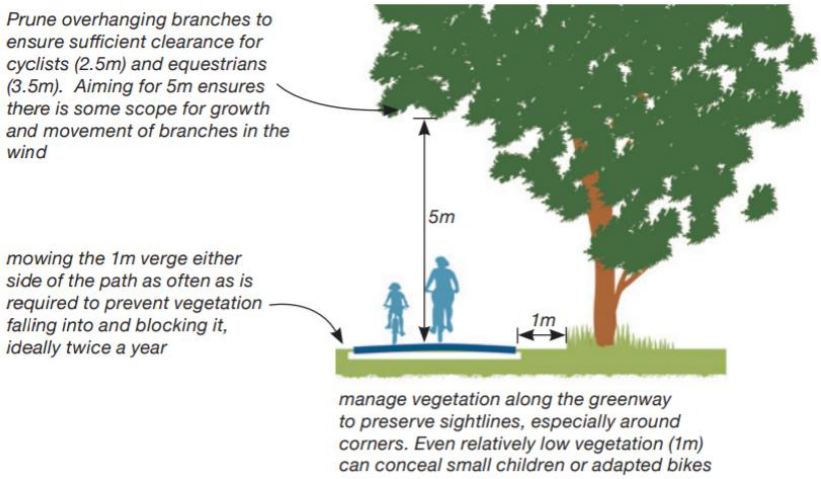


Figure 3.1 - Extract from Greenway Management handbook - Vegetation clearance to preserve sightlines

The proposed greenway will look to comply with the geometric requirements set out above. Notable requirements include ensuring vegetation will not impede the path over time due to growth.

3.2.6 Flooding

According to 'Sustrans Design Manual – Chapter 6', "*Occasional flooding need not be a major problem, provided the path is constructed to withstand inundation. A path that floods 5 to 10 days a year is acceptable, and even 20 days a year may be preferable to no path at all. Suitable diversion routes need to be identified and coherently signed*."

Based on existing data taken from Catchment flood risk assessment and management (CFRAM), there is a chance of flooding along certain sections of the route. Flooding is acceptable along greenways but the number of occurrences should be minimised where possible. CFRAM data shows the Annual Exceedance Probability (AEP) intersects the Green Network study area (red) as shown in the figure below. The bound surface proposed is essential to preserving the cycleway during any expected flooding and will ensure that the quality of the path will not deteriorate during these events.

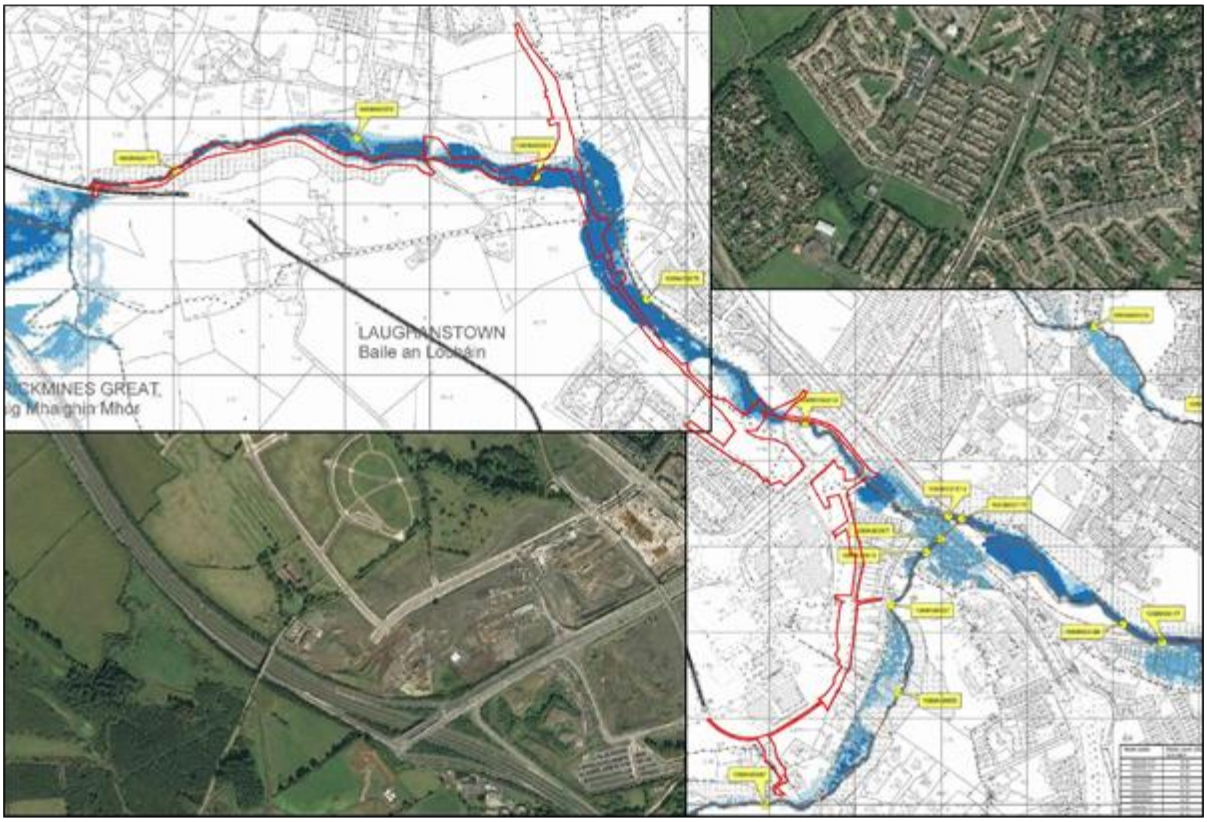


Figure 3.2 - CFRAM Data for Cherrywood

3.3 Greenway Geometric Design

3.3.1 Cross Section

It is proposed that the proposed greenway will be 4m wide, as set out in Figure 3.3. The greenway will be a shared use facility, used by pedestrians and cyclists. It is not proposed to provide segregation measures between modes, but as with all greenways, pedestrians will have priority. The path will be segregated from traffic for the entirety of the route.

3.3.2 Pavement Construction

A key objective for any greenway is a smooth even surface, therefore it is proposed that the greenway will comprise of a bound asphalt surface. A sealed surface will give a better performance and reduced whole-life maintenance costs than an unsealed surface. The sealed surface will be similar to the path recently provided at Pond 2B.

A smooth riding surface provides a safe, attractive and comfortable environment for all users, including pedestrians and cyclists. The proposed cycleway will comply with the minimum requirements of the specification for road pavements CC-SPW-00700- Specification for Road Works Series 700 – Road Pavements.

Asphalt surfacing is the most popular among cyclists because of its evenness and high skid resistance. Aggregate grading of 0/6 to 0/11 is proposed in accordance with TII guidance. The proposed bound surface pavement construction should be made up of the following and as shown in the Figure 3.3 below:

- 20 mm thin surface course
- 55 mm base course
- 150mm Clause 804 subbase (machine laid to achieve correct ride quality)
- Geotextile layer (where necessary)
- Capping (where necessary)

Softwood timber kerbs are proposed for this greenway. It is proposed instead to extend the subbase to 300mm beyond the surface course on each side, as is shown in Figure 3.3.

The requirements for geotextiles and capping will be dependent on the ground conditions along the proposed route. This will be determined at a later design stage following Ground Investigation surveys. These will give added stability where the ground conditions are sub-par.

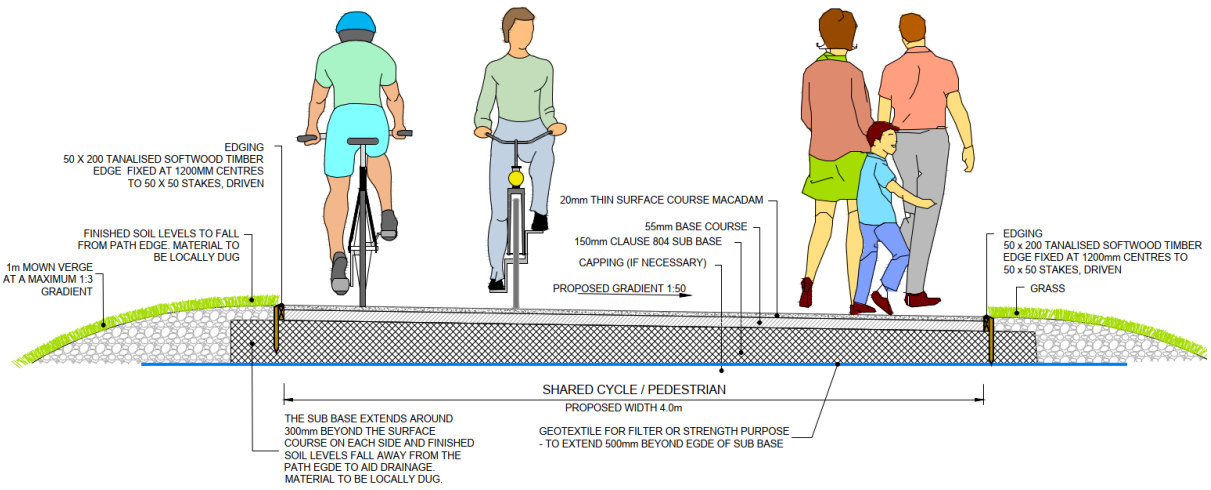


Figure 3.3 – Proposed Greenway Cross Section

The greenway should be higher than the proposed ground level by 20mm to stop back flow of the surface water runoff from a flat grassed verge.

3.3.3 Surface Construction

The NTA Cycle Manual recommends that a cycle route surface should be as smooth as possible to ensure efficient surface water run-off. A rough texture will provide for increased grip and reduced wheel spray compared to a smooth texture.

On cycle surfaces, there is no requirement for significant macro-texture. Therefore, the wearing course should consist primarily of smaller aggregates, e.g. 10mm or less.

Surfacing material choice is significant when allowing for effective drainage solutions, and the materials commonly used on sealed or impermeable surfaces include:

- 45/6F or 45/10F hot rolled asphalt wearing course to EN13108: 4 (BS 594:1)
- 0/6 or 0/10 Dense bitumen macadam surface course to EN13108:1 (BS 4987:1)
- Close graded SMA (10mm or 6mm aggregate) to EN 13108-5

While high-friction (anti-skid) surfacing, in a range of colours, is often used to provide grip as well as delineation, the cost can be excessive. It has therefore only been proposed at junction locations along the route.

3.3.4 Surface Cross Fall

Greenway surfaces need to be adequately drained to avoid the difficulties that standing water and ice can create for pedestrian and cyclists. The *Rural Cycleway Design* standard sets out the following cross fall limits below:

- Cross Fall: 1.0% to 3.0%

However, crossfall gradients of up to a maximum 5% are acceptable over short distances.

It is proposed to provide a consistent crossfall throughout the design of 2%. It is proposed that the crossfall is developed to one side of the greenway to the other, i.e. that a crown line isn't provided in the middle of the greenway. It is proposed that the greenway crossfall is directed towards the inside of a bend (or flat) to prevent negative crossfall, which could pose a hazard to cyclists.

3.3.5 Grassed Verge

Where vertical objects such as a wall, a fence, road sign or lighting column are located immediately adjacent to the greenway the effective width will be reduced. It is therefore necessary to provide a buffer between these objects and the greenway. Figure 3.4 provides the additional widths required where vertical objects are located adjacent to the greenway.

Type of Edge Constraint	Desirable Min (m)	One Step Below Desirable Min (m)	Two Steps Below Desirable Min (m)
Vertical features (wall, fencing, etc.)	1.00	0.50	0.25

Figure 3.4 - Lateral Clearance for Cycleways

The grassed verge will also be lower than the proposed cycleway to ensure that no back flow occurs from the proposed grass verge back onto the cycleway. However, the verge gradient will not be more than 33% in gradient so that errant cyclists are not destabilised if they stray from the cycleway.

3.3.6 Drainage

3.3.6.1 Over-the-Edge Drainage

It is proposed to provide over-the-edge drainage along the proposed greenway. Therefore, to ensure that the surface water runoff flows off the greenway towards the edge and does not pond, a crossfall of 2% is proposed (range between 1% and 3%).

The verge either side of the greenway should not be constructed with a crossfall greater than 33% so as not to destabilise a wayward cyclist. No minimum crossfall is specified for the grassed verge.

3.3.6.2 Drainage at Ramp in Linear Park

A filter drain is proposed along the regraded section of path in the Linear Park in Cherrywood. The size of the filter drain will be calculated at detailed design stage, following results from the Ground Investigations.

3.3.7 Pavement Construction Methodology

It is proposed that the greenway is machine laid, as this gives a much more even surface with better ride comfort and better drainage than using a hand laid approach.

General

Most damage to a cycleway pavement is likely to occur during the construction process due to the use of heavy weight machinery. It is essential that suitable lightweight equipment is used to avoid deformation of the pavement and foundation.

Foundations

The cycleway pavement foundation should be designed to the road design standards in in TII Publications (Standards). Where necessary, due to soft ground conditions, capping should be placed in accordance with CC-SPW-00600 - Specification for Road Works Series 600 - Earthworks. Foundations will need to be wider than the paving in order to eliminate the risk of edge damage.

Sub-Base Construction

A minimum of 150mm of sub-base must be laid in accordance with Series 800 of the Specification for Roadworks. So as to achieve the desired level tolerance and associated ride quality, the sub-base should be laid with a paver as shown in Photo 3.1 below. Mini-pavers are available that can lay to the narrow widths required for a cycleway.

Photo 3.1 – Paving machine laying sub-base for a Cycleway

Bound Pavement and Surfacing

The bituminous pavement must be laid and compacted with suitable lightweight machinery as shown in Photo 3.2 below.

Photo 3.2 – Lightweight roller compacting Cycleway pavement

3.3.8 Ecology Considerations

The proposed greenway will traverse a small section of tall-herb swamp (FS2), corresponding to the EU Annex I habitat [6430] hydrophilous tall herb fringe communities of plains and of the montane to alpine levels, in the Lehaunstown Valley. Although the habitat type as a whole is valued as being of national importance, the scale of loss will be very small (several square meters) and will not compromise the hydrogeological regime of the remaining vegetation, whose water source originates from calcareous springs on the western slope of the Lehaunstown Valley. For this reason, the potential effects are likely to be significant at the local level only.

The greenway will not disrupt the existing ground water regime, and therefore it will avoid dewatering the existing habitat. The impermeable section of the greenway, the surface and base courses are only 75mm deep in total. Any existing water will be able to flow over the top of the greenway, or through the subbase and capping layers (likely to be 400mm deep). The subbase and the capping layers will typically be more permeable then the existing subsoil and therefore will minimise disruption to the hydrogeological regime. A Ground Investigation will be undertaken during the detailed design stage to check the existing permeability of the soil and the level of the existing Water Table.

3.4 Druids Glen Valley Path Geometric Design

3.4.1 Cross Section

The proposed route in Druids Glen comprises the resurfacing of the existing trail that meanders through the woodlands. It is proposed to retain the existing trail width though the Druids Glen, approx. 1.2m wide, but will be narrowed if there will be an unacceptable impact on existing trees or ecology. The cross section below is the optimum solution, but narrower sections may be required to suit the terrain and minimise impacts on existing trees and ecology.

3.4.2 Pavement Construction

In order to protect the trees on the path route, it is proposed that a "no dig" construction method is applied through the use of a geocellular web confinement system. This removes the requirement for excavation to build the proposed path. Although the path will not encounter trees roots along the entire length, it is proposed to use the geocellular web confinement system for the full length to ensure consistency in performance and finish.

Proposed Construction Layers

A robust geotextile membrane must be laid out across the proposed area for the load bearing surface. This includes both the proposed path and any extra areas required for construction. All permanent locations must be positioned to give a minimum clearance of 500mm from the base of a retained tree where possible. Timber edging will be used with the cell web providing the necessary support for the edges of the path.

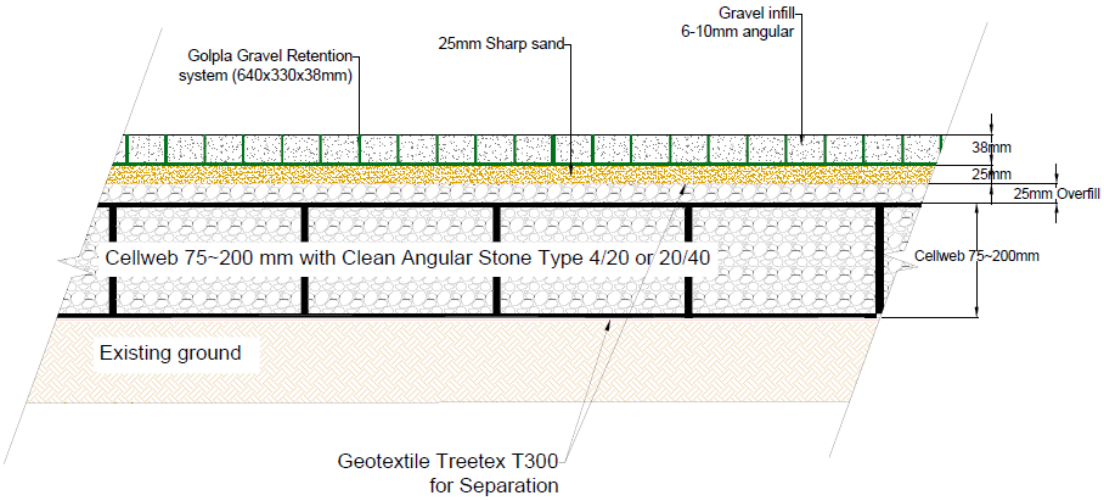


Figure 3.5 - Proposed Footpath Build-up for Druids Glen Valley

A geocellular web / 3D cellular confinement system (e.g. Cellweb or equivalent) is to be laid on top of the geotextile membrane layer as detailed in Figure 3.5 above. This surface must be able to support the greatest expected load the surface is likely to experience (including any construction traffic). The depth is governed by the expected loading and for this footway, the Cellweb or equivalent will be 75mm (The footway is for pedestrians only but depending on construction methodology, a stronger (thicker) layer may be required to support construction traffic.). The load bearing surface must be filled with 4/20 or 4/40 washed angular stone. On top of the Cellweb or equivalent layer, a small sand layer will be applied and then on top of the sand, a gravel retention system (Golpa or equivalent) will be laid and gravel filled in on top. The Golpla system is used on top of Cellweb to contain the gravel surface reducing movement and avoiding rutting. The gravel retention will help provide support to the footpath as well as reducing maintenance requirements. The Golpa system will also help to retain the proposed gravel surfacing in the event of a flooding event.

Geocellular Web Construction Methodology

The surface shall be designed to meet the highest expected loads, including those used for the construction of the proposed new route. Work will preferably be carried out in dry conditions, within the period of May to October, when the ground is less liable to compaction and must be supervised by an arboriculturist where it occurs within an RPA.

The existing ground cover vegetation (e.g. grass/weeds) if necessary is to be killed off using an appropriate herbicide (see Pesticides Handbook). Herbicides that can leach through the soil, e.g. products containing sodium chlorate, are not be used. The soil surface is not to be excavated to establish a sub base for the finished surfaces. Loose organic matter, woody vegetation and/or turf are to be removed carefully using hand tools. If there is a delay in installing the surface following clearing, the soil surface once prepared is to be covered immediately either with hessian sacking or plastic to prevent the surface drying out until the new surface is installed.

Existing ground vegetation shall be treated with an approved herbicide such as glyphosate 2-3 weeks before construction takes place. Killed vegetation can then be subject to a maximum 50 mm vegetative scrape which must take place by hand. Any arising's shall be removed (if left in situ they could cause anaerobic conditions as they break down which could be detrimental to tree roots).

The Geocellular Web needs a level base. Any hollows must be filled with inert granular material, such as sharp sand or washed no fines gravel. Builder's sand must not be used as this contains salts which are toxic to tree roots. Any rocks, stumps (if present) or other protruding objects within the footprint of the load bearing surface must be removed. Stumps must be ground out below ground level. All other objects must be removed by hand.

The proposed methodology will be dependent on the accessibility to the path during the construction period. Where possible, machinery will be used to help lay the path but where this isn't possible, the work will be carried out by hand.

Cellweb

The Cellweb is to be laid on top of the geotextile membrane and is intended to support all loading expected on the path as well as protecting the existing ground and roots.

Following the preparation of the ground surface and the laying of the geotextile membrane, as detailed above, the Cellweb is laid out on the proposed path and pinned in place. During this step, the Cellweb can be trimmed to fit the layout. Once set, the Cellweb is then filled with 4/20 or 4/40 washed angular stone. This can be done by hand if restrictions are required to limit machinery being used along the path. With the Cellweb filled, edging can be installed. This is likely to be a peg and timber board installation, however, excavations for kerbs and edgings should be avoided within the RPAs. The path will then be set for the proposed surfacing to be applied.

Figure 3.6 – Pinning the CellWeb

Figure 3.7 – Filing the CellWeb with Angular Stone

Golpa Gravel Retention

This system makes up the surfacing layer and will be laid on top of the proposed Cellweb geogrid as detailed above.

A further geotextile membrane is laid on top of the Cellweb geogrid to prepare the surface for the proposed Golpa system. On top of this membrane, a bedding layer is laid of sharp sand. This is to support the proposed gravel surfacing as well as the Golpa units. The individual Golpa units are then laid and pinned to the surface. The units can be cut to fit the proposed surface. Once the units have been secured, they can be filled with the proposed gravel surfacing ensuring that the top of the Golpa system remains visible as shown in Figure 3.8 below.

Figure 3.8 - Golpa Gravel Retention System

3.4.3 Grassed Verge Width

There is no requirement for verge adjacent to the footpath. However, the proposed construction using the root protection geotextile will result in the footpath being built up from the ground level as mentioned above. Therefore, there will be a requirement for the existing surface to tie in with the proposed surface. This must be achieved by gradually ramping up or down the adjacent ground levels outside the proposed surface. The gradient of the transitions shall not exceed 25% where possible.

3.4.4 Tree Works

All tree works are to be carried out in accordance with the Arboricultural Assessment of the 'Cherrywood Linear Park Greenway' undertaken by Arborist Associates Ltd. as part of this scheme.

DLRCC or the main contractor is to appoint a tree surgery company competent of carrying out the remedial tree surgery works and tree felling that are required on this site. The tree surgery contractor is to produce a method statement detailing how he plans to undertake the works and informing the site foreman of the process so the necessary steps can be taken to ensure the works are carried out safely and efficiently. The works are to be carried out by appropriately trained personnel taking account of the recommendations of BS3998 2010.

3.4.4.1 Filling in Root Holes

Existing fallen trees, which impede or are located close to the proposed Druids Glen path, are to be infilled with topsoil material. The finish is to be to existing ground levels and planted with the woodland plant mix.

Figure 3.9 - Fallen Trees within Druids Glen

3.4.5 Proposed Viewing Area

It is proposed to infill an existing hole in the Druids Glen woodland, which is situated beside an existing manhole, see Figure 3.10, below. The hole will be infilled to bring the all the ground to the same level as the manhole. Timbers sleepers will be provided at the back of this flat section to make up the level difference between the viewing area and the proposed woodland path. These will also be used as seating.

Figure 3.10 - Existing Manhole in Druids Glen

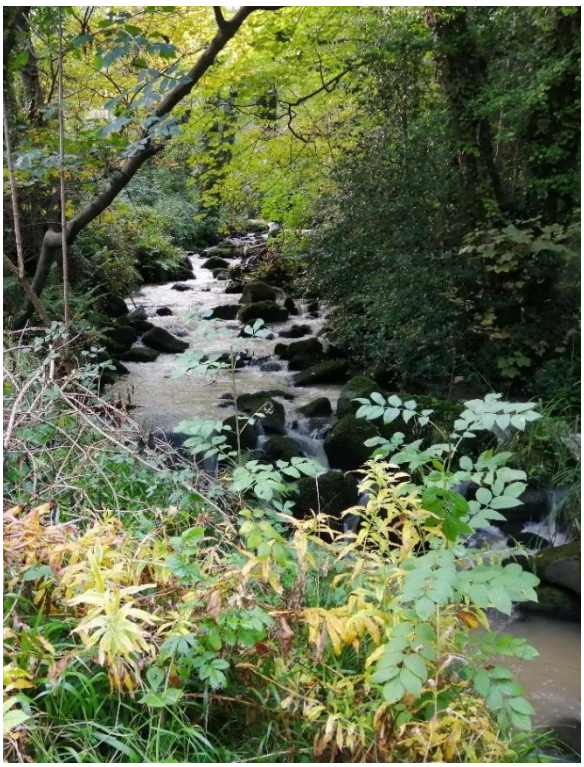


Figure 3.11 - Proposed Viewing Area

3.4.6 Spring habitat in Druids Glen

The proposed walkway will cross a section spring run-off, from an uphill calcareous spring habitat in Druids Glen. The spring in the Druids Glen is a tufa cascade which crosses the Druids Glen pathway (as shown in Figure 3.12 and Figure 3.13) before continuing downstream to the Carrickmines River. The spring source is located up-slope in the Druids Glen valley and will not be affected by the proposed development.

Figure 3.12 - Spring Water crossing path in Druids Glen

Figure 3.13 - Spring Water crossing path in Druids Glen

The crossing of the spring water will be by elevated platform using treated timber planks to avoid impeding the flow of water downslope. The timber planks will be treated and slip resistant with U-nails and cross bears, similar to those provided in boggy walkways. The proposed platform is shown in Figure 3.14 below.

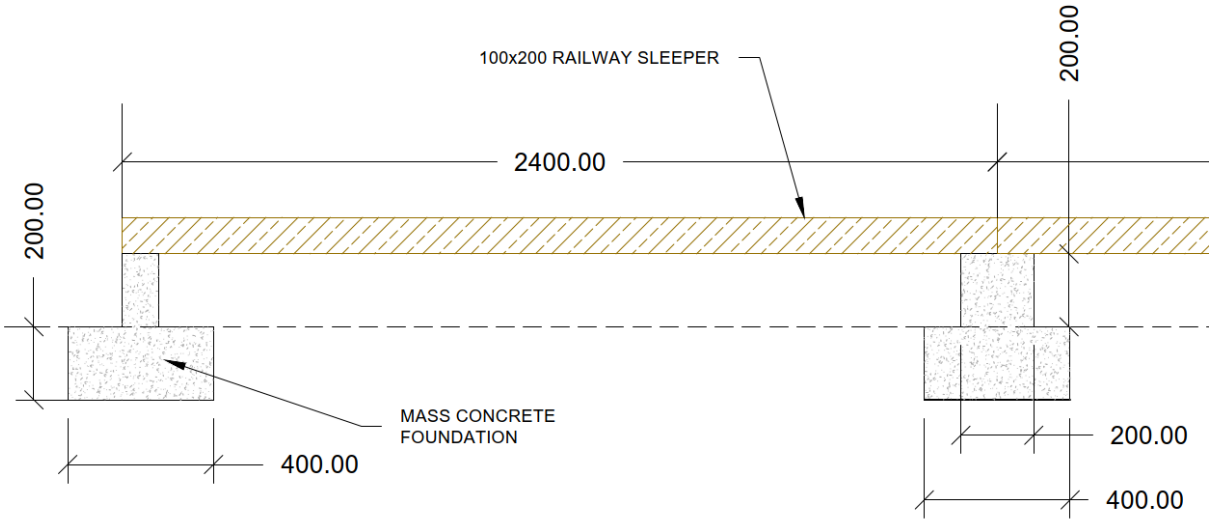


Figure 3.14 - Proposed Timber Platform

3.4.7 Fencing

Fencing will be installed along the proposed pedestrian path through the Druids Glen Woodland as a design measure to protect the sensitive ecological flora and fauna that have been identified in this area. A suitable fencing design will be agreed at detailed design stage with DLR's Biodiversity Officer. At a minimum the fencing will:

- Guide and direct users through Druids Glen to reduce disturbance and other potential negative impacts on ecologically sensitive features, including rare flora;
- A fencing design that is sympathetic to the natural surroundings, whereby the fencing does not impact negatively on ecologically sensitive features, e.g. through its installation or ongoing maintenance;
- Incorporate any design features if and where needed, to facilitate movement of fauna through the area;
- Use sustainable and low maintenance materials; and,
- Not impede water or water flow through the area.

It is also proposed, where the path is adjacent to rivers, to safeguard pedestrians near the water. One section of the path that will be provided close to the river is shown in Figure 3.15 below.

Figure 3.15 – Existing Path beside Carrickmines River

An example of a potentially suitable design is a slatted fence, similar to fencing designed for boardwalks, as shown in Figure 3.16 below. In addition to the provision of fencing through the Druids Glen, signposts containing a visitors code of conduct, which will include at minimum the following, will be installed at all access/egress points to the Druids Glen Woodland:

- Visitors to the Druids Glen Woodland commit to staying on the boardwalk, and will not diverge off the boardwalk to avoid disturbing sensitive flora and fauna contained in the woodland;
- Visitors with dogs will maintain their dogs on a lead/restraining device at all times to avoid disturbing sensitive flora and fauna contained in the woodland; and,
- Visitors to the woodland will leave no trace of their visit, and take only pictures of the site.

Figure 3.16 - Example Fence (Source: HC4 Decking Planks | Projects | EcoChoice)

4 Utility Services and Public Lighting

4.1 Existing Utility Infrastructure

A desktop study has been carried out to identify all utility constraints located within the study area. A review of the obtained records has assisted in determining the likely impact of the proposed works on the existing services. The design will look for affected services to be protected in-situ, where possible. Where service diversions would be deemed necessary, close liaison with the service providers would be necessary.

4.1.1 Existing Utility Records

All major utility providers were contacted, including the following;

- BT;
- Eir;
- enet;
- ESB Networks;
- Gas Network Ireland;
- Irish Water;
- Virgin Media; and
- Water Services DLRCC

The following utility providers did not have any utilities in the proposed scheme.

- BT;
- enet;
- Irish Water; and
- Virgin Media.

The following utility providers had utilities in the proposed scheme.

- Eir – Lehaunstown Lane (adjacent to the Linear Park);
- ESB Networks;
    - There are two underground ESB ducts in the Cherrywood Business Park, which run up to Lehaunstown Valley (south).
    - There are ESB overhead cables crossing over Lehaunstown Valley (south) and Druids Glen.
- Gas Network Ireland – A 250 PE 4 bar, is found in Lehaunstown Valley (south), adjacent to the D-loop, as shown in Figure 4.1.

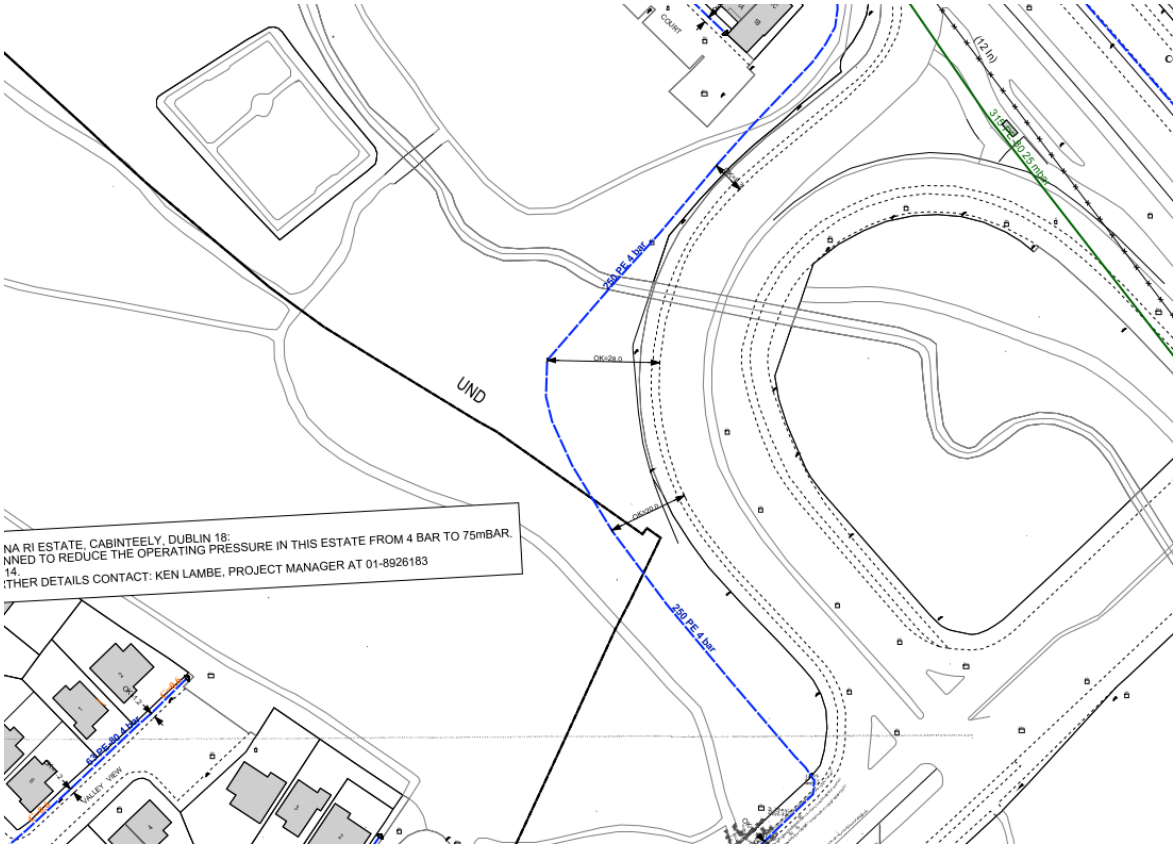


Figure 4.1 - Gas Network Ireland Records

- Water Services DLRCC – An Asbestos 20 inch watermain pipe is found in the Cherrywood Business Park, as shown in Figure 4.3. Consultation will be undertaken with Irish Water and DLRCC Water Services regarding the location of the pipe. Slit trenches will be undertaken to find an accurate level of this pipe prior to detailed design and construction.

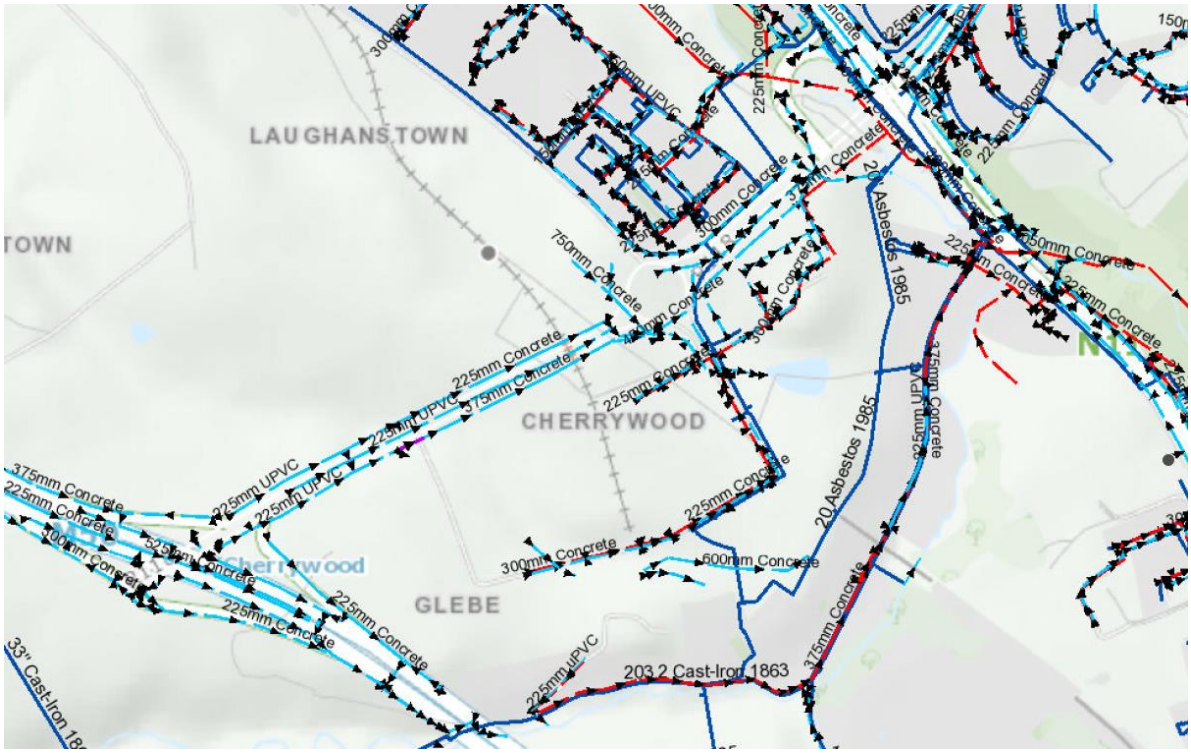


Figure 4.2 - Water Services DLRCC Records

- Water Services DLRCC – Two foul pipes are found in the Lehaunstown Valley (North and South), as shown in Figure 4.3.
- Water Services DLRCC – A watermain is also found in the Lehaunstown Valley (South), as shown in Figure 4.3. Irish water will be contacted as part of the detailed design procedures.

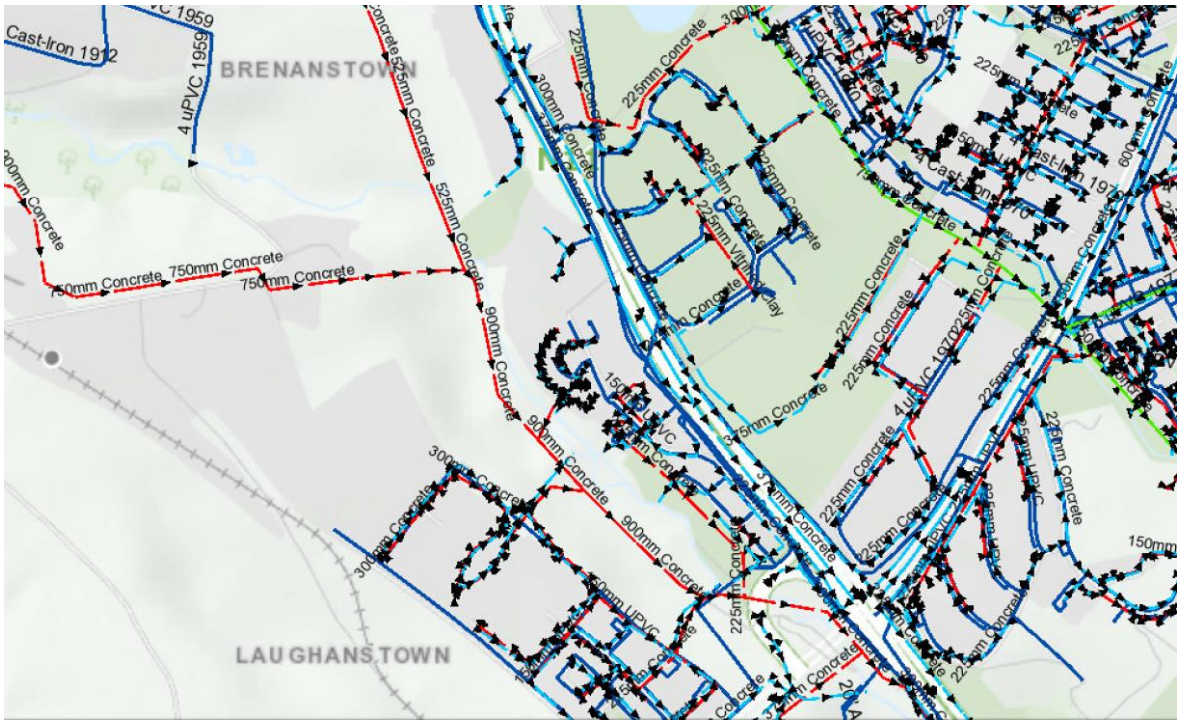


Figure 4.3 - Water Services DLRCC Records

4.2 Lighting Proposals

4.2.1 Existing Public Lighting

There are 33 existing public lighting columns in the existing park. These are located in the park area beside Druids Glen Residential Estate, under the N11 D-Loop, and south of the N11, as shown in the figure below.

Figure 4.4 - Existing Lighting Columns

Figure 4.5 - Existing Lighting Columns

4.2.2 Proposed Public Lighting

The provision of a safe, accessible, high-quality route is critical in the success of this project and lighting in high activity areas adjacent to HIE lands and public transport nodes is considered essential. All green infrastructure must also perform an ecological role. The lighting proposals for this route have been designed to facilitate the ecological constraints while maintaining an appropriate standard of lighting for the greenway route.

There are three lighting zones proposed.

- Zone 1 - Existing lighting will be rationalised and new lighting will be installed where required to provide uniform lighting along the proposed route.
- Zone 2 - Ecologically sensitive lighting will be installed along this section of the proposed route.
- Zone 3 will not have public lighting.

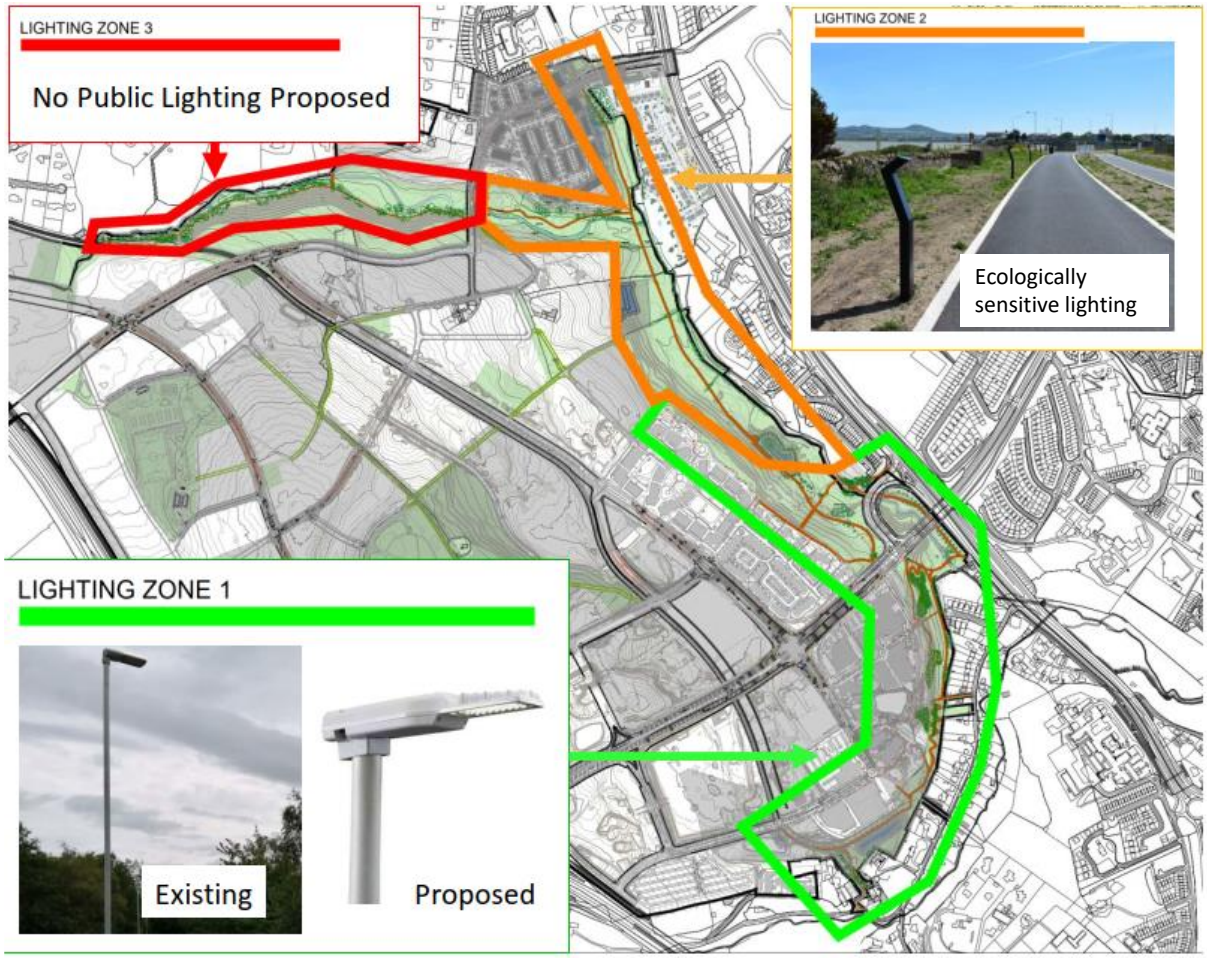


Figure 4.6 - Proposed Lighting zoning

Table 1 highlights the proposed lighting, and the ecological and health and safety considerations for each zone.

Table 1: Proposed Lighting Zoning

	Proposed Lighting	Ecological Considerations	Health and Safety
Zone 1	Standard Lighting – All lighting has been designed in accordance with EN 13201:2015, Lighting Category P4.	This zone is the most heavily modified section of the proposal, and already subject to lighting in specific places. The habitat is most suitable for the three most common bat species: Common pipistrelle bat, soprano pipistrelle bat, and Leisler's bat on account of the prevailing topography, habitats, and lighting regime.	High levels of pedestrian and cyclists predicted. Safety concerns if public lighting not provided.
Zone 2	Ecologically sensitive Lighting Light levels 1.2 lux minimum. All lighting has been designed in accordance with EN 13201:2015, Lighting Category P4.	This section comprises a mix of semi-natural habitats, including woodland habitats in close proximity to wetlands. This zone supports a broad range of bat species, including rarer species that are more vulnerable to effects of lighting, e.g. Daubenton's bat and Natterer's bat, as well as the more common species. Lighting proposed will minimise avoid light being emitted above 1.5m height,	Moderate levels of pedestrian and cyclists predicted. Safety concerns if public lighting not provided.

	Lighting installation does not emit light above 1.5m. Lux levels will drop off rapidly from the path to levels below 1 lux within about 2m or so of the path boundary. Layout configured to avoid illumination of watercourses.	to minimise lighting at elevations typically used by foraging bats in complex landscapes. Lighting has been designed to ensure light spill falls off rapidly away from the proposed cycleway.	
Zone 3	None	Zone 3 comprises woodland that has been valued as county importance for its bat fauna. Any addition of lighting to this zone is likely to compromise the suitability of habitat within for foraging and roosting bats.	Pedestrians not encouraged to use this route at night time.

Public Lighting Zone 1

This zone is already lit by existing lighting within the park sections adjacent to the N11 D-loop. The existing public lighting is shown in Figure 3 below. In total, there are 33 lighting columns that will be reused.

Road lighting for the Wyattville Link Road, and the N11 also spills into this area. The permitted developments (Pond 5A, Cherrywood Business Park Upgrade, F-Blocks) adjacent to the proposed natural green space have also included for lighting and these areas are under construction.

Figure 3: Existing lighting columns

Where there is currently no public lighting, south of the Wyattville Link Road, new public lighting to match existing will be used. It is proposed to provide approximately 40 new public lighting columns in the Cherrywood Business Park, as shown in the adjacent figure.

It is proposed to use standard lighting fittings in this area, as shown in Figure 4 below. Detail to be agreed with DLR Lighting Section at detailed design stage.

Figure 4: Standard lighting lantern

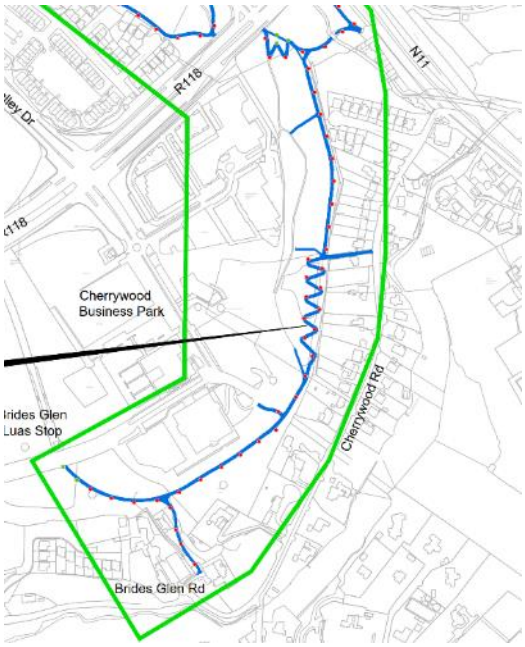


Figure 5: Proposed Lighting Columns south of the Wyattville Link Road

Potential ecological effects: This zone is comprised of an existing public park, and as referenced already, there is some pre-existing light spill. The habitats in this section are generally more open than zones 2 and 3, and therefore less suitable for woodland specialist bat species (e.g. those species that are most sensitive to light spill) than zones 2 and 3. The addition of standard public lighting columns to unlit sections of zone 1 may displace foraging bats from the lit sections of edge habitat in zone 1. This is most likely to affect the three most common Irish bat species, common pipistrelle bat *Pipistrellus pipistrellus*, soprano pipistrelle bat *Pipistrellus pygmaeus* and Leisler's bat *Nyctalus leisleri* through displacement away from lit zones. The effects are likely to be significant at the local geographic scale.

Public Lighting Zone 2

This zone is currently unlit and has been identified in the EcIA as of high suitability for foraging and commuting bats due to its unlit character and range of semi-natural habitats (open grassland, mature tree lines and Cabinteely stream).

These sections of the route are also critical to the NTA and lighting proposals should integrate with the link onwards to Cabinteely Park, which is also under review. Increased future lighting from adjacent developments (Tudor Homes, Domville, Druids Glen Road, and Bridge, Beach Park) will also once completed, reduce the unlit area in this zone.

Therefore, it is proposed to install ecologically sensitive lighting along this section of the proposed route.

Lighting will be designed to ensure that the fitting does not emit light above 1.5m. Lux levels will drop off rapidly from the path to levels below 1 lux within about 2m or so of the path boundary and the layout will be configured to avoid illumination of watercourses.

Figure 6: Lighting provided on the Portmarnock Greenway

Potential ecological effects: This zone comprises a mix of open and closed semi-natural habitats. The landscape is suitable for a wide range of bat species, including those that are more sensitive to the introduction of artificial lighting. Potential impacts resulting from the introduction of artificial lighting have been identified and assessed in the EcIA submitted.

Public Lighting Zone 3

No lighting will be proposed in this Zone.

This zone is currently unlit. The EcIA identifies 'that bat activity is concentrated in the vicinity of woodland along the route. In particular, the long-established woodland habitat of the Druid's Glen is an important resource for bat populations and is rare in the context of both County Dublin and the Dun Laoghaire-Rathdown Council area'.

This zone will continue to be protected in the future by the valley topography, existing trees and ecological buffer zone required within the Cherrywood Planning Scheme.

This section of the proposed route is 1.2m in width. It is proposed for pedestrian use only. An alternative pedestrian cycle route connection runs parallel at the top of the valley along Barringtons Road.

This area is of high ecological value, and the primary pedestrian cycle route will have alternatives at this point where lighting can be facilitated.

Potential ecological effects: This zone is comprised chiefly of closed woodland. Based on surveys conducted for the Ecological Impact Assessment of the proposal, this area of woodland is likely to support eight of Ireland's nine bat species, and contains features which are important for roosting and foraging bats. The omission of lighting means that no significant effects are likely to arise with respect to light spill/displacement of bats in zone 3.

4.2.3 Summary of Ecological Effects, and Compliance with the Cherrywood Biodiversity Plan

Bats have been identified as a key ecological receptor in the Ecological Impact Assessment (EcIA) report for the proposed Cherrywood Green Network, and they are known to forage across the proposed development site. The

proposed zonation of lighting has been designed with input from the project ecologist, in order to avoid effects on the most ecologically sensitive sections of the route (Zone 3 Druids Glen). Non-standard lighting has been proposed in zone 2, which is also important for woodland-specialist bat species, to minimise effects on foraging, whilst also considering public safety. Zone 1 is least suitable for woodland specialist bat species, and lighting of this area includes standard light fittings. It is the professional opinion of the project ecologist, subject to further input at the detailed design phase, that the proposed lighting design complies in principle with the following policy of the *Cherrywood Planning Scheme* which relates to the effects of public lighting on bats:

GI 50 Require that any public lighting is minimised in areas within 30m of existing or proposed hedgerows, treelines, watercourses or woodland edges, specifically in areas that are important for bats such as along commuting routes and at foraging and roosting locations. In these locations, lighting shall be installed only where necessary for public safety, with directional illumination and to the minimum lux level consistent with this need.

5 Bridge Details

5.1 Introduction

The proposed alignment for the Cherrywood Green Routes Network crosses the Carrickmines River at one new location. It is proposed that a new bridge will be constructed in the Lehaunstown Valley, over the Carrickmines River, close to its confluence with the Cabinteely River. The two existing bridges (with minor alterations) will be maintained for crossings of the Cabinteely River.

The proposed bridge will be located at coordinates 723674.787, 724099.929 (ITM).

5.2 Proposed Carrickmines River Bridge

The proposed bridge has been designed with a total span of 12.75m. This span has been chosen to ensure a clear span of 12.1m over the river and the riverbanks. The soffit of the bridge will be located at 25.63 mOD which ensures a 300mm freeboard to the Q100 flood level. The width of the bridge will be 4.6m from edge of longitudinal beam to edge of longitudinal beam, this will ensure a minimum internal clear width of 4.0m.

The superstructure of the bridge has been designed using a painted steel ladder beam. The ladder beam will be formed by two longitudinal RHS steel members with intermediate transverse RHS steel members spanning perpendicular to the longitudinal members ensuring structural continuity. Diagonal bracing will be also be provided to increase the stiffness of the bridge. A solid steel deck plate with a combined bridge deck waterproofing and surfacing material will provide the finished surfacing. The overall structural depth of the bridge will be in the region of 0.5 - 0.7m ensuring a shallow structural depth improving aesthetics and giving the impression of a lightweight slender structure.

The substructure of the bridge will be composed of two ground bearing insitu concrete abutments located within the flood plain of the Carrickmines River. Earthwork embankments will be provided on both approaches to the bridge raising the finished ground level at a gradient of 1 in 20 to tie in with the bridge deck level. Flood modelling has been carried as part of the project to ensure minimal effects on the flood levels in the surrounding area due to construction of approach embankments and concrete abutments.

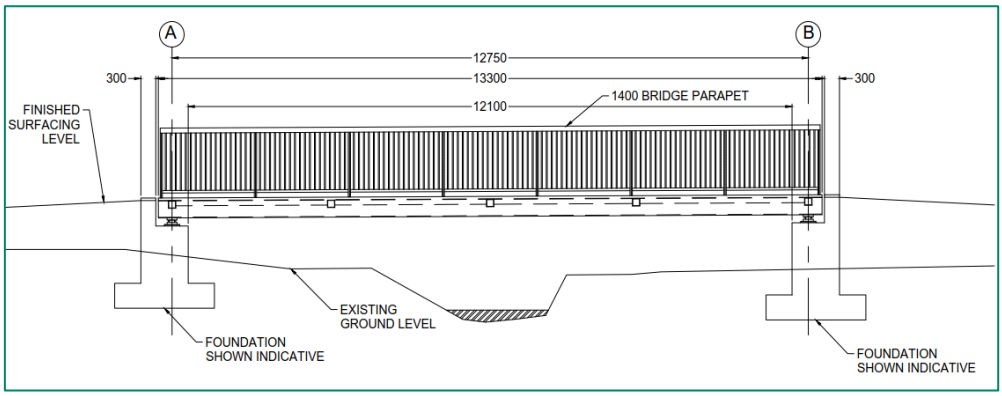


Figure 5.1 - Proposed Bridge Elevation

Painted steel parapets designed in accordance with DN-STR-03011 will be provided along the edge of the bridge to improve safety of the end user and avoid falls from height. The parapets will be 1.4m high to meet the requirements within DN-STR-03011 for cycle facilities. The parapets will be composed of vertical members with a horizontal top and bottom rail. Vertical members have been chosen to reduce the risk of anti-social behaviour and climbing the parapet. The vertical members will also reduce the risk of vandalism and “love-locking”. The spacing of the vertical members will be designed to ensure no gaps larger than 100mm are provided between the members.

The bridge approaches will drain directly to the existing surface water drainage system in the area and as a result no bridge deck drainage system will be provided on the bridge.

5.3 Existing Cabinteely River Bridge

No historical/as built information is available for the existing Cabinteely River Bridge and the date of construction is unknown. A site visit was carried out on 6th October 2020 to determine the form of structure and give an indication of its current condition.

The bridge appears to be a concrete beam and slab structure with a span of approximately 8m over the river and a total width of 3.8m from edge of parapet beam to edge of parapet beam. The edge beams are 0.25m wide giving an internal clear width of 3.2m. 1.0m high galvanised steel parapets are provided to both edge beams. Overall the structure appears to be a good to fair condition. No defects were noted to ancillary elements which would indicate that the primary elements of the structure were in distress.

Figure 5.2 – Existing Cabinteely River Bridge

As part of the Cherrywood Green Routes Network it is proposed to remove and replace the existing surfacing and bridge deck waterproofing on the structure. The new waterproofing shall have a minimum design life of 50 year in accordance with DN-STR-03012. In addition, it is proposed to remove the existing bridge parapets and replace with a 1.4m high painted steel parapet to meet the requirements within DN-STR-03011 for cycle facilities.

As no as built information is available it is unclear if the structure was designed to allow for service vehicle loading and as a result this type of loading should be avoided. Under the proposed scheme bollards will be placed on both approaches to the structure to avoid the risk of unauthorised access from service vehicles on the bridge.

6 Landscaping

6.1 Proposed Seating

As per the Design Manual for Urban Roads and Streets, all proposed seating will be set back from the proposed path so that it does not impede either pedestrians or cyclists. The seating locations are shown on the scheme drawings and show that the seating is visible from the path so that approaching cyclists/pedestrians can have the appropriate stopping distance. Proposed seating will look to enhance the value of the location rather than be seen as street furniture clutter.

Bench Rest Areas

Bench havens will be positioned at different points along the Greenway to promote rest and social engagement opportunities. The surface finish on the rest points will give a hierarchy to the route and a differentiation from the adjacent greenway.

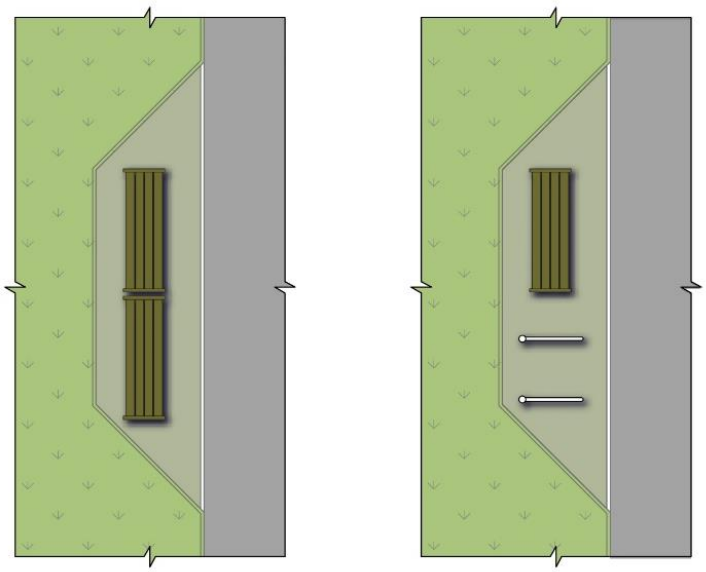


Figure 6.1 – Bench Rest Areas

6.2 Cycle Parking

Similar to proposed seating, cycle parking must provide a place of function and value to the route. The locations of these pieces of street furniture must be considered so that they provide benefit to the users of the route. The furniture must also be suitably set back from the path so that users are not impeded by its presence or users.

6.2 Landscaping Types & Planting /Finishes Details

Softworks Palette

A variety of open space and softworks currently exists on the site. These elements function as part of the green space, provide visual aesthetic as well as offering areas for rest and recreation.

The existing site offers a variety of softworks elements which have been categorised into five groups, Specimen Trees, Feature Trees, Shrubs and Underplanting, Meadow and Wild Areas and Amenity lawn areas.

Planting mixes will be further agreed with the DLR Biodiversity officer at the next stage of the design to allow the greenway to develop within its local context.

Specimen Trees

Many impressive specimen trees currently exist on site. More will be added to the landscape to further enhance views and punctuate the open space. New specimen tree planting will enhance the existing tree stock along the greenway and define a spatial succession along the greenway.

Feature Trees

Feature trees line many of the areas within the site and offer a sense of arrival and a feeling of maturity as well as definition to the site edges and adjacent properties.

Woodland Planting

Existing woodland is supplemented and enhanced through the introduction of opportunity for woodland areas to regenerate naturally. Spatial succession is also strengthened as more opportunities for views and spaces to be revealed are created along the route.

Shrubs and Underplanting

A distinctive palette of underplanting currently exists on site. This will be enhanced and continued through the use of appropriate species defined by those that already exist within the area of the proposed greenway. This will help define the greenway and allow it to sit more elegantly into the landscape while providing benefits to the biodiversity of the area.

Meadow planting and Wild areas

Wild areas and Grassland which are left to grow are important due to their benefits to biodiversity and lower maintenance costs. These areas can be used to frame and define amenity and recreation space.

Amenity Lawn

Amenity lawns make up a portion of the open space on site and provide visitors the opportunity for rest and recreation.

Potential Tree species for use along the greenway

Quercus robur	20-25cmg	Root balled
Betula pendula	20-25cmg	Root balled
Betula pubescens	16 - 18cmg	Root balled
Fagus sylvatica	18-20cmg	Root balled
Alnus glutinosa	20-25cmg	Root balled
Acer campestre	20-25cmg	Root balled
Sorbus aucuparia	20-25cmg	Root balled
Sorbus aria	18-20cmg	Root balled
Carpinus betulis	20-25cmg	Root balled
Pinus sylvestris		Root balled
Salix alba	18-20cmg	Root balled
Metasequoia glyptostroboides		Root balled
Parrotia persica	25-30cmg	Root balled
Ginkgo biloba	25-30cmg	Root balled

Fagus sylwatica v. purpurea	16-18cmg	Root balled
Pinus sylvestris		Root balled
Liriodendron tulipfera	25-30cmg	Root balled
Crateugus laevigata 'Pauls Scarlet'	18-20cmg	Root balled
Aesculus x carnea	25-30cmg	Root balled
Castanea sativa	18-20cmg	Root balled

Hard Materials Finishes

The hardworks palette has been chosen to be sympathetic and contextual to the surroundings, yet the materials equally need to be robust and durable with the intention of bringing a more modern and contemporary feel to enhance the space.

Surface finishes across the greenway will comprise of a robust set of materials which are outline below.

Asphalt

Asphalt Footway/Cycleway will be developed as the main paving material throughout the Greenway offering opportunities for walking, running and cycling through Cherrywood Greenway.

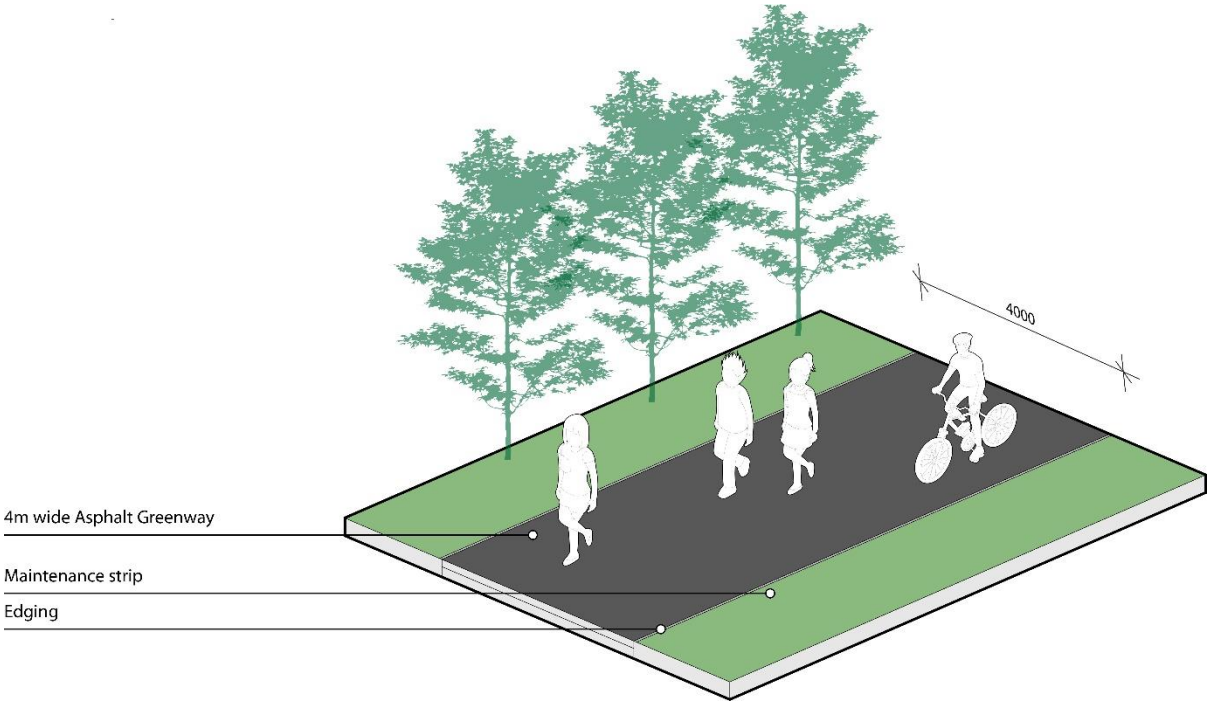


Figure 6.2 – Asphalt Greenway

Loose fill gravel (Geocell footway)

Gravel path in buff colour. This amenity trail meanders the Druids glen area of the site, offering an opportunity for walking and running.

Resin Bonded gravel

This material will be used to define areas for rest and social engagement along the route and give a different feel to these points along the greenway. Resin bonded gravel will form key materials at junctions along the greenway.

Precast concrete Paving

Precast concrete paving units will define key entrances to the greenway making a clear entrance exit point to the greenway.

Steps and Handrails

Concrete step units will be used throughout the greenway development with stainless steel handrails.

Reinforced Earth Slope / Green Wall

It is proposed to provide a 260m long ramp overcoming a level difference of approximately 14m in the Cherrywood Business Park. In order to provide the space to provide a greenway route of this length it is proposed to create more space by retaining or reinforcing the ground with a reinforced earth slope (greenwall). It is planned to reuse existing topsoil (where possible) in the greenwall to use the natural seed bank from the topsoil available with the greenway. The levels of the proposed greenwall vary with a maximum height of 3.0m.

The typical cross section of the greenwall is shown in the figure below. Ground Investigations will be undertaken to examine the existing soil conditions at this location prior to detailed design.

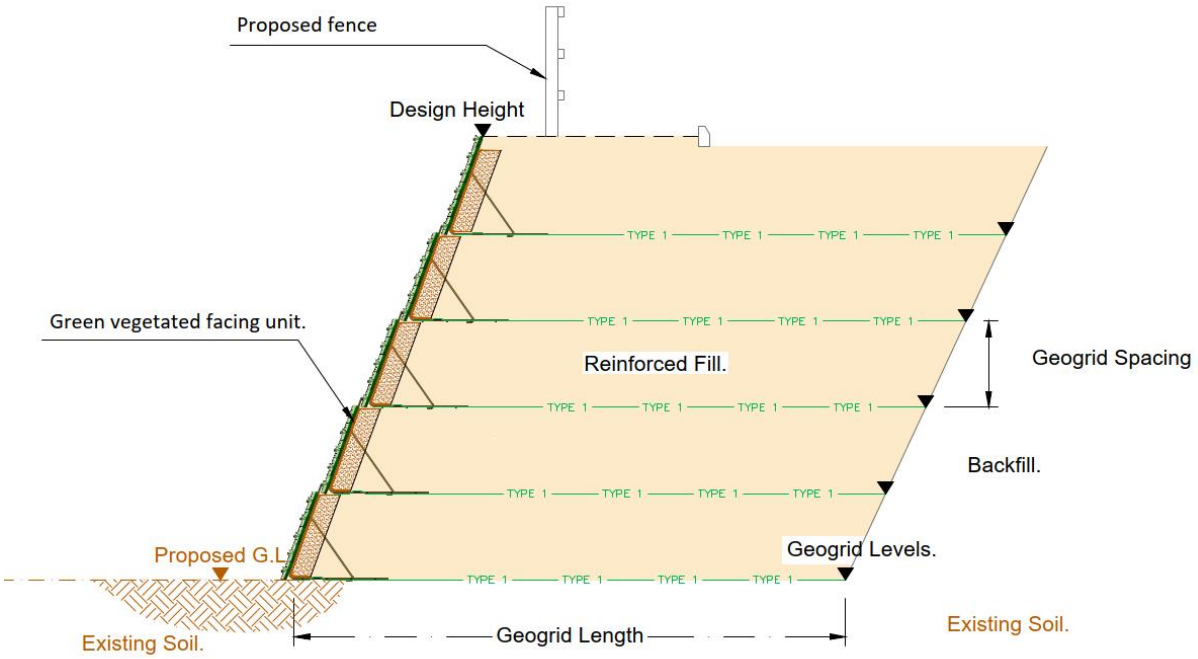


Figure 6.3 – Proposed Greenwall (reinforced earth)

The greenall will be plugged with topsoil retained from excavations in adjacent linear park where it is possible depending on final greenwall solution. Intention for wall to regenerate naturally and not to plug with seedlings where existing Site Won topsoil can be used in the greenwall. Options for additional biodiversity can be further developed during the detailed design stage with the DLRCC Biodiversity Officer and EcIA Ecologist.

It is proposed to reuse topsoil from the adjacent linear park area of cut in the green wall, therefore, the chemical composition should be same/similar to the green wall baseline soil chemistry. Therefore since we are not proposing to bring in foreign topsoil, there should not be a requirement to complete soil testing.

The slope ratios here are dictated by the location of the green wall and adjacent area of cut. This will be developed during detailed design stage and in coordination with the suitable suppliers and the DLRCC biodiversity officer.

aecom.com