KANE WILLIAMS

Natura Impact Statement Report

Portal Assets Holdings Ltd

Port Road Large-scale Residential Development

April 2024 (Final Report)

Project No:	2307
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1 Introduction

The proposed development (PD) is a Large-scale Residential Development (LRD) at Port Road, Killarney. The application is being made under the Planning and Development (Amendment) (Large-scale Residential Development) Act 2021. The applicant is Portal Assets Holdings Ltd.

A screening for appropriate assessment was completed for the PD (refer to Appendix 1) to determine whether it was likely to significantly affect European/Natura 2000 sites (Special Areas of Conservation (SACs) or Special Protected Areas (SPAs). The screening determined the need for a full appropriate assessment of the PD, as it could not be excluded, based on objective information, that the PD, individually or in combination with other plans or projects, would not have a significant effect on an SAC, in view of the site's conservation objectives. It was concluded that the PD is likely to have a significant effect, or significant effects cannot be ruled out (at the screening stage) and in the absence of mitigation, on the following European site:

- Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365) (Killarney National Park (KNP) SAC, for short)

An Appropriate Assessment of the project is required and thus this Natura Impact Statement (NIS) has been prepared, which is a report of a scientific examination of evidence and data, carried out by competent persons to identify and classify any implications (ecological effects) for the SAC in the view of the conservation objectives of the site. The aim of the assessment is to provide a sufficient level of information to the planning authority on which to base their appropriate assessment of the PD. Additionally, mitigation measures to avoid or reduce ecological effects were considered. The PD or project is fully described, with a focus on the aspects that could interact with the surrounding environment.

1.1 Legislative context

The Habitats Directive (92/43/EEC) seeks to conserve natural habitats and of wild fauna and flora by the designation of Special Areas of Conservation (SACs), and the Birds Directive (79/409/EEC) seeks to protect birds of special importance by the classification of Special Protected Areas (SPAs). It is the responsibility of each member state to designate SPAs and SACs, both of which will form part of Natura 2000, a network of protected sites throughout the European Union. One of the measures which protects these areas is the requirement that every project must undergo an assessment, referred to as an appropriate assessment, of its implications for any European site before consent for the project is given. Consent for a project can only be given after it has been determined that it will not adversely affect the integrity of the site(s). The requirements for appropriate assessment are set out in Article 6 of the Habitats Directive and Part XAB of the Planning and Development Act 2000, as amended.

2 Methodology

2.1 Guidance

This NIS has been undertaken with regard to the following publications:

- European Commission (2021), Assessment of plans and projects in relation to Natura 2000 sites - Methodological Guidance on the provision of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC,
- European Commission (2019), Guidance 'Managing Natura 2000 the provisions of Article 6 of the Habitats Directive 92/43/EEC,
- Appropriate Assessment of Plans & Projects - Guidance for Planning Authorities prepared by the NPWS (DoEHLG, 2009 (rev. 2010).
- Bat Conservation Ireland (2012) Bats and Appropriate Assessment Guidelines, Version 1, December 2012. Bat Conservation Ireland, www.batconservationireland.org.

2.2 Desk study

A desk study was completed to review available knowledge and included information from the following sources:

- OSI mapping and aerial photography
- Aerial imagery from Bing Maps and Google Maps
- Geological Survey Ireland (GSI)
- Teagasc Irish Soil Information System
- Environmental Protection Agency (EPA)
- National Parks and Wildlife Service (NPWS)
- National Biodiversity Data Centre (NBDC)
- Kerry County Council (KCC)
- An Bord Pleanála (ABP)
- Office of Public Works (OPW)
- Inland Fisheries Ireland (IFI)

Many other information sources including scientific reports and papers relied on are footnoted or referenced in the report.

Project specific documents were examined including:

- Ecological Impact Assessment (MWP, 2024)
- Pre-application Consultation Design Statement (Deady Gahan Architects, 2024)
- Engineering Design Report (MHL, 2024)
- Public Lighting Design Assessment (MHL, 2024) (see Appendix 3)
- Flood Risk Assessment (2021)
- Traffic and Transportation Assessment (MHL, 2023)
- Tree Survey, report and drawings (Brady Shipman Martin, 2021)
- Landscape Design Report (Brady Shipman Martin, 2021)
- Construction Environmental Management Plan (MHL, 2021)
- Planning Drawings (MHL, 2023)
- Bat survey report, Port Road Killarney (Dr Tina Aughney, Bat Eco Services, 2024)

2.3 NPWS Consultation and Data Request

A pre-planning meeting was held at the PD site with NPWS on site 1st November 2022. Further correspondence with NPWS was made on 17th July 2023 and February 2024.

A data request was made to NPWS in July 2023 to which a response was received. Data received included GIS habitat mapping for Killarney National Park and rare and threatened species records as well as *Najas flexilis* survey information for Lough Leane.

2.4 Field survey

Several ecological surveys were undertaken at the PD site including habitat survey and mapping, invasive species survey, mammal survey, bat surveys and bird survey. Full details of the survey methodologies have been presented in the Ecological Impact Assessment (2024) accompanying this application. The results of the surveys are summarised below in Section **3.1.6**.

2.5 NIS process

2.5.1 Overview

Appropriate Assessment is the consideration of the impact of the project on the integrity of European, or Natura 2000, sites, either alone or in combination with other plans or projects, with respect to the site's ecological structure and function, and in view of the site's conservation objectives. The focus of the assessment is specifically on the species and habitats for which Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (KNP SAC) is designated. This assessment identifies the aspects of the projects construction and operation that will interact with the ecological requirements or sensitivities of the habitats and species. For example, a sites integrity could be affected through habitat loss or damage, significant disturbance to a designated species, or harm of the sites ecological function reducing its ability to support a species or habitat.

2.5.2 Information Gathering

To this end, the first step was to gather information on the PD and the SAC through desk study (section **2.2**), consultation with, and information request from, NPWS (section **2.3**) and review of ecological field studies (section **2.4**). This information was examined to establish the characteristics of the project, or PD, site and area (location, history, geology and soils, topography and landcover, water and ecology) (section **3.1**). Project specific documentation was examined through desk study, and aspects of the PD that could, either individually or in combination with other plans and projects, negatively affect the SAC were identified. A description of the characteristics of the project is presented in section **3.2**. Information on other plans and projects that could act in combination with the PD are listed (section **3.3**).

2.5.3 Assessment of Implications of Project on the Conservation Objectives (CO)

The assessment of the PD was carried out in three parts. Firstly, the likely effects of the PD were examined (Section **4**) including: habitat loss, emissions to water, emissions to air, emissions to ground and disturbance to qualifying interests (QI) species of KNP SAC.

Secondly, an evaluation was undertaken to determine which of the qualifying interest (QI) habitat or species of the SAC potentially lie within the zone of influence of the project and could be directly or indirectly affected. This was done through a scientific examination of the information gathered. All the QIs were included in this step. Each QI was examined in turn to determine if a credible or tangible source-pathway-receptor link exists between the PD and QI. Identification of a link does mean that there is a possibility of

ecological or environmental damage occurring, with the level and significance of the impact depending upon the nature of the risk, the extent of the exposure to the risk and the characteristics of the receptor. Where it was confirmed that a credible or tangible source-pathway-receptor link exists between the PD and QI, the QI is then selected for further assessment as a plausible ecological receptor in the third step. The results of this part of the assessment are presented in Section **5**.

In the third and final part of the assessment, the QI that could potentially be affected by the PD, either individually or in combination with other plans and projects, were then assessed against the measures designed to achieve the site-level conservation objectives (CO). The CO for a QI may be either to maintain or restore its favourable conservation condition. The CO are based on the ecological requirements of the QI species and habitats present and define the desired conservation condition of these species and habitat types on the site. The measures to achieve the CO for a QI are defined using attributes and targets that are based on parameters as set out in the Habitats Directive for defining favourable status, namely area, range, structure and function.

2.5.4 Ascertainment of Effects of the Project on the Integrity of the SAC

Following the assessment of implications of the PD on the COs of the SAC, the effects of the PD on the integrity of the SAC will be determined (section **7**). The integrity of the SAC relates to quality and condition of being whole and its resilience and ability to evolve. It can also be defined as the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated. A site can be described as having a high degree of integrity where the inherent potential for meeting site conservation objectives is realised, the capacity for self-repair and self-renewal under dynamic conditions is maintained, and a minimum of external management support is required (EC, 2021).

2.5.5 Mitigation Measures

Where potentially significant effects were identified, ways to avoid or reduce (mitigate) any potential for 'adverse effect on the integrity of the site' were considered. This section also includes monitoring measures, which according to the EC (2021) is crucial to check their successful and timely implementation and to detect any unexpected impacts requiring additional measures.

2.6 Statement of authority

This report has been undertaken by Monica Kane, BSc MSc MCIEEM, of KWA, an Ecologist and Environmental Consultant, who has 20 years' experience working in environmental consultancy. She has extensive experience in undertaking ecological surveys and specialises in assessing the effects of developments on ecology and nature conservation. During this time, she has authored, contributed and reviewed multiple screening for appropriate assessment reports and Natura Impact Statements, Environmental Impact Assessments/Environmental Impact Assessment Reports, Ecological Impact Assessments and other ecological and environmental reports for a variety of projects.

3 Description of project and PD site characteristics

3.1 Project site characteristics

3.1.1 Site location and context

The PD site is situated in the north-west of Killarney town with site access provided at Port Road (N71). The scheme occupies a greenfield site in a built-up urban area. Killarney National Park is located to the west. This section describes the characteristics of the main PD site and local area. The 'main PD site' refers to the greenfield site proposed for the LRD, which lies in the townland of Coollegrean. It is divided into two parcels,

a large green field and smaller scrubland/wooded field to the southeast, separated by a cluster of Oak trees and referred to from hereon in as the western and eastern field. As part of the PD, works are proposed to two roads, Port Road between the site entrance and the junction with New Road (works to the carriageway and footpath), and St. Margarets Road (works to the existing foul/combined sewer network).

Figure 1. Site location

3.1.2 Site history

The scheme occupies a greenfield site as is evidenced from OSI aerial photography and old 6-inch mapping. Previously the site was used for the grazing of livestock and once formed part of the Mercy Order farm and school.

According to the KCC planning viewer, the PD site has a number of previous planning applications for housing and associated development. In 2007 and 2008, 5-year permissions were granted for developments on the PD site, which were extended in duration once lapsed. In 2022, a planning application was lodged directly to An Bord Pleanála (ABP) for a similar residential development subject to the current application under the now defunct Planning and Development (Strategic Housing Development) Regulations 2017. It was refused the same year on the basis that the appropriate assessment screening report submitted with the application did not provide sufficient scientific reasoning to clearly eliminate the likelihood of significant adverse effects on the Lesser horseshoe Bat as a result of increased artificial lighting. Consequently, in view of the conservation objectives for Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC, ABP concluded that adverse effects to the integrity of the SAC could not be ruled out.

The main PD site is currently zoned by KCC for residential development. An area within the existing scrub habitat in the south-eastern section of the eastern field appears to have been used for dumping waste construction material.

3.1.3 Geology and soils

The main PD site is underlain by limestone, mostly the Dirtoge Limestone Formation, and the Cloonagh Limestone Formation in the south-eastern corner of the site. Quaternary sediments at the site are classed as gravels derived from Devonian sandstones. Soils at the site are categorised as shallow well drained mineral soil (mainly acidic) derived from sandstone sands and gravels. Trial pits excavated at the site indicated varying depth of soil of between 100mm and 350mm over a brown sandy gravel.

3.1.4 Topography and landcover

The main PD site generally slopes north to south. The northern part is generally flat and the terrain falls towards the stream at the western and southern boundaries. The site survey indicates the highest point of the site is 38m, which slopes down to 30m at the site entrance and 27/28m at the stream.

Land use in the vicinity of the site is mainly residential with Port Road and the National Park to the west. The northern and eastern boundaries of the site adjoin existing residential developments. Cottages/houses on Port Road adjoin the site to the west. The southern boundary adjoins the playing fields of Killarney Community College.

3.1.5 Water

Killarney town is located just east of Lough Leane. Lough Leane is a moderately deep lake in a high rainfall area. The River Flesk, The Long Range river and Deenagh River and Muckross Lake all drain directly into Lough Leane, which in turn drains to Castlemaine Harbour via the River Laune. The catchment area is dominated by upland peatland and forest to the south and west, and by agricultural grassland to the east. Lough Leane has an area of 19.9 km^2, a mean depth of 13.4m and a maximum depth of 65m. Lough Leane was classified as mesotrophic[1] (having a moderate level of nutrients and moderate biological productivity) for most of the period to the early 1980s and as moderately eutrophic (high level of nutrients/biological productivity) in 1983 and 1984. Following the implementation of phosphorus removal at Killarney WWTP in the mid-1980s, the status improved to oligotrophic (low level of nutrients/biological productivity) in 1990 and 1991 but was again mesotrophic for much of the 1990s. Hypereutrophic conditions were record in August 1997 linked to increase in external diffuse loadings of phosphorous (P). The lake returned to mesotrophic status in the 2000s and this was coincident with implementation of an intensive water quality monitoring programme in the catchment, changes in national regulations of P export from agriculture and slight decline in the cattle farming population in the catchment (Jennings and Taylor, 2013).

In Cycle 3 (2022-2027) of the WFD, Lough Leane remains in Good ecological status, however, Ross Bay has been classed as Moderate status because of diffuse urban pressures. Monitoring data for Ross Bay in 2012 indicated Moderate status for chlorophyll and total phosphorous[2]. Ross Bay has been recommended as an Area for Restoration in Cycle 3 of the WFD.

[1] The Trophic State Index (TSI) is a classification system designed to rate water bodies based on the amount of biological productivity they sustain. The quantities of nitrogen, phosphorous and other nutrients are the primary determinants of a water bodies trophic status index. Source: https://en.wikipedia.org/wiki/Trophic_state_index

[2] https://epawebapp.epa.ie/licences/lic_eDMS/090151b28043f117.pdf

The Folly Stream, a field boundary drain, rises along the boundary of the main PD site east of Port Road and passes along the southern boundary before being culverted through Killarney town where it joins the municipal combined storm and sewer network. From here it flows to the Killarney WWTP, the flow from which enters the lake about 1km downstream at Ross Bay. As a result, the Folly Stream (referred to by EPA as Folies Stream) water quality downstream of the WWTP is categorised as Bad.

The Deenagh River flows south just west of the main PD site on the western side of Port Road. It drains agricultural land to the north and north-east of Killarney before flowing into Lough Leane at Victoria Bay. The river in the upper catchment is Poor ecological status due to significant peat extraction pollution pressure and is recommended for restoration in Cycle 3. The lower catchment is Good status, a reduction from High status in Cycle 1.

The PD site lies within the Laune Muckross lowland karstic groundwater body (GWB), which extends east along part of the River Flesk and west along the River Laune to the coast and encompasses Killarney and much of Lough Leane. It's flanked by poorly productive GWB's to the north and south. The GWB is overlain by a potential gravel aquifer extending from Killarney to Killorglin and the limestones can be highly productive. Karst features exist east of Lough Leane and along the shores of the lake. The bedrock aquifer at the main PD site is classed as locally important becoming regionally important in the south-east corner. Groundwater vulnerability and soil permeability at the site is classed as High, an indication of the ease of which infiltering water and contaminants may reach groundwater. Groundwater discharges to Lough Leane and to the rivers and streams crossing the GWB. The River Laune is likely to be the primary discharge line (GSI, 2004). The status for 2016-2021 (Cycle 2) was Good, however, the Laune Muckross GWB is considered At Risk of not achieving WFD objectives in Cycle 3 (2022-2027) due to nutrient and chemical impacts with agriculture considered a significant pressure because of diffuse phosphorous and ammonia losses (EPA, 2021).

Two springs are mapped in the main PD site along the route of the Folly Stream in historic 25-inch mapping. Eight trial pits were excavated in July 2021 and groundwater was encountered at 1.6m and 0.5m in the south-eastern corner of the site.

The site does not appear to be at risk from flooding.

3.1.6 Ecology

The north-eastern boundary of Killarney National Park occurs along the western edge of Port Road. This part of the park supports a mix of mixed woodland, wet willow-alder-ash woodland and grassland as well as the River Deenagh, which runs alongside Port Road. The Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC lies just west of Port Road. It is a very large European site extending from The Paps in the east through the Reeks almost as far west as Waterville. This site has been screened in for appropriate assessment and is the subject of this NIS. The boundary of Killarney National Park SPA overlaps with the National Park and has been screened out for appropriate assessment.

The main PD site is dominated by improved agricultural grassland supporting mainly grasses but also some wildflower species. Areas of scrub occur in the west of the western field, and separately in the eastern field. A wet grassland/marsh habitat occurs in a low lying area to the south near the stream. Mature hedgerow and treelines occur along the site boundary supporting a variety of native trees including Hawthorn, Hazel, Ash, Holly, Rowan, Blackthorn, Birch and Oak. A strip of mature willow woodland associated with the stream corridor occurs to the eastern field.

Within the main PD site, scrub, hedgerow, wet grassland/marsh and willow (riparian) woodland are all considered to be ecologically valuable terrestrial habitats.

During previous ecological surveys, the Folly stream channel along the southern boundary was either dry or had extremely low flow. The vegetation present within the channel and on the embankments were terrestrial, not aquatic, and included Harts-tongue Fern and Holly, indicating a lack of continuous flow. The substrate was predominantly silt and mud. The stream appears to be ephemeral and dependent on rainfall and associated run-off from its catchment for flow. The Folly stream is of no value to fish or aquatic species and does not have the physical or biological requirements to sustain populations of aquatic fauna.

Japanese Knotweed was recorded in the scrub habitat in the eastern field possibly introduced with the dumping of waste construction material at this location. Montbretia and Butterfly Bush, both invasive non-native plants, occur at the site.

Evidence of fox, rabbit and badger were recorded at the main PD site. An active badger sett was identified in a cluster of Oak trees that separates the western and eastern fields. Subsequent surveys identified one active main sett and three unused outlier setts in the boundaries of the site.

There are no buildings or structures in the proposal site which could be used as a bat roost. The trees within the site are considered to have low suitability for roosting bats. Bat activity surveys at the site was low with two species recorded foraging, Common and Soprano Pipistrelle, and a third, Leisler, commuting.

Common bird species were recorded during ecological surveys while the habitat at the main PD site was considered of moderate to high value for birds.

3.2 Characteristics of the Project

3.2.1 Overview

This section provides a sufficient level of detail of the project to understand its nature and scale, and can be read in conjunction with the documentation listed in section **2.2** accompanying this planning application.

The PD is a Large-scale Residential Development (LRD) that will accommodate 224 no. residential units, consisting of 76 housing units, 52 ground floor and duplex apartments, and 96 apartment units within 3 blocks. The development also includes a 2 no. storey child crèche and all associated site development works. The proposed scheme and the layout has been organised into specific areas with larger housing units at the entrance to the north-west, higher density duplex units to the south and large apartment blocks on the south-eastern part of the site, the eastern field. It includes for 320 car parking spaces and 26 E.V. parking spaces and 350 bicycle spaces.

The project includes upgrades to the footpaths along Port Road and the combined sewer along St. Margaret's Road. Ancillary infrastructure development works on the main PD site will include relocation/undergrounding of ESB powerlines, wastewater infrastructure including foul pumping station, surface water storage/infiltration, water utility services, public lighting, bin stores, bicycle stores, ESB substation, and all associated site development works.

3.2.2 Site access

The PD will provide for a new vehicular access and pedestrian entrances onto Port Road, upgrades to Port Road comprising reduction in carriageway widths, provision of shared pedestrian/cycle path and uncontrolled pedestrian crossing, and a pedestrian connection to Millwood Estate. Construction site access will use the main access. A main spine road and connected local roads will connect the housing units on site while the main spine road will access the apartment blocks close to the northern site boundary.

3.2.3 Landscaping

A pocket of mature specimen Oak trees where the active badger sett is located divide the main PD site into two areas – a western and eastern field. The southern boundary of the site is outlined by mature specimen trees most of which are located outside of the site boundary on the neighbouring college lands. Pockets of wetland occur inside the site near the stream here. A mix of trees and scrub to the rear of residential gardens form a substantial landscape along the western boundary. A mixed fragmented hedgerow forms along the northern field boundaries of both fields and the eastern boundary of the western field.

For the most part existing hedgerow and trees will be maintained and protected at the main PD site with gaps to be filled with native species. Trees will be lost in the eastern field and around the site entrance with the removal of scrub and woodland. There will be selected removal of vegetation in the northern hedgerow and retained trees will be protected by temporary fencing during construction works. In an anti-clockwise direction from the proposed site entrance, the Landscaping Plan proposes to:

- strengthen the western site boundary between the site entrance and the rear of the cottages with planting a dense/tightly spaced strip of native species with Oak on the outside/boundary side and a mix of Birch and Scots Pine inside.
- strengthen the western site boundary along the rear of the cottages and existing residential trees and hedgerow with planting a dense/tightly spaced strip of native species including Birch, Alder, Oak and Scots Pine.
- retain existing trees and hedgerow on the southern college fields boundary of the western field with planting of a few scattered Birch.
- retain existing trees and hedgerow on the southern boundary of the eastern field and remove adjacent woodland and replace with planting of Oak, Birch and Alder, mainly.
- remove hedge con eastern side of eastern field and replace with a ‘Screen Planting’ mix of Holly, Wild Cherry, Dog Rose, Blackthorn, Hawthorn and Hazel inside which a treeline mix of Oak, Birch, Alder, Wild Cherry and Dutch elm cultivar[3] will be planted.
- remove hedge on northern side of eastern field and replace with a ‘Native Hedgerow Planting Mix’ mix of Holly, Blackthorn and Hawthorn inside which a treeline mix of Oak, Birch, Wild Cherry and Rowan will be planted.
- retain existing trees and hedgerow for the most part on the northern boundary of the western field and plant up gaps with Oak, Rowan and Birch inside which some further planting of Oak, Birch and Rowan will be done.

Further planting of native trees is proposed within the main PD site associated with the housing units and green spaces. The area of hedgerow and Oak trees separating the western and eastern fields will be retained. It is proposed to retain existing wetland habitat where feasible near the southern boundary of the western field. Full details of the Landscaping Plan are provided in the Landscape Design Report and drawings accompany this application.

3.2.4 Water

The site will connect to an existing watermain at the entrance to the PD site. Kerry Central Regional Water Supply Scheme, which abstracts water from Lough Guitane and Owgariff River, supplies water to Killarney as well as other parts of Kerry. Lough Guitane via the Finow River flows into the Owgariff River before joining the River Flesk, which in turn flows into Lough Leane.

[3] Extremely resistant to Dutch elm disease. Source: https://en.wikipedia.org/wiki/Ulmus_%27Columella%27

3.2.5 Stormwater management

The MHL Engineering Report (2024) report that storm water management proposals for the site have been informed by the relevant standards and comply with best practice in terms of SuDS (Sustainable Urban Drainage Design). Rainfall falling on roofs, paved areas, roads, soft landscaped/green areas will infiltrate to ground through a mix of gullies, permeable paving, soakaways and bioretention features (swales, catchpits, treepits and rain gardens) into a piped stormwater network. Green roofs, which are planted surfaces, will be incorporated into the proposed apartment blocks which will intercept rainfall before being discharged to the network. Underground attenuation and associated flow control devices will restrict stormwater flows to greenfield runoff rates before being discharged via full retention Class 1 oil interceptors. Four underground attenuation tanks are proposed, the two northerly tanks, 1 and 2, will infiltrate to ground (with Tank 2 having overflow to Tank 3) while the two southerly tanks, 3 and 4, will discharge to the Folly Stream via headwalls.

Flows from large rainfall events will bypass the bio-retention area and be conveyed directly to the sewer system. Stormwater entering bioretention features will also infiltrate to soils and groundwater. Infiltration storage to be provided up to the 100-year storm event allowing for 10% climate change.

According to the engineering report, regular maintenance of the flow control device will be required to remove any blockages, particularly in the wake of heavy rainfall events or local floods. It recommends that the petrol interceptors be fitted with an audible high-level silt and oil alarm for maintenance and safety purposes. Regular inspection and maintenance are recommended for the petrol interceptors.

3.2.6 Wastewater Management

The estimated DWF average from the PD is 9.635l/s. Uisce Éireann (UÉ) reviewed the applicants PD wastewater design in 2022 and based upon details concluded that the proposals were compliant with their code of practice. Once approved by UÉ the PD site will be connected to the existing foul sewer network, which is drained by gravity and flows into Killarney WWTP. The Killarney sewer system is a combined sewer carrying both wastewater and surface water in a single pipe. According to UÉ[4], due to limited capacity in the existing foul/combined network in the local area, storm water separation from the existing 450mm diameter combined sewer will be required for an area of 0.2ha to accommodate the proposed connection. Sections of surface water loading from the combined sewer along St. Margaret's Road will be removed from the combined system and assigned to a separate existing storm sewer network, which discharges directly to Lough Leane via the Deenagh River. This will alleviate current loading in the existing foul sewer network, thereby providing capacity for the site's generated foul flows. Works will be carried out by the developer.

On site wastewater infrastructure includes underground sewer lines and foul pumping station including 24-hour emergency storage.

3.2.7 Lighting

Residential lighting comprises streetlights and internal and external lighting from housing units and apartments. As part of this application, it is proposed to move the street lighting along Port Road from its current location along the eastern side of Port Road to the western side of the road and replace the existing public lighting heads/lanterns with LEDs as part of the Lesser horseshoe bat mitigation measures. Refer to section **8.5** for details.

[4] Confirmation of Feasibility Letter dated 10-04-2024 from UÉ to MHL & Associates

3.2.8 Traffic

The AADT (Annual Average Daily Traffic) for Port Road has been approximated at 10,000 veh/day based on 2023 traffic counts. 1,100 veh/day will be generated by the PD.

3.2.9 Construction works

It is proposed to develop the site in three phases over a 3.5 year period, however, these periods are likely to overlap:

- Phase 1: The total developable Phase 1 site is to contain 76 dwellings in total and the childcare facility and is envisaged to take approximately 15 months to complete.
- Phase 2: The total developable Phase 2 site is to contain 52 duplex units and is envisaged to take 12 months to complete.
- Phase 3: The total developable Phase 3 site is to contain 96 apartments, including undercroft parking and is envisaged to take 15 months to complete.

A temporary site compound will be established in the centre of the northern part of the site. It will contain offices, canteen, changing facilities, water supply, portable toilets and wastewater treatment unit. It will provide secure storage for materials, plant and chemicals, and a refuelling area.

The main stages of construction will proceed as follows:

- Enabling works including set-up of temporary compound
- Site clearance will include bult excavation and cut and fill
- Construction of drainage, water supply and utility services
- Construction of buildings
- Landscaping
- Building fit-out and commissioning

The PD also includes offsite works to the carriageway and footpath at Port Road and sewer network at St. Margarets Road.

Details of the construction methodology is set out in the Construction Environmental Management Plan (CEMP) and are summarised here. Pre-construction activities will include demarcation of the site, detailed ground investigations, excavation and burial of invasive species, establishment of temporary site compound. Construction activities for each phase will involve bulk excavation – removal and temporary storage of large amount of soil, rock or other material in preparation for construction - and associated cut and fill of that material (approximate earthworks volume: 33,500m^3 cut, 5,700m^3 fill) with excess material will be removed off site to an appropriately licenced waste facility. Early works will involve the installation of underground utilities to provide the infrastructure required for stormwater drainage, foul water drainage, water supply, power and building utility systems. Civil works will include the pouring of foundations followed by concrete block construction followed by external finishing and roofing. Works on external services including water mains, foul sewers, storm sewers, roads, footpaths and public lighting will be carried out in conjunction with the completion of the units. Landscaping works will take place in tandem with other construction.

Details of a temporary internal roadway and associated drainage to be constructed on site and a list of typical construction plant and equipment is provided in the CEMP.

Principal construction material used on site will include stone, concrete (7,000m^3), masonry concrete, timber, steel.

Working hours will be between 7am and 7pm Monday to Friday, and to 4pm on Saturday. No work on Sundays of bank holidays. The working day may extend at times when critical elements of work need to be advanced. Longer working days can occur when there is a planned concrete pour. If extended working hours are required, these will be agreed in advance with the planning authority.

It is expected that a maximum of 50 construction personnel will be on site daily.

3.2.10 Waste management

A Construction and Demolition Waste Management Plan has been prepared and included in the CEMP. It lists the types of waste likely to be generated. It stipulates that wastes will be managed, collected, stored, and segregated in separate areas and removed off site by a licensed waste management contractor at regular intervals during the works. All concrete trucks will have to return to their respective yards for washout. Turfs and topsoil will be stored separately. Stock-piles will be located away from drainage features.

3.2.11 Constructions emissions and nuisances

Construction emission associated with the construction site include air pollution from vehicles and machinery, dust, runoff of silted water, risk of oil/fuel spill and noise. Environmental management procedures to avoid and reduce emissions relating to dust, runoff of silted water, fuel and oil management and noise from construction activities are set out in the CEMP. Emissions to air from the production of materials (oil, cement, concrete, iron, steel) and material transportation contributes about 90% of total CO_2 emissions through the construction period (Sizirci, 2021).

3.2.12 Construction environmental management

A Construction Environmental Management Plan (CEMP) has been prepared detailing environmental protection measures. It includes the Construction and Demolition Plan. The CEMP sets out the role and responsibilities including that of the project ecologist. A nominated Environmental Engineer will be responsible for the implementation of the CEMP. They will be responsible for the management or execution of all environmental monitoring on site.

Water quality control measures (CIRA 2010 and ISO 14001:2015 – Environmental Management Systems and C741 Environmental good practice on site guide (4th edition) and CIRIA (2015)) will be put in place to protect water quality particularly that of the Folly stream. A wheel wash is proposed at the site entrance.

Biodiversity and invasive species protocols are included in the CEMP. A separate Invasive Species Management Plan has been prepared.

Site storage protocols are set out in the CEMP. The CEMP sets out Environmental Management Procedures to manage impact including for fuel and oil, traffic, waste, noise, dust and surface water management as well as procedures for emergency response, monitoring and auditing, incidents and corrective action, complaints, odour and light pollution.

3.2.13 Operation

The PD is a residential development including associated roads and services, creche and open space. Once operational the main effects of the development will be energy usage, lighting and waste production.

Operational waste will be managed through appropriately permitted waste collection companies.

When the residential development comes to the end of its useful life, it may be upgraded or demolished. Such as timeline is difficult to predict and may be in excess of 100 years.

3.3 Identification of Plans or Projects

A series of low-level impacts may, in combination, produce a significant impact. This section identifies the projects, activities and plans that could act in combination with the PD to cause potential significant cumulative effects.

3.3.1 Plans

The following land plans relate to the county and Killarney area:

- Kerry County Development Plan (2022-2028)
- Killarney Municipal District Local Area Plan (2018-2024)
- Killarney Municipal District Local Area Plan (2023-2029), pre-draft

Killarney Town Development Plan 2009-2015 as extended and its associated variations (now lapsed)
The main cumulative pressure of the local area plans for Killarney arise from proposed zoning for new development. The 2022 County Development Plan Volume 2 indicates new/proposed residential zones south of Countess Road, north of the PD site associated with Parkland Homes, the N72, south of Deerpark Pitch and Putt, Ross Road and Upper Park Road. Other areas of the town are zoned for mixed use and commerce/industry/enterprise/economic development. Increase in housing will increase the amount of wastewater requiring treatment.

One of the aims of the Killarney National Park (KNP) Management Plan is to conserve, and where possible enhance, the ecological value of all natural and semi-natural habitats and features and to conserve notable plant and animal species and to maintain their populations in KNP. The main challenges to the conservation of natural and cultural resources in the National Park include trespassing sheep, unsustainable numbers of goats, deer and other livestock, rhododendron infestation, pollution in Lough Leane and uncontrolled visitor usage.

The following research programme and restoration plans relate to Lough Leane catchment:

- Arctic Char Project (IFI, 2022[5])
- Ross Bay: Area for Restoration (Local Authority Waters Programme (LAWPRO), 2022)
- Deenagh: Area for Restoration (Local Authority Waters Programme (LAWPRO), 2021)

3.3.2 Planning applications

Recent planning applications of note in the vicinity of the PD include proposals for:

- the construction of 9No. dwellings north of the PD on Port Road (planning ref.: 23/305),
- the construction of staff accommodation at The Lake Hotel (planning ref.: 23/267).
- works to dwelling house (planning ref.: 23/523).

Another LRD project was granted by An Bord Pleanála east of the town at Cronin's Wood, Upper Park Road for the construction of 143 houses, 106 apartments and a creche and associated site works (planning ref.: 318509).

[5] https://www.qub.ac.uk/sites/irish-artic-char/

3.3.3 Ongoing activities or environmental pressures

The main sources of cumulative emissions to water within the Lough Leane catchment include losses of nutrients and silt from agriculture, peat extraction and forestry operations. They also include urban run-off and WWTP discharges from Killarney town and septic tank/domestic WWTS. There are no arterial drainage schemes in the Lough Leane catchment.

A climate emergency has been declared by the Irish government. The main sources of cumulative GHG emissions to air in Ireland include agriculture, energy industries, residential (13.6%), transport, manufacturing. Climate change leads to increasing temperatures, shifting seasons, changing precipitation patterns, the potential increase of weather extremes and sea level rise. The Natura 2000 network (SACs and SPAs) hold a large proportion of Europe's natural and semi-natural ecosystems that provide a wide variety of ecosystem services (EU, 2013). These sites provide natural solutions for mitigating and adapting to climate change but are also vulnerable to the effects of climate change.

4 Likely effects of the project

This section examines individual and cumulative effects on Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC and associated conservation objectives (CO).

4.1 Habitat Loss

Within the main PD site, scrub, hedgerow, wet grassland/marsh and willow (riparian) woodland are all considered to be ecologically valuable terrestrial habitats that support a range of insect, mammal and bird life. Scrub habitat will be lost mainly in the eastern field where the apartments are proposed. The Landscaping Plan proposes to retain much of the hedgerows and treelines, and some of the wetland area. It also allows for additional planting to further screen the development from surrounding land (see section **3.2.3**).

Figure 2. SAC map

There will be no direct land-take or habitat loss from the SAC. Works proposed along Port Road are restricted to the carriageway and eastern footpath. Works proposed along St. Margarets Road are restricted to the carriageway. Indirect effects such as habitat degradation of the PD on attributes such as habitat distribution and extent are addressed in the following section.

4.2 Emissions to Water

Once approved by UÉ sewage from the PD site will be connected to the existing foul sewer network and the site's foul flows will be directed to the existing, separate, foul/combined network. Both will then be directed to the Killarney WWTP at Ross Road prior to treatment and effluent discharge to Lough Leane. Refer to Section **3.2.6**. Stormwater runoff from the PD will be managed through the sites stormwater system based on SuDS, and will also discharge to the Folly Stream. Refer to Section **3.2.5**.

Water quality is a CO attribute for all water dependent QI habitats and species within the SAC including lake habitats, rivers, Slender naiad, Freshwater pearl mussel, Lamprey and Salmon. The additional loading from the PD on the WWTP may result in negative cumulative water quality impacts to the lake through nutrient inputs and these are discussed in greater detail in Section **6**.

Eutrophication caused by increased inputs of nutrients is the foremost environmental problem associated with rivers, lakes and estuaries. Adverse ecological effects of excessive growth or algae/plants include increased prevalence of toxic algal blooms, loss of sensitive plants which are replaced by nutrient tolerant species, a shift from plant to algal dominated lakes, reduced oxygen levels and associated impacts on invertebrates and fish (EA, 2019).

Eutrophication is caused by nitrogen and phosphorous (P) nutrient loading of surface waters. The two most important sources of nutrients in freshwater systems are nutrient losses from agriculture and wastewater discharge from households and industry. Killarney has about 10,000 hotel and other accommodation beds resulting in increased loading to the WWTP during summer months. Other sources of nutrients in the catchment may include combined sewer overflows, septic tanks, urban drainage, leaking sewers, food waste, drink/food additives and P dosing of water supplies (EA, 2019).

The daily total phosphorous (TP) to Lough Leane is dominated by agriculture from the Flesk and Deenagh river catchments where intensive cattle agriculture is practiced. A past study by Jennings and Taylor (2013) reported that, on average, agriculture contributed 65% of the TP daily load over the year and over 90% for most days in months between October and March. However, during summer months, the contribution from the Folly Stream and WWTP, which remained more constant than the loading from the general catchment, contributed between 50% and 60% of the total loading on many dates.

Climate change, which is already being felt, will result in more frequent extreme rainfall events and change in rainfall patterns. Increased rainfall and inflows to the combined sewer may require more frequent bypassing and uncontrolled discharge of untreated wastewater to the environment, which may reduce the capacity of receiving environment to accommodate contaminant loads, termed assimilative capacity, and also affect the performance of WWTP's. Greater storm run-off is likely to lead to increased nutrient loading from land to water. A recent study of English catchments suggest it could increase by up to 30% by 2050. Increased temperatures and sunlight are likely to encourage more algal/plant growth and reduced summer river flows may lead to increased nutrient concentrations and longer water residence times during the algal growing season. However, more frequent storms may reduce eutrophication impacts (EA, 2019). However, there is uncertainty around climate change predictions and associated consequences.

4.3 Emissions to Air

In Ireland temperatures are warming in response to increased atmospheric greenhouse gas (GHG) concentrations. Producing and transporting construction materials and constructing buildings and infrastructure account for 11% of our national emissions (embodied emissions) (IGBC, 2021). Emissions embodied in the PD will include emissions from the processing of raw materials, manufacturing of products both on and off site as well as the emissions associated with the maintenance and end of life of the materials and products used in the built environment. Diesel generators will power the construction phase of the PD.

The Irish built environment, including construction, is estimated to account for >30% of the overall GHG emissions in a standard year. This includes emissions resulting from the energy required for the operation (~20% of overall emissions). Operational carbon emissions will decrease in line with reduction in the carbon intensity of electricity resulting in a proportional in the embodied carbon related increases (IGBC, 2021).

The main features of an increase in temperature of 1.5-2°C would be: increases in average temperature (surface air temperature and sea surface temperature); changes in precipitation patterns; changes in the rate of occurrence and scale of extreme weather events (such as heat waves, rainfall events, storms, sea surges and flash floods); slow-onset changes (such as sea level rise, the loss of glaciers and ecosystem changes). For Ireland, mid-century mean annual temperatures are projected to increase by between 1.0°C and 1.6°C depending on the emissions trajectory. These changes may affect the phenological phases (the timings of cyclical or seasonal biological events, such as migrations, egg laying, flowering, and hibernation) in many plant and animal species. By mid-century increases in both dry periods and heavy precipitation events are predicted, meaning that we will have to consider increased flood risk and droughts risks [6].

Climate change will result in increased frequency of drought, flooding with more intense rainfall events. Air quality is not an attribute for any of the QI habitats or species, however, indirect effects of climate change are likely. Temperature in particular, but wind and rain too are important drivers of freshwater ecosystem processes via biological effects (e.g. photosynthesis) and effects on lake hydrology, stratification, nutrient cycling, etc. (Nõges et al., 2009). Changes to the ecosystem of Lough Leane are likely to have negative ecological effects on QI fish and plant species. Negative nitrogen deposition effects the nutrient balance of naturally nutrient-poor peatland habitats and may alter plant communities.

Future warming will depend on global efforts to curb GHG emissions.

4.4 Emissions to Ground

The site is a greenfield one and unlikely to contain contaminated ground. Runoff of silty water arising during wet weather conditions during the construction period will be controlled and prevented from entering the Folly stream and is expected to infiltrate to ground. The CEMP has provisions in place to deal with an accidental oil spill with contaminated material to be disposed of at an approved waste facility. The emissions to ground arising from the PD are not considered to be significant and will not undermine the CO of the SAC.

4.5 Disturbance of QI Species

Disturbance to species relates to changes in the existing environment and may result in a reduction in population and density through displacement of individuals with changes in behaviour and knock-on effects on species home range, feeding area, refuge area, reproductive feeding.

The PD is a large-scale residential development likely to result in increased noise, light pollution and a greater frequentation of people and vehicles at the main PD site but also along nearby roads and cycleways/walkways within Killarney National Park (KNP), which is encompassed with the SAC. The construction phase of the project will last <4 years and likely give rise to noise disturbance through increased noise emissions arising from construction work and machinery, equipment and workers. The increased presence and frequentation of construction workers and associated vehicles will increase potential disturbance impacts. Indirect disturbance could arise from artificial site lighting during the construction phase.

Similarly, once the residential development is occupied, it will result in the increased presence and frequentation of people and associated vehicles. It is likely that occupiers of the PD will increase the number of users on the cycleways/walkways within KNP, which may increase the disturbance risk to QI species.

[6] https://www.epa.ie/our-services/monitoring--assessment/assessment/irelands-environment/climate/

Indirect disturbance could arise from artificial lighting from the residential development (streetlights, building lights, upperstorey windows, vehicles) once operational.

Sources of cumulative disturbance impacts will mainly arise from the Killarney urban area (operation of businesses/schools/tourist accommodation, residential areas, etc), recreation in KNP and frequentation of people (tourists, local residents) and associated vehicles.

The QI species of the SAC are Kerry Slug, Freshwater pearl mussel, Marsh Fritillary, Sea lamprey, Brook lamprey, River lamprey, Salmon, Killarney shad, Lesser horseshoe Bat, Otter, Killarney Fern, Slender naiad. Fish species are confined to the lake and rivers and while Otter, Lamprey and Salmon may use the Deenagh River but will not be directly disturbed by the PD. Lesser horseshoe bat uses the SAC for roosting, foraging and commuting so may be negatively affected by lighting.

5 Identification of potentially significant effects to QI of the Killarney National Park SAC

Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365) is a very large site encompassing the mountains, rivers and lakes of the Iveragh Peninsula, and the Paps Mountains which stretch eastward from Killarney towards Millstreet. It is selected for a range of QI habitats and species including two lake habitats, river habitat, peatlands, woodlands, grasslands, Kerry Slug, pearl mussel species, a butterfly species, five fish species, bat species, otter and two rare plants. Oak woodlands, occurring mostly around the Killarney lakes, are the habitat for which the area is perhaps best known forming the most extensive area of woodland in Ireland. The only sizeable Yew woodland in Ireland is found on the limestone of the Muckross peninsula. Wet woodland, or carr, occurring on the low-lying limestone areas within the floodplain of Lough Leane, forms one of the most extensive areas of this woodland type in Ireland. The most common habitat types within the overall site are blanket bog, heath and upland grassland. A variety of blanket bog types are represented from lowland valley to mountain blanket bog. Wet heath often occurs in association with blanket bog. Dry heath is more frequent in the site. The site contains many lakes, but these can be broadly divided into two types: small upland corrie lakes that are oligotrophic/nutrient-poor and larger lowland lakes that tend to be more species-rich are mostly oligotrophic though Lough Leane has become mesotrophic due to pollution. Many plant and animal species of interest occur within the site. Two plant species listed on Annex II of the E.U. Habitats Directive occur. Slender naiad is found in some of the lakes at the site. The Killarney Fern is another listed and well-known rarity. The main land use within the SAC is sheep grazing. Pressures include overgrazing by sheep, invasive Rhododendron in the Oak woodlands, afforestation and eutrophication. A full description is available in the NPWS site synopsis[7].

The following table lists the qualifying features of the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (00365) (Killarney National Park (KNP) SAC, for short) and evaluates through a scientific examination of evidence and data whether these qualifying features are likely to be significantly affected by the project and should or should not be selected for further detailed assessment in the NIS. The main environmental pressures on the QI habitats and species are taken from the NPWS (2019a, 2019b) Status of EU Protected Habitats and Species in Ireland. The conservation status and trend are based on the overall assessment of conservation status and the overall trend in conservation status in NPWS (2019a, 2019b).

[7] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000365.pdf

Table 1. Identification of potentially significant effects to qualifying features of the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (00365)

Qualifying Feature	Potential for Significant Effects	Rationale
Kerry Slug (Geomalacus maculosus) 1024	No potential for significant effects on CO attributes and targets	*Conservation status*: Favourable. *Conservation trend*: improving.
		Main pressures: Invasive alien species.
		Conservation Objective: maintain favourable condition.
		NPWS (2017a) mapping show numerous records for Kerry Slug, however, it is much more widespread and abundant throughout the SAC. It is a terrestrial species found in open peatland habitat on boulders and woodland on trees where they feed on moss, lichens and liverworts. DNA analysis of specimens across its range show that the Irish population is the product of an introduction many hundreds, perhaps thousands of years ago (NPWS 2019a). There is potential for the Kerry Slug to occur in the woodland trees in the SAC immediately west of Port Road. However, the PD will not result in any trees being felled or damaged within the SAC. Thus, the PD will not negatively affect the habitat extent, quality or distribution within the SAC. Kerry Slug will not be considered further in the NIS.
Freshwater pearl mussel (Margaritifera margaritifera) 1029	Yes, potential for significant indirect effects to attributes and targets	*Conservation status*: Bad. *Conservation trend*: deteriorating.
		Main pressures: land drainage, hydrological/physical changes to waterbodies, changes to hydrological conditions, agriculture and forestry activities generating pollution, urban wastewater discharges, peat extraction, changes in flooding from flood protection, hydropower, water abstraction.
		Conservation Objective: restore favourable condition.
		The Freshwater pearl mussel catchments within the SAC are Currane, Carragh and Gearhameen. Currane drains west towards Waterville, Carragh drains north to Rossbehy Creek while Gearhameen drains to the Upper Lake, which drains into Lough Leane via The Long Range. Freshwater pearl mussel is sensitive to hydrological change and water pollution. The Freshwater pearl mussel catchment of Gearhameen is therefore upstream of Lough Leane and upgradient of any negative ecological effects of the project. Thus, the project will not negatively affect the following attributes relating to suitable habitat area or distribution, population structure, substratum quality, fringing habitat, hydrology or water quality associated with the lake habitat. However, host fish are potentially vulnerable to indirect effects from changes in water quality. Therefore, more detailed assessment is required to determine the potential effects of the project.
Marsh fritillary (*Euphydryas aurinia*) 1065	No potential for significant effects	*Conservation status*: Inadequate. *Conservation trend*: improving.
		Main pressures: conversion of agricultural land, change in land management, extensive grazing or undergrazing.
		Conservation Objective: restore favourable condition.

	on CO attributes and targets	Marsh Fritillary is mapped in one location near Muckross (NPWS, 2017a), however, it is likely to be much more widespread and abundant in the SAC. Marsh Fritillary colonies can be found on many types of site and the habitat it occupies can be difficult to define. The presence of Devil's-bit Scabious (*Succisa pratensis*) is an essential factor. The species can be found in a range of habitats including grassland with short to medium height vegetation and an abundance of *Succisa pratensis*. There is no suitable habitat on the PD site for Marsh Fritillary.
Sea lamprey (*Petromyzon marinus*) **1095**	Yes, potential for significant indirect effects to attributes and targets	*Conservation status*: Bad. *Conservation trend*: stable.
		Main pressures: hydropower, increase in rainfall with climate change, agricultural fertiliser runoff, land drainage, reducing prey through fish and shellfish harvesting.
		Conservation Objective: maintain favourable condition.
		Adult Sea Lampreys spend 3 years as host fish in the sea. In spring adult Sea Lamprey migrate from marine waters to freshwaters to excavate redds/spawning nests in gravelled areas of large rivers. Sea lamprey distribution in Ireland is scattered. The PD will not affect fish passage. However, juvenile density/population/habitat and spawning habitat extent/distribution in fine sediment in the Laune River are potentially vulnerable to indirect effects from changes in water quality. Therefore, more detailed assessment is required to determine the potential effects of the project.
Brook lamprey (*Lampetra planeri*) **1096**	Yes, potential for significant indirect effects to attributes and targets	*Conservation status*: Favourable. *Conservation trend*: stable.
		Main pressures: hydropower, agricultural fertiliser runoff, land drainage, clear-cutting, urban run-off, discharge of urban wastewater.
		Conservation Objective: maintain favourable condition.
		Unlike Sea and River lampreys the Brook lamprey is non-parasitic and non-migratory living its entire life in freshwater Adults spawn in spring excavating nests in gravelled areas. Unlike other lamprey species Brook lamprey is widespread in Ireland. The PD will not affect fish passage. However, juvenile density/population/habitat and spawning habitat extent/distribution in fine sediment in the Laune River are potentially vulnerable to indirect effects from changes in water quality. Therefore, more detailed assessment is required to determine the potential effects of the project.
River lamprey (*Lampetra fluviatilis*) **1099**	Yes, potential for significant indirect effects to attributes and targets	*Conservation status*: Unknown. *Conservation trend*: not stated.
		Main pressures: hydropower, increase in rainfall with climate change, agricultural fertiliser runoff, land drainage, shipping/dredging.
		Conservation Objective: maintain favourable condition.
		River lamprey breeds in freshwater rivers and streams in shallow nests of fine gravels and small stones. As adults they are parasitic, attaching to and feeding on larger fish in coastal waters (NPWS, 2019a). River lamprey has a

		much more restricted range than Brook lamprey. The PD will not affect fish passage. However, juvenile density/population/habitat and spawning habitat extent/distribution in fine sediment in the Laune River are potentially vulnerable to indirect effects from changes in water quality. Therefore, more detailed assessment is required to determine the potential effects of the project.
Salmon (*Salmo salar*) 1106	Yes, potential for significant indirect effects to attributes and targets	*Conservation status*: Inadequate. *Conservation trend*: stable.
		Main pressures: pollution associated with agriculture, forestry and other sources, marine aquaculture, hydropower, illegal harvesting, abstraction of water, flow diversion, dams, pathogens/parasites.
		Conservation Objective: maintain favourable condition.
		Salmon breeds in natal freshwater rivers and streams in gravels having spent one/two winters at sea. The PD will not affect fish passage. However, adult numbers, juvenile abundance, and redds are potentially vulnerable to indirect effects from changes in water quality. Therefore, more detailed assessment is required to determine the potential effects of the project.
Lesser horseshoe bat (*Rhinolophus hipposideros*) 1303	Yes, potential for significant indirect effects to attributes and targets	*Conservation status*: Inadequate. *Conservation trend*: deteriorating.
		Main pressures: Removal of small landscape features, livestock farming (anti-parasitic drugs effect dung fauna), clear-cutting & removal of trees, conversion of land to housing, construction/modification of houses in existing urban areas (alteration of buildings used by bats), human intrusion and disturbance, interspecific relations, flooding (caves).
		Conservation Objective: maintain favourable condition.
		Lesser horseshoe bats are faithful to their roosts and will return to the same site each year. The bats forage on flying insects predominantly in deciduous woodland and riparian vegetation normally within a few km of their roosts (NPWS, 2019b). A number of roosts are mapped for the SAC including one that lies within 0.5km southwest of the PD site (NPWS, 2017a). There is no potential for direct effects to the SAC as the PD such as habitat loss, however, there is potential for affects to the attributes and targets of the CO from artificial lighting from the PD.
Otter (*Lutra lutra*) 1355	Yes, potential for significant indirect effects to attributes and targets	*Conservation status*: Favourable. *Conservation trend*: improving.
		Main pressures: no pressures.
		Conservation Objective: maintain favourable condition.
		The occurrence of Otter is widespread in the SAC. A 250m commuting belt surrounds the shoreline of Lough Leane and associated islands. Otters have two basic requirements: aquatic prey and safe refuges where they can rest. In freshwater areas a variety of fish from sticklebacks to salmon and eels will be taken, while crayfish and frogs can be important locally or seasonally (NPWS, 2019a). The Folly stream in the vicinity of the PD is not considered to be of any value to Otter. The PD will not create any barriers to connectivity and will not affect the

		extent of habitat or number of couching sites, however negative water quality effect arising from the PD may indirectly affect prey biomass.
Killarney Fern (Trichomanes speciosum) 1421	No potential for significant effects on CO attributes and targets	*Conservation status*: Favourable. *Conservation trend*: stable.
		Main pressures: no pressures.
		Conservation Objective: maintain favourable condition.
		Killarney Fern is found in dripping caves, cliffs, crevices and gullies by waterfalls, crevices in woodland, and occasionally the floor of damp woodland; all deeply shaded humid habitats (NPWS, 2019a). It persists at many locations within the SAC, particularly in remoter areas and more inaccessible situations (NPWS 2017a). The PD site does have suitable habitat for the fern species. Attributes for the fern are site-specific and the PD will not adversely affect the ferns distribution, populations, colonies, population size or structure, habitat, hydrological conditions, light levels, woodland canopy or invasive species. Killarney Fern will not be considered further in the NIS.
Slender naiad (*Najas flexilis*) 1833	Yes, potential for significant indirect effects to attributes and targets	*Conservation status*: Inadequate. *Conservation trend*: deteriorating.
		Main pressures: Modification of hydrological flow, physical alteration of water bodies, agricultural activities contributing to water pollution, urban wastewater discharges, invasive alien species, forestry activities and peat extraction.
		Conservation Objective: maintain favourable condition.
		Slender naiad occurs in several lakes within the SAC including Lough Leane. It is a fragile annual plant that grows in clear-water lowland lakes, is a glacial relict species not colonising new lakes and is rare and declining in many counties. The Slender naiad has exacting environmental requirements, most notably high-water clarity/transparency and deep euphotic zones (NPWS, 2019b). It is thus a surface water dependent species and potentially vulnerable to changes in water quality. Therefore, more detailed assessment is required to determine the potential effects of the project.
Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) 3110	No potential for significant effects on CO attributes and targets	*Conservation status*: Bad. *Conservation trend*: stable.
		Main pressures: agricultural and forestry activities generating diffuse pollution to surface or ground waters; peat extraction; drainage for agricultural and forestry; hydrological and physical modifications; and discharge of urban wastewater.
		Conservation Objective: restore favourable condition.
		Ireland is a European stronghold for this soft-water, nutrient-poor lake habitat. It is quite species-poor and dominated by plants with an isoetid growth form, such as Quillwort (*Isoetes lacustris*), or Water Lobelia (*Lobelia dortmanna*) (NPWS, 2019a). Oligotrophic lakes of varying sizes occur throughout the SAC (NPWS, 2017a). Lough

		Leane is not categorised as an oligotrophic lake containing very few minerals of sandy plains; however, it is categorised as Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) / Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea (see below). Lough Leane is mesotrophic (having a moderate level of nutrients[1] and moderate biological productivity) rather than oligotrophic (having a low level of nutrients and low biological productivity). The nearest oligotrophic lakes containing very few minerals of sandy plains are Lough Guitane and other much smaller lake bodies to the southeast, which are part of the River Flesk catchment that flow via a series of river tributaries into the River Flesk before entering Lough Leane at Castlelough Bay. Other such lakes occur in the upper catchment to the southwest and ultimately drain to Lough Leane. The lakes supporting this habitat is therefore upstream of Lough Leane and upgradient of any negative ecological effects of the project. Thus, the project will not negatively affect the habitat area or distribution, typical species vegetation, hydrology, substratum quality, water quality or fringing habitat associated with the lake habitat. Oligotrophic lake containing very few minerals of sandy plains are outside of the zone of influence of the project and not considered further in the NIS.
Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) 3110/ Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea (Mixed *Najas flexilis* lake habitat) 3130	Yes, potential for significant indirect effects to attributes and targets	*Conservation status*: Inadequate. *Conservation trend*: deteriorating.
		Main pressures: modification of hydrological flow; physical alteration of water bodies; agricultural activities generating diffuse and point source pollution to surface or ground waters; discharge of urban wastewater to surface or ground waters; invasive alien species; forestry activities generating pollution to surface or ground waters; and peat extraction.
		Conservation Objective: restore favourable condition.
		Lough Leane, Muckross Lake and the Upper Lake, as well as other lakes in the SAC, are categorised as oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea (NPWS, 2017a). Lough Leane is mesotrophic rather than oligotrophic and has in the past suffered from eutrophication. 'Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoeto Nanojuncetea' has been interpreted as a mixed *Najas flexilis* lake habitat in Ireland. The habitat occurs in lakes with circum-neutral, low-nutrient waters in catchments of mixed geology. The Annex II macrophyte *Najas flexilis* (Slender naiad) is a character species. The co-occurrence of *Potamogeton perfoliatus* and *Isoetes lacustris* is also characteristic. Owing to its rare species and relatively high species richness, habitat 3130 is of high conservation value. Ireland is a European stronghold for the habitat and for *Najas flexilis* (NPWS, 2019a). The habitat is potentially vulnerable to changes in water quality. Therefore, more detailed assessment is required to determine the potential effects of the project.
		Conservation status: Inadequate. *Conservation trend*: deteriorating.

Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (Vegetation of flowing waters) 3260	No potential for significant effects on CO attributes and targets	*Main pressures*: pollution from agricultural and forestry activities, changes to hydrology and physical structure of river, urban wastewater discharges, urban runoff, peat extraction, contaminated abandoned industrial sites, water abstraction. *Conservation Objective: maintain favourable condition.* This annexed habitat has a broad definition, covering from upland, flashy, oligotrophic, bryophyte- and algal-dominated rivers, to tidal reaches dominated by higher plants. In Ireland, the highest riverine conservation interest is associated with lowland depositing and tidal rivers and unmodified, fast-flowing, low-nutrient rivers (NPWS, 2019b). The watercourses/rivers within the SAC that drain into Lough Leane include The Long Range, Owengarriff River and a stretch of the lower Deenagh River from Port Road to Lough Leane. A number of streams within the SAC drain into the lake too including the Folly stream. The exit area of the lake to the Laune River is within the SAC, however, the river itself, which meanders in a broadly northwest direction before entering the sea beyond Killorglin into Castlemaine Harbour is not within the Killarney National Park SAC. This rivers and streams supporting this habitat are therefore upgradient of any negative water quality ecological impacts, therefore the CO will not be negatively affected. Floating river vegetation habitat will not be considered further in the NIS.
Northern Atlantic wet heaths with *Erica tetralix* 4010	No potential for significant effects on CO attributes and targets	*Conservation status*: Bad. *Conservation trend*: deteriorating. *Main pressures*: intensive grazing/overgrazing, burning, land use change, agricultural activities generating pollution, wind power, erosion. *Conservation Objective: restore favourable condition.* Wet heath is a highly variable peatland habitat that is intermediate in many regards between dry heath and blanket bog, generally occurring on gently sloping, poorly draining ground on shallow or intermediate peat depths (NPWS, 2019b). Wet heath is a terrestrial habitat generally confined to thin peaty soils in lowland areas, and the slopes of hills and mountains within the SAC. Wet heath is outside of the zone of influence of the project and not considered further in the NIS.
European dry heaths 4030	No potential for significant effects on CO attributes and targets	*Conservation status*: Bad. *Conservation trend*: stable. *Main pressures*: intensive grazing/overgrazing, burning, land use change, wind power. *Conservation Objective: restore favourable condition.* Dry heath comprises vegetation dominated by ericaceous dwarf shrubs and usually occurs on well-drained, nutrient-poor and acidic mineral soils or shallow peats on sloping ground (NPWS, 2019b). Dry heath is a terrestrial habitat generally confined to the slopes of hills and mountains within the SAC. Dry heath is outside of the zone of influence of the project and not considered further in the NIS.
Alpine and Boreal heaths		*Conservation status*: Bad. *Conservation trend*: stable.

4060	No potential for significant effects on CO attributes and targets	*Main pressures*: intensive grazing/overgrazing, agricultural activities generating pollution, tourism. *Conservation Objective: restore favourable condition.* Alpine and boreal heaths have two distinct subtypes in Ireland: an upland subtype occurs on the exposed summits and upper slopes of mountains on acidic substrate - typically occurs from around 350-400 m upwards but can occur at lower altitudes in more exposed locations; and a lowland subtype comprises Dryas heath on limestone. The vegetation is characterised by mats of *Dryas octopetala* accompanied by species typical of calcareous grassland (NPWS, 2019b). The habitat is documented to occur on most of the higher mountains and ridges within the SAC (NPWS, 2017a). Alpine and boreal heaths is outside of the zone of influence of the project and not considered further in the NIS.
Killarney shad (*Alosa fallax killarnensis*) **5046**	Yes, potential for significant effects to four attributes relating to water quality, population structure and spawning areas	*Conservation status*: Favourable. *Conservation trend*: stable. *Main pressures*: no pressures. *Conservation Objective: restore favourable condition.* The Killarney shad is unique to Ireland and is only recorded in Lough Leane in the Killarney National Park SAC. Anecdotal reports and observations indicate that the species spawns within Lough Leane along shallow gravelled shores and on gravel shoals adjoining the various islands. The adult fish live in shoals in the lake, feeding on zooplankton. Thus, the full life cycle is undertaken within the lake (NPWS, 2019a). The PD will not impede the movement of Killarney shad or affect its distribution. However, population structure and spawning habitat are potentially vulnerable to indirect effects from changes in water quality. Therefore, more detailed assessment is required to determine the potential effects of the project.
Juniperus communis formations on heaths or calcareous grasslands (Juniper scrub) 5130	No potential for significant effects on CO attributes and targets	*Conservation status*: Favourable. *Conservation trend*: stable. *Main pressures*: no pressures. *Conservation Objective: maintain favourable condition.* Juniper formations are mostly associated with lowland dry calcareous and neutral grassland, exposed calcareous rock, dry siliceous heath, exposed siliceous rock and dry calcareous heath (NPWS, 2019b). The habitat is documented to occur on islands in the Upper Lake and on headlands of the Muckross peninsula within the SAC but could occur elsewhere (NPWS, 2017a). Juniper scrub is a terrestrial habitat generally and is outside of the zone of influence of the project and not considered further in the NIS.
Calaminarian grasslands of the Violetalia calaminariae 6130	No potential for significant effects	*Conservation status*: Inadequate. *Conservation trend*: deteriorating. *Main pressures*: Abiotic natural processes; natural succession; and sports, tourism and leisure activities. *Conservation Objective: maintain favourable condition.*

	on CO attributes and targets	Calaminarian grassland vegetation is characterised by the presence of plants that can tolerate high levels of heavy metals. In Ireland, this habitat is restricted to artificial habitats on spoil heaps in the vicinity of old mine workings (Holyoak & Lockhart, 2011, as cited in NPWS, 2019a). It is mapped by NPWS (2017a) as occurring at two locations: southern shore of Ross Island and the northern shore of Muckross Lake. In both cases the habitat is associated with old copper mines. The habitat is terrestrial and is not a surface or ground water dependent habitat. Calaminarian grasslands are outside of the influence of the project and not considered further in the NIS.
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) 6410	No potential for significant effects on CO attributes and targets	*Conservation status*: Bad. *Conservation trend*: deteriorating. *Main pressures*: agricultural land conversion; abandonment of management; extensive grazing or undergrazing; conversion to forest or other land use; livestock farming without grazing; drainage. *Conservation Objective: maintain favourable condition.* *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) is represented in Ireland by both fen and grassland communities on nutrient-poor soils. The habitat is either managed as traditional hay meadows or more usually by extensive pasture (NPWS, 2019a). *Molinia* meadows have a very limited distribution in Co. Kerry. NPWS (2017a) have mapped its occurrence at neighbouring sites Ross Island, Bunrower and Cahernane. The habitat is terrestrial and is not a surface or ground water dependent habitat. *Molinia* meadows are outside of the influence of the project and not considered further in the NIS.
Blanket bogs (*if active) 7130	No potential for significant effects on CO attributes and targets	*Conservation status*: Bad. *Conservation trend*: deteriorating. *Main pressures*: intensive grazing/overgrazing, burning, land use change, peat extraction, agricultural activities generating pollution, wind power, erosion, drainage. *Conservation Objective: restore favourable condition.* Blanket bog may be broadly divided into upland and lowland types, though Schouten (1984 as cited in NPWS, 2019b) also distinguishes an intermediate or highland type. Blanket bog occurs on minimum peat thicknesses of typically 0.50 m whereas shallower peats support heath habitats (NPWS, 2019b). It depends on rainfall for its formation The habitat is terrestrial and outside the influence of the project and not considered further in the NIS.
Depressions on peat substrates of the Rhynchosporion (Rhynchosporion depressions) 7150	No potential for significant effects on CO attributes and targets	*Conservation status*: Bad. *Conservation trend*: deteriorating. *Main pressures*: intensive grazing/overgrazing, burning, land use change, peat extraction, drainage. *Conservation Objective: restore favourable condition.* Depressions on peat substrates of the Rhynchosporion, which is characterised by the presence (*inter* alia) of *Rhynchospora alba* and *R. fusca*, is considered to be an integral part, and a microhabitat, of active raised bog and Blanket bog. It depends on rainfall for its formation. The habitat is terrestrial associated with blanket bog and outside the influence of the project and not considered further in the NIS.

Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (Old oak woodland) 91A0	No potential for significant effects on CO attributes and targets	*Conservation status*: Bad. *Conservation trend*: deteriorating.
		Main pressures: invasive alien species; overgrazing by deer; problematic native species; and clear-cutting, removal of all trees.
		Conservation Objective: restore favourable condition.
		Old sessile oak woods are defined in the interpretation manual of EU habitats as "acidophilous Quercus petraea woods, with low, low-branched, trees, with many ferns, mosses, lichens and evergreen bushes (NPWS, 2019b). Old sessile oak woods occur mainly along the western and southern shores of Lough Leane as well in the valleys to the south (NPWS, 2017a). Old oak woodland is a terrestrial habitat and outside the influence of the project and not considered further in the NIS.
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* 91E0	No potential for significant effects on CO attributes and targets	*Conservation status*: Bad. *Conservation trend*: deteriorating.
		Main pressures: invasive alien species; problematic native species; and clear-cutting, removal of all trees.
		Conservation Objective: restore favourable condition.
		Alluvial woodlands are a priority habitat that occur on heavy soils that are periodically inundated by the rise of river levels, but which are otherwise well drained and aerated during low water (NPWS, 2019a). Occurrence of alluvial woodands is widespread in Ireland. Mapping of alluvial forests show good cover along the shore of Ross Bay and further north in Victoria Bay (NPWS, 2017a). The habitat is surface/ground water dependent. Alluvial woodlands have been mapped as occurring 30m west the PD site entrance separated by Port Road, the Deenagh River and a walkway/cycleway. Works to Port Road will take place within the confines of the carriageway and footpaths and will not directly or indirectly affect the alluvial woodland. Port Road lies about 15m east of the alluvial woodland. The PD will not affect the following attributes: habitat area or distribution, woodland size or structure or vegetation composition. Neither will it affect the hydrological regime, which is dependent on periodic flooding to maintain alluvial woodlands along lake floodplains. Thus, alluvial woodlands are outside the zone of influence of the project.
Taxus baccata woods of the British Isles* 91J0	No potential for significant effects on CO attributes and targets	*Conservation status*: Bad. *Conservation trend*: stable.
		Main pressures: invasive alien species; and overgrazing by deer.
		Conservation Objective: restore favourable condition.
		Taxus baccata or Yew Woodland is a priority habitat with very restricted distribution in Ireland only occurring at a limited number of sites in the west and south-west, predominately on shallow soils over limestone pavement or outcrops (NPWS, 2019a). It is mapped as occurring at Muckross (NPWS, 2017a). The habitat is terrestrial. The woodland at Muckross is outside of the influence of the project. *Taxus baccata* woods will not be considered further in the NIS.

6 Assessment of effects on the conservation objectives of QI/SCI

In the previous section, an evaluation was undertaken to determine whether the PD could potentially affect the CO (conservation objectives) of the QI (qualifying interest) habitats and species of the Killarney National Park SAC and whether further assessment in the NIS. This was done through a scientific examination of ecological evidence and data listed above in section **3** or referenced. The following QI have been brought forward to this assessment step, which will examine the potential impacts of the project against the QI CO. The effects of the project, individually and in combination with other environmental impacts, on the QI have been assessed against the measures (attributes and targets) designed to achieve the conservation objectives. The outcome of the assessment has been presented in the following sections.

6.1 Freshwater Pearl Mussel

The Freshwater pearl mussel catchments within the SAC are Currane, Carragh and Gearhameen. Currane drains west towards Waterville, Carragh drains north to Rossbehy Creek while Gearhameen drains to the Upper Lake, which drains into Lough Leane via The Long Range. The Freshwater pearl mussel catchment of Gearhameen is therefore upstream of the Upper Lake and Lough Leane and upgradient of any negative ecological effects of the project.

The assessment in the table below concludes that potentially significant individual or cumulative indirect effects from the PD are unlikely on the attribute and targets that contribute to the CO to restore the favourable conservation condition of Freshwater pearl mussel. No mitigation is required.

Table 2. Assessment of effects of PD on the CO of Freshwater pearl mussel

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Assessment of Potentially Significant Cumulative Effects	Mitigation
Distribution (km)	Area stable or increasing	The Freshwater pearl mussel catchments within the SAC are Currane, Carragh and Gearhameen. The Gearhameen drains to the Upper Lake, which drains into Lough Leane via The Long Range. The known distribution of the Freshwater pearl mussel is from the base of a section of falls in the Owenreagh River at Looscaunagh to the Bridge on the Gearhameen River at Lord Brandon's Cottage (Ross, 2007 as cited in NPWS 2017a). Ross (2016 as cited in NPWS 2017a) found small numbers of mussels in 800m surveyed downstream of the Bridge. The Freshwater pearl mussel distribution in the Gearhameen is upstream of the Upper Lake and Lough Leane. Therefore, the PD is unlikely to directly or indirectly significantly affect the following Freshwater pearl mussel attributes and targets that define the CO: distribution, population size, population structure, suitable habitat, water quality, substratum quality, hydrological regime or fringing habitat. *Potentially significant effects are unlikely*.	Based on the distribution of Freshwater pearl mussel being confined to the Gearhameen River, Freshwater pearl mussel distribution is therefore upstream of any negative effect and the PD in combination with cumulative pressures acting on the catchment (nutrient losses from agriculture/forestry, urban runoff) is unlikely to significantly impact the following Freshwater pearl mussel attributes and targets that define the CO: distribution, population size, population structure, suitable habitat, water quality, substratum quality, hydrological regime or fringing habitat. *Potentially significant cumulative effects are unlikely.*	No mitigation required
Distribution: Gearhameen (km)	Maintain Gearhameen distribution at 4.45km			No mitigation required
Population size (no. adults)	Restore populations to: 2.8 million adult mussels in the Caragh, 100,000 in the Currane & 100,000 in the Gearhameen			No mitigation required
Population structure (% per size class)	Restore to 20% of each population no more than 65mm in length; & at least 5% of each population no more than 30mm in length			No mitigation required
Population structure: adult mortality (%)	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population & scattered in distribution.			No mitigation required
Suitable habitat: extent (km)	See targets below and map 8. Note that the suitable habitat target lengths include the perimeters of lakes in each catchment			No mitigation required
Suitable habitat: extent – Gearhameen (km)	Restore suitable habitat in more than 4.45km in the Gearhameen and any additional stretches necessary for salmonid spawning			No mitigation required
Water quality: macroinvertebrate and phytobenthos (diatoms) (EQR)	Restore water quality - macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93			No mitigation required
Substratum quality: filamentous algae & macropytes (%)	Restore substratum quality - filamentous algae: absent or trace (less than 5%); macrophytes: absent or trace (less than 5%)			No mitigation required
Substratum quality: sediment (occurrence)	Restore substratum quality - stable cobble and gravel substrate with very little fine			No mitigation required

	material; no artificially elevated levels of fine sediment			
Hydrological regime: flow variability (m/s)	Restore appropriate hydrological regime			No mitigation required
Fringing habitat: area and condition (ha)	Maintain the area and condition of fringing habitats necessary to support the population			No mitigation required
Host fish (no.)	Maintain sufficient juvenile salmonids to host glochidial larvae.	Salmonid fish (salmon or trout) are host to the larval stage of the freshwater pearl mussel and essential to completion of the life cycle. In section **6.5** significant effects from the PD to Salmon were considered unlikely. A recent fish stock survey of Lough Leane recorded Brown trout as the most abundant fish with little change between numbers and biomass of the species between 2005 and 2021. Lough Leane was classified as Good in 2021 based on the fish populations present (McCloone et al., 2022). On this basis trout abundance is unlikely to be appreciably affected. *Potentially significant effects are unlikely*.	Cumulative effects on CL include climate change and marine ecosystem change (altered marine food webs and oceanic prey distribution), and freshwater water quality impacts. In section **6.5** significant cumulative effects from the PD to Salmon were considered unlikely. Population levels and trend for Brown trout in the lake appear to be good and stable (McCloone et al., 2022). *Potentially significant cumulative effects are unlikely*.	No mitigation required

6.2 Sea Lamprey

Adult Sea Lampreys spend 3 years as host fish in the sea. In spring adult Sea Lamprey migrate from marine waters to freshwaters to excavate redds/spawning nests in gravelled areas of large rivers. Lampreys spawn in clean gravels while juveniles burrow in fine sediment. Lamprey then spend several years in a blind, worm-like juvenile form known as ammocoetes, which filter feed microscopic organisms from the water and mud. After about six to eight years, Sea Lamprey ammocoetes develop eyes and turn silvery, transforming into free-swimming adults as they make their way downstream and migrate to sea[8]. Sea lamprey spawning has been recorded in the upper reaches of the River Laune, where there are no barriers to upstream migration (NPWS, 2019a). Sea lamprey spawning grounds have been recorded on the Laune River, River Flesk and as far upstream as the Gearhameen River near Lord Brandon's Cottage while suitable spawning habitat has been recorded on the Laune River and The Long Range near Dinish Island (Gallagher et al., 2019).

The assessment in the table below concludes that potentially significant individual or cumulative indirect effects from the PD are unlikely on the attribute and targets that contribute to the CO to maintain the favourable conservation condition of Sea lamprey. No mitigation is required.

[8] https://www.fisheriesireland.ie/species/sea-lamprey-petromyzon-marinus

Table 3. Assessment of effects of PD on the CO of Sea lamprey

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Assessment of Potentially Significant Cumulative Effects	Mitigation
Distribution: extent of anadromy (% of accessible river)	Greater than 75% of main stem length of rivers accessible from estuary	This attribute relates to artificial barriers that can block or cause difficulties to lamprey upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. Sea lamprey spawning areas have been found as far upstream as the Gearhameen River so there are currently no restrictions to movement up to here. The PD works are confined to the PD site and are unlikely to result any restrictions to movements for Sea lamprey along its current migratory route. *Potentially significant effects are unlikely*.	Sea lamprey appear to have unrestricted passage as far upstream as the Gearhameen River and thus no immediate cumulative pressures are identified, apart from possible severe drought arising from climate change impacts impeding passage along shallower stretches of river, or severe pollution. The PD works are unlikely to result in any cumulative restrictions to movements for Sea lamprey along its current migratory route. *Potentially significant cumulative effects are unlikely*.	No mitigation required.
Population structure of juveniles (no. age/size groups)	At least three age/size groups present	Ammocoete larvae are filter feeders drift downstream after hatching and burrow into fine sediment. The nearest confirmed suitable spawning habitat on the Laune River is <2km downstream of the outlet of the river from Lough Leane where it is joined by the River Loe (Gallagher et al., 2019). Ammocoete larvae are likely to burrow in fine sediment downstream of spawning grounds. Given the nearest downstream location of confirmed and suitable spawning grounds for Sea lamprey on the Laune River, the dilution capacity of the lake and the intervening distance between Ross Bay, it is considered that the PD is unlikely to significantly affect the population structure of juveniles or juvenile density or availability of juvenile habitat. *Potentially significant effects are unlikely*.	Cumulative impacts acting on juvenile/ammocoete larvae silt beds can include instream engineering works (dams, weirs, etc), dredging, eutrophication. The River Laune has a Good ecological status so eutrophication is unlikely to be a significant problem for larvae. The PD is unlikely to result in any significant cumulative impacts on the population structure of juveniles or juvenile density or availability of juvenile habitat. *Potentially significant cumulative effects are unlikely*.	No mitigation required.
Juvenile density in fine sediment (juv/m^2)	Juvenile density at least 1/m^2			No mitigation required.
Availability of juvenile habitat (no. of positive sites in 3rd order channels (& greater), downstream of spawning areas)	More than 10% of sample sites positive			No mitigation required.

Extent and distribution of spawning habitat (m^2 and occurrence)	No decline in extent & distribution of spawning beds	The nearest confirmed suitable spawning habitat on the Laune River is <2km downstream of the outlet of the river from Lough Leane where it is joined by the River Loe (Gallagher et al., 2019). Clean gravel is required for nest construction. In terms of potential for negative water quality effects, given the nearest downstream location of confirmed and suitable spawning grounds for Sea lamprey on the Laune River, the dilution capacity of the lake and the intervening distance between Ross Bay, it is considered that the PD is unlikely to affect the extent and distribution of spawning habitat. *Potentially significant effects are unlikely*.	Cumulative impacts acting on suitable spawning grounds/gravels can include excessive algal growth associated with eutrophication from forestry and agricultural activity, and significant accumulations of silt from peat extraction, in a catchment. However, the Laune River supports several suitable spawning habitat and the river is in Good ecological status (Cycle 3) so eutrophication or silt deposition is unlikely to be a significant problem for larvae. The PD is unlikely to result in any significant cumulative impacts on the extent and distribution of spawning habitat. *Potentially significant cumulative effects are unlikely*.	No mitigation required.

6.3 Brook lamprey

Unlike Sea and River lampreys the Brook lamprey is non-parasitic and non-migratory living its entire life in freshwater. Adults spawn in spring excavating nests in gravelled areas. Unlike other lamprey species Brook lamprey is widespread in Ireland. The species can be found in both large and small river channels, although they are more typically found in smaller rivers. After hatching, larval lamprey drift downstream until they find a suitable muddy or silty part of the riverbed to burrow into. Lamprey then spend several years in a blind, worm-like juvenile form known as ammocoetes, which filter feed microscopic organisms from the water and mud. After about five or six years, Brook lamprey ammocoetes develop eyes and turn silvery, transforming into free-swimming adults. Adults do not feed and live for only about six months. Although they are not considered to be at risk in this country, they may be threatened by factors impacts on rivers such as pollution, instream works in river channels and barriers to migration[9]. Brook lamprey occur within rivers and streams in the Killarney National Park SAC (NPWS, 2017a) and the Laune River is also within their current distribution (NPWS, 2019a). River/Brook lamprey spawning sites have been recorded on the River Flesk, Deenagh River and the River Laune and some of its tributaries (King et al., 2011).

The assessment in the table below concludes that potentially significant individual or cumulative indirect effects from the PD are unlikely on the attribute and targets that contribute to the CO to maintain the favourable conservation condition of Brook lamprey. No mitigation is required.

[9] https://www.fisheriesireland.ie/species/brook-lamprey-lampetra-planeri

Table 4. Assessment of effects of PD on the CO of Brook lamprey

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Assessment of Potentially Significant Cumulative Effects	Mitigation
Distribution (% of accessible river)	Access to all water courses down to first order streams	This attribute relates to artificial barriers that can block or cause difficulties to lamprey upstream movement, thereby limiting species to lower stretches and restricting access to spawning areas. Brook lamprey, however, can however complete their full life cycle in a short stretch of river. The PD works are confined to the PD site and are unlikely to result any restrictions to movements for Brook lamprey. *Potentially significant effects are unlikely*.	No cumulative pressures, apart from possibly severe drought arising from climate change impacts impeding passage along shallower stretches of river, or severe pollution, are identified. The PD works are unlikely to result in any cumulative restrictions to movements for Brook lamprey. *Potentially significant cumulative effects are unlikely*.	No mitigation required
Population structure of juveniles (no. age/size groups)	At least three age/size groups present	After hatching the young ammocoete larvae leave the nest and distribute themselves by drifting downstream and burrowing in suitable areas of silty sand. The larvae, occur in suitable silt beds, mainly in running water but sometimes in large numbers in silt banks in lakes (Maitland, 2003). It is possible they occur in sediment accumulations in Lough Leane. Ammocoete larvae are likely to burrow in fine sediment downstream of spawning grounds in the Laune River and possibly in silt beds in Lough Leane. In terms of potential for negative water quality effects, given Brook lamprey's favourable conservation status nationally, the dilution capacity of the lake and the intervening distance between Ross Bay, it is considered that the PD is unlikely to significantly affect the population structure of juveniles or juvenile density or availability of juvenile habitat. *Potentially significant effects are unlikely*.	Cumulative impacts acting on juvenile/ammocoete larvae silt beds can include instream engineering works (dams, weirs, etc), dredging, eutrophication. The River Laune has a Good ecological status so eutrophication is unlikely to be a significant problem for larvae. Lough Leane is Good status, however, Ross Bay is Moderate because of eutrophication. Given the favourable status of Brook lamprey, the PD is unlikely to result in any significant cumulative impacts on the population structure of juveniles or juvenile density or availability of juvenile habitat. *Potentially significant cumulative effects are unlikely*.	No mitigation required
Juvenile density in fine sediment (juv/m^2)	Mean catchment juvenile density of at least 5/m^2			No mitigation required
Availability of juvenile habitat (no. of positive sites in 2nd order channels (& greater), downstream of spawning areas)	More than 50% of sample sites positive			No mitigation required
Extent and distribution of spawning	No decline in extent & distribution of spawning beds	Brook lamprey usually spawn in areas of small stones and gravel at the lower end of pools in rivers or streams (Maitland, 2003). Eutrophication causing build up of algae and	Cumulative impacts acting on suitable spawning grounds/gravels can include excessive algal growth associated with eutrophication from forestry and agricultural activity, and significant	No mitigation required.

habitat (m^2 and occurrence)		sedimentation of gravels are the main potential impacts to spawning ground. In terms of potential for negative water quality effects, given the nearest downstream location of suitable spawning habitat is likely to be the Laune River, the dilution capacity of the lake and the intervening distance between Ross Bay and the Laune, it is considered that the PD is unlikely to significantly affect the extent and distribution of spawning habitat. *Potentially significant effects are unlikely*.	accumulations of silt from peat extraction, in a catchment. However, the Laune River supports several suitable spawning habitat and the river is in Good ecological status (Cycle 3) so eutrophication or silt deposition is unlikely to be a significant problem for larvae. The PD is unlikely to result in any significant cumulative impacts on the extent and distribution of spawning habitat. *Potentially significant cumulative effects are unlikely*.	

6.4 River Lamprey

River lamprey breeds in freshwater rivers and streams in shallow nests of fine gravels and small stones. As adults they are parasitic, attaching to and feeding on larger fish in coastal waters. River lamprey has a much more restricted range than Brook lamprey. Their conservation status is unknown (NPWS, 2019a). It is a migratory species, which grows to maturity in estuaries around Britain and then moves into fresh water to spawn in clean rivers and streams. The larvae spend several years in silt beds before metamorphosing and migrating downstream to estuaries. Mature river lamprey, having spent one to two years mainly in estuaries, stop feeding in the autumn and move upstream into medium to large rivers, usually migrating into fresh water from October to December. After an incubation period of some 15–30 days, depending on prevailing water temperatures, the larvae hatch and immediately start to drift downstream and burrow in suitable silt beds. After metamorphosis (July–September) at three to five years of age, the young adults migrate during darkness to estuaries (Maitland, 2003). River lamprey are found in the Upper Lake (Kurz and Costello, 1999). River/Brook lamprey spawning sites have been recorded on the River Flesk, Deenagh River and the River Laune and some of its tributaries (King et al., 2011).

The assessment in the table below concludes that potentially significant individual or cumulative indirect effects from the PD are unlikely on the attribute and targets that contribute to the CO to maintain the favourable conservation condition of River lamprey. No mitigation is required.

Table 5. Assessment of effects of PD on the CO of River lamprey

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Assessment of Potentially Significant Cumulative Effects	Mitigation
Distribution (% of accessible river)	Access to all water courses down to first order streams	This attribute relates to artificial barriers that can block or cause difficulties to lamprey upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. Given the distribution of Sea lamprey up as far as the Gearhameen River, there is unlikely to be any physical barriers to River lamprey either. The PD works are confined to the PD site and are unlikely to result any restrictions to movements for River lamprey along its current migratory route. *Potentially significant effects are unlikely*.	River lamprey appear to have unrestricted passage as far upstream as the Gearhameen River and thus no cumulative pressures, apart from possibly severe drought arising from climate change impacts impeding passage along shallower stretches of river, or severe pollution, are identified. The PD works are unlikely to result in any cumulative restrictions to movements for River lamprey along its current migratory route. *Potentially significant cumulative effects are unlikely*.	No mitigation required
Population structure of juveniles (no. age/size groups)	At least three age/size groups present	Ammocoete larvae are filter feeders drift downstream after hatching and burrow into fine sediment. Ammocoete larvae are likely to burrow in fine sediment downstream of spawning grounds in the Laune River. While the conservation status of River lamprey is unknown, between the dilution capacity of the lake and the intervening distance between Ross Bay, it is considered that the PD is unlikely to significantly affect the population structure of juveniles or juvenile density or availability of juvenile habitat. *Potentially significant effects are unlikely*.	Cumulative impacts acting on juvenile/ammocoete larvae silt beds can include instream engineering works (dams, weirs, etc), dredging, eutrophication. The River Laune has a Good ecological status so eutrophication is unlikely to be a significant problem for larvae. The PD is unlikely to result in any significant cumulative impacts on the population structure of juveniles or juvenile density or availability of juvenile habitat. *Potentially significant cumulative effects are unlikely*.	No mitigation required.
Juvenile density in fine sediment (juv/m^2)	Mean catchment juvenile density of at least 5/m^2			No mitigation required.
Availability of juvenile habitat (no. of positive sites in 2nd order channels (& greater), downstream of spawning areas)	More than 50% of sample sites positive			No mitigation required.
Extent and distribution of spawning habitat	No decline in extent &	The spawning grounds are areas of small stones and gravel in flowing water (Maitland, 2003). Eutrophication causing built up of algae and	Cumulative impacts acting on suitable spawning grounds/gravels can include excessive algal growth associated with	No mitigation required.

(m^2 and occurrence)	distribution of spawning beds	sedimentation of gravels are the main potential impacts to spawning ground. In terms of negative water quality effects, given the nearest downstream location of suitable spawning habitat is likely to be the Laune River, the dilution capacity of the lake and the intervening distance between Ross Bay and the Laune, it is considered that the PD is unlikely to significantly affect the extent and distribution of spawning habitat. *Potentially significant cumulative effects are unlikely*.	eutrophication from forestry and agricultural activity, and significant accumulations of silt from peat extraction, in a catchment. However, the Laune River supports several suitable spawning habitat and the river is in Good ecological status (Cycle 3) so eutrophication or silt deposition is unlikely to be a significant problem for larvae. The PD is unlikely to result in any significant cumulative impacts on the extent and distribution of spawning habitat. *Potentially significant cumulative effects are unlikely*.	

6.5 Salmon

Salmon spawning typically occurs in headwaters, though it may happen anywhere in a river if a suitable substrate of well oxygenated loose gravel is available. The hatched fish are called alevins and once they begin to swim freely are called fry, which develop into parr. Parr feed on aquatic insects and continue to grow for one to three years while maintaining their territory in the stream. Smoltification is the physiological adaptation which occurs when the juvenile salmon change from the parr stage (freshwater phase) to the smolt stage (marine phase).

In recent decades, the abundance of wild Atlantic salmon has declined, despite regulations set in place to protect them. International research has highlighted climate change and marine ecosystem change (altered marine food webs and oceanic prey distribution) as potential causes for this observed decline. Marine survival is considered to have the biggest influence on return, from far North Atlantic feeding grounds in the waters surrounding the Faroe Islands, Norwegian Sea and western Greenland, to all rivers on Atlantic coasts. There is evidence that heavy sea-lice infestation from salmon farming has resulted in additional mortality in respect of migratory North Atlantic salmon generally (O. Torrissen et. al. 2013 as cited in IB, 2022). In freshwater, water quality and a range of pressures such as afforestation, drainage, effluent discharge, siltation and agricultural enrichment can all have a negative impact on juvenile salmon survival (IB, 2022).

McGinnity et al., (2012) verified the extent of Salmon anadromy[10] on the Laune catchment. The majority of the catchment was suitable for Salmon with the exception of impassable barriers (waterfalls) in the upper catchment. Salmon fry were recorded on the Deenagh River, River Flesk, Gearhameen River, all of which drain to Lough Leane. Salmon fry were recorded on tributaries of the River Laune. Of a total of 14 Salmon caught in Lough Leane in 2021 as part of an IFI fish survey, 12 of the 14 were adult upstream migrants (McLoone et al., 2022).

The assessment in the table below concludes that potentially significant individual or cumulative indirect water quality effects from the PD are unlikely on the attribute and targets that contribute to the CO to maintain the favourable conservation condition of Salmon. No mitigation is required.

[10] A form of diadromy (migration between marine and freshwater) where a fish is born in fresh water, matures in the ocean, and returns to fresh water to spawn. Source: https://www.sciencedirect.com.

Table 6. Assessment of effects of PD on the CO of Salmon

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Assessment of Potentially Significant Cumulative Effects	Mitigation
Distribution: extent of anadromy (% of river accessible)	100% of river channels to 2nd order accessible from estuary	Salmon has unrestricted passage as far upstream as the upper Laune catchment. This attribute relates to artificial barriers that can block or cause difficulties to lamprey upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. The PD works are confined to the PD site and are unlikely to result in any restrictions to movements for Salmon along its current migratory route. *Potentially significant effects are unlikely*.	Salmon has unrestricted passage as far upstream as the upper Laune catchment and thus no cumulative pressures, apart from possibly severe drought arising from climate change impacts impeding passage along shallower stretches of river, or severe pollution, are identified. The PD works are unlikely to result in any cumulative restrictions to movements for Salmon along its current migratory route. *Potentially significant cumulative effects are unlikely*.	No mitigation required.
Adult spawning fish (no.)	Conservation Limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces longterm average maximum sustainable yield as derived from the adult-to-adult stock and recruitment relationship". The Flesk/Laune is currently exceeding its CL (2017a). The Laune has a forecasted surplus above the required CL for 2021. The Laune has been above the CL since 2011 (Gargan, 2021). The Salmon fishery status for the Laune in 2023 is Open for Harvest (rod and line). Salmon spawning occurs in suitable clean gravels in rivers and streams in the Laune catchment. The PD will not affect the rivers and streams upgradient of Lough Leane. Most of the recorded fry and by association spawning in the Laune River appears to occur in its tributaries though likely to occur in main channel too. Given the catchment is exceeding its CL, the Laune is Good status and the dilution capacity of Lough Leane, numbers of adult spawning fish or fry are unlikely to be affected. *Potentially significant effects are unlikely*.	Cumulative effects on CL include climate change and marine ecosystem change (altered marine food webs and oceanic prey distribution), and freshwater water quality impacts. According to IB (2022), angling will have negligible effect on Salmon in the Laune catchment. Given the catchment is exceeding its CL, the Laune is Good status and the dilution capacity of Lough Leane, numbers of adult spawning fish or fry are unlikely to be affected by cumulative impacts. *Potentially significant cumulative effects are unlikely*.	No mitigation required.
Salmon fry abundance (no./5min electrofishing)	Maintain or exceed 0+ fry mean catchment wide abundance threshold value. Currently set at 17 fry/5 min sampling			No mitigation required.

Out-migrating smolt abundance (no.)	No significant decline	Given the catchment is exceeding its CL, the Laune is Good status and the dilution capacity of Lough Leane, it is considered that significant water quality effects to estuarine waters from the PD will not occur and out-migrating smolt numbers will not be significantly impacted. *Potentially significant effects are unlikely*.	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*). There are no marine salmon farms on the Flesk/Laune estuaries (NPWS, 2017a). Evidence suggests that the death rate for salmon is very high at the smolt stage, a phase in their life cycle during which they migrate downstream towards the sea[11]. SMOLTRACK revealed generally problems with initial migratory phase with low survival rates in the lower freshwater and transition environments. Smolts tracked from the River Erriff, Co Mayo, had 30% successful return indicating a mortality of 70% at sea[12]. Given the catchment is exceeding its CL, the Laune is Good status and the dilution capacity of Lough Leane, it is considered that significant cumulative water quality effects to estuarine waters from the PD will not occur and out-migrating smolt numbers will not be significantly impacted. *Potentially significant cumulative effects are unlikely*.	No mitigation required.
Number & distribution of redds (no. & occurrence)	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in redds, which are nests made out of small stones and gravel favouring fast flowing glides and riffles where eggs are deposited. They can lay thousands of eggs. Eutrophication causing built up of algae and sedimentation of gravels are the main potential impacts to spawning ground. In terms of negative water quality effects, given the nearest downstream location of suitable spawning habitat is likely to	Cumulative impacts acting on suitable spawning grounds/gravels can include excessive algal growth associated with eutrophication from forestry and agricultural activity, and significant accumulations of silt from peat extraction, in a catchment. The River Laune has a Good ecological status so eutrophication or silt deposition is unlikely to be a significant problem for larvae.	No mitigation required.

[11] https://www.fisheriesireland.ie/what-we-do/research/smoltrack
[12] https://smoltrack.eu/

		be the Laune River, the dilution capacity of the lake and the intervening distance between Ross Bay and the Laune, it is considered that the PD is unlikely to significantly affect the number and distribution of redds. *Potentially significant effects are unlikely*.	*Potentially significant cumulative effects are unlikely*.	
Water quality (EPA Q value)	At least Q4 at all sites sampled by EPA	Biological water quality sampling is undertaken on the Deenagh River, River Flesk, rivers that drain to the Upper Lake's catchment and Laune River, all upgradient of Lough Leane. The Folly stream, also sampled, has a biological water quality value of Q2, Bad ecological status, failing to reach the objectives of the WFD. Close to the exit point of the lake (outside the KNP SAC) in the upper part of the Laune River at Laune bridge, a Q value of 3-4, Moderate, was recorded. Four sampling points between Beaufort Bridge and Killorglin all record Good ecological status at Q4, thus meeting the objectives of the WFD. The target for water quality for Salmon is at least Q4 at all sites sampled by the EPA, thus this target is not being met for the Folly stream, which lies within the SAC. However, given the small catchment, and its seemingly channelised nature, the Folly stream is considered not to be important for Salmon. Were Q4 quality achieved, Salmon are unlikely to use it in any significant numbers. It is thus considered that the target refers to the larger rivers within the catchment and not the Folly stream. In terms of negative effects to water quality, the PD is unlikely to significantly affect the biological values of the river sampling points monitored by the EPA. *Potentially significant effects are unlikely*.	The main cumulative pressure on water quality in the catchment are agriculture and in Lough Leane, both agriculture and WWTP/urban discharges. Significant cumulative water quality effects on the EPA sampling points for biological quality on rivers within the catchment is unlikely. *Potentially significant effects are unlikely*.	No mitigation required.

6.6 Lesser Horseshoe Bat

The Lesser horseshoe bat does not have a specialised diet and the optimal foraging habitats for this species are deciduous woodlands, riparian vegetation and mature hedgerows within a few kilometres of a roost. Grazed pastures are important for winter feeding. Its distinctive echolocation call enables it to fly within cluttered environments (e.g. dense vegetation) but does not travel far, so the bats need to fly close to linear features to navigate through the landscape. Lesser horseshoe bats generally fly within 5m of a feature and avoid open areas. In addition, the echolocation call is not able to detect approaching predators so at higher light levels this species flies close to vegetation to avoid being attacked. It is the most photophobic of all the Irish bats NPWS & VWT (2022). Lesser horseshoe bat fly close to vegetation and emits high-frequency calls that attenuate rapidly.

Lesser horseshoe bat populations will use a variety of roosts during the year besides the main summer maternity and winter hibernation roosts. Such additional roosts within the SAC may be important as night roosts, satellite roosts, etc. A database of all known Lesser horseshoe roosts is available on the National Biodiversity Data Centre (NDBC) website. Further unrecorded roosts may also be present within this SAC (NPWS, 2017a).

Four roosts have been identified in the CO (NPWS, 2017a) with three of these in the Killarney region. A 2.5km foraging radius/range is delineated for each mapped roost. The closest roost to site is No. 296. Its 2.5km foraging range includes the PD site. Potential woodland foraging grounds mapped do not include the main PD site but encompass all the woodland within the SAC on the western side of Port Road. Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008 as cited in NPWS, 2017a).

Lesser horseshoe bat follows commuting routes from its roost to its foraging grounds and will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species, most importantly within 2.5km around each roost (Schofield, 2008 as cited in NPWS, 2017a).

6.6.1 Bat Surveys

Bat Roost Survey at Main PD site

A bat roost survey was undertaken in the main PD site in 2018 having regard to guidance by Collins (2016). There are no buildings or structures in the site which could be used as a bat roost. The trees within the site are considered to have low suitability for roosting bats (Ecological Impact Assessment (MWP, 2021)).

Walked Bat Activity Transect at Main PD Site

Walked bat activity transects were conducted in 2021. The site is considered to have moderate suitability for foraging and commuting bats owing to the boundary trees and hedgerows which provide foraging habitat and connection to the wider landscape. In total two species were recorded foraging at mature trees along the boundaries of the site; Common pipistrelle and Soprano pipistrelle, and one species was recorded commuting over the site; Leisler's bat. Lesser horseshoe bats have not been recorded at the main PD site indicating that they are unlikely to forage at the site possibly because of the barrier to movement associated with Port Road or the preference for, or availability of, broadleaf woodland within the KNP SAC. Overall, the bat activity level at the site was low (Ecological Impact Assessment (MWP, 2024)).

Static Detector Survey outside of the Main PD Site along River Deenagh/Port Road

Passive Static Bat Surveys were completed on 2nd August to 3rd August 2023. Eight units were deployed along the River Deenagh / Port Road. Static 1 and Static 2 were located upstream of the gap (a break in vegetation exists north of the site entrance and south of the pedestrian entrance) in the existing tall

vegetation along the River Deenagh (and therefore the boundary of the Port Road and Killarney National Park). Static 3 and Static 4 were located downstream of the gap in the existing tall vegetation along the River Deenagh (and therefore the boundary of the Port Road and Killarney National Park) while all other static units were located to detect potential commuting Lesser horseshoe bats emerging from the roost.

The eight detectors located along or close to the Deenagh River recorded between 1-32 bat encounters in any one-hour period apart from Static 7. Static 8, located in woodland, had the highest number of encounters. Bats were either emerging, foraging or returning (to the roost). Static 1, 3 and 6 also had good numbers. It is likely there are a number of commuting routes north of the roost including along the Deenagh River, which according to the data may be primarily a commuting habitat for the species. See Appendix 2 for full bat survey report.

While surveys were only brief, they indicated that a potential 14.7% of the Tea House colony commuted along the River Deenagh directly after emergence. In addition, 11.8% of the Tea House colony continued commuted along the River Deenagh in vicinity of the proposed development area. As a consequence, this high level of Lesser horseshoe bat usage it seems that the River Deenagh is an important commuting habitat for the local lesser horseshoe bat population. See Appendix 2 for full bat survey report. For the purposes of this report, the 'Deenagh River/Port Road woodland corridor' route is defined as the Deenagh River and associated riparian (river) trees/woodland on either side stretching from the pedestrian entrance opposite Parkland homes north of the PD site entrance as far south as the Cathedral entrance to the National Park, on the western side of Port Road.

Dusk Bat Survey at Tea House and River Deenagh
A Dusk Emergence Survey was completed of the known Lesser horseshoe bat roost in the Tea House of Killarney National Park from 10 minutes before sunset to at least 80 minutes post sunset on 28th July 2023. Surveyors were located at 6 locations along the pedestrian path west of the Deenagh River. A total of 340 Lesser horseshoe bats were recorded emerging from the roost during the dusk survey. In relation to the recordings of Lesser horseshoe bats at locations, no Lesser horseshoe bats were recorded on the static units located at Locations 2, 4 and 6. Lesser horseshoe bats were recorded by the surveyors at Location 1 (7 bat encounters at 22:32, 22:33, 22:34 and 22:34 hrs), Location 3 (1 bat encounter at 22:32 hrs) and Location 5 (1 bat encounter at 22:32 hrs) along River Deenagh. See Appendix 2 for full bat survey report.

Filming Survey
A Guide TrackIR Pro19 thermal imagery scope filming was also deployed at the Tea House to capture potential emerging bats from the Lesser horseshoe bat roost on 28th July 2023. This was deployed to determine the commuting routes. No bats were recorded commuting across the principal path in front of the roost to the adjacent woodland. See Appendix 2 for full bat survey report.

Previous Bat Roost Emergence Survey
MWP competed a 15 consecutive night emergence survey in June/July 2018 and 2019 at the Tea House. About 2/3 of the bats flew north into the woodland through the hedge and about 1/3 flew south into the woodland across open ground. This pattern was very consistent regardless of weather.

6.6.2 Light Pollution

Artificial lighting is increasing globally by 6% per annum and had been identified as a key biodiversity threat, ranked within the top 10 emerging issues in biodiversity conservation (Hökler et al., 2010). With increased new housing pressure on our villages, towns and cities, artificial lighting is considered a threat to nocturnal mammals.

Where there is too much luminance bats vision can be reduced resulting in disorientation, and light sensitivity varies between individuals. Too much luminance at bat roosts may cause bats to desert a roost. Light falling on a roost exit point can delay bats from emerging and miss peak levels of insect activity at dusk. Any delays of emergence can reduce feeding periods (BCI, 2010). As the main peak of nocturnal insect abundance occurs at and soon after dusk, a delay in emergence means this vital time for feeding is missed with direct impacts on reproductive ecology such as slower growth rate and starvation of young (BCT, 2018). Lighting can also disturb bats' feeding behaviour. Many night flying insects are attracted to lights especially those lamps that emit UV light. A single source of light in a dark area can cause local insect populations to congregate in concentrations around the light source. Most Irish bat species are too sensitive to such light sources and suffer from insect populations being reduced in traditional feeding areas (BCT, 2010) with potentially significant knock-on effects on fitness and breeding success. Bats avoid artificial lights, which can also reduce drinking resources (BCT, 2018). In addition, artificial lighting can increase the chances of bats being preyed on. Lighting can be particularly harmful to bat populations along river corridors, woodland edges, along hedgerows and treelines and at lake edges (BCI, 2010). The presence of lit conditions can pose a barrier to movement, which many bat species cannot cross (BCT, 2018).

Bat species such as the Lesser horseshoe bat regularly light sample before leaving the roost to feed at nighttime. Light sampling is where the bat flies in and out of the exit point to determine the light levels. The bat will not fully leave the roost until the light levels are low enough for it to leave the roost safely (BCI, 2010). It is thought that because light-averse bats are often slower flying, more manoeuvrable species, they avoid light to reduce the risk of predation (Rydell, 1994 and Rydall et al., 1996 as cited in Rowse et al., 2018). Thus, Lesser horseshoe bats are very sensitive to light pollution and will avoid brightly lit areas. Inappropriate lighting around roosts may cause abandonment; lighting along commuting routes may cause preferred foraging areas to be abandoned, thus increasing the energetic cost for bats (Schofield, 2008 as cited in NPWS, 2017a).

Activity of Lesser horseshoe bats is also significantly reduced along commuting routes illuminated with HPS streetlights (Stone et al. 2009). Stone et al., (2012) showed that LED (light-emitting diodes) streetlights caused a reduction in activity of slow-flying bats such as Lesser horseshoe with activities significantly reduced even during low light levels of 3.6 lux and can potentially fragment commuting routes. On 56% of observations bats flew through the lights, and on the remaining 44% avoided the lights by turning back or flying through the hedge. Bats did not avoid the lit side of the hedge by flying down the unlit side. A study showed lower light levels (25% of the original output) do not affect activity levels of either light opportunistic or light-averse species of bats (such as *Myotis* spp.) compared to the unlit treatment, thus dimming is an effective strategy to mitigate ecological impacts of street lighting (Rowse *et al*., 2018).

In a study of Lesser horseshoe bats using the River Avon in the UK, bat activity was greatest at locations where ambient light levels were lowest and where vegetation was densest, particularly where a 'green lane' effect was formed. Hard-edged banks were generally less favoured, although activity persisted where there was a dark 'shadow' zone afforded by a tall hard-edged bank to screen illumination, even in the absence of vegetation. Therefore, light levels were seen to be a greater predictor of activity rates although vegetation can be crucial in providing adequate light screening (CWEC, 2017).

Zeale et al. (2018) showed the importance of preserving dark corridors for Lesser horseshoe bats. In one experiment, Lesser horseshoe bat activity declined significantly on the lit side of the experimental hedge under all light types compared to the dark control night, with white light having the strongest, and red light the weakest, effect. The reduction in passes on the lit side of the hedge was mirrored by a corresponding significant increase in passes on the opposite dark side of the hedge for all light types. No effect on ranging and foraging behaviour was observed (Zeale et al., 2018). Zeale *et al*. (2018) show that good management

of light spill can mitigate disturbance to Lesser horseshoe bats and recommends that light trespass on hedgerow commuting routes should not exceed that recorded on the dark side of the hedge (0.74 lx).

Sources of lighting which can disturb bats are not limited to roadside or external security lighting, but can also include light spill via windows, permanent but sporadically operated lighting such as sports floodlighting, and in some cases car headlights. Additionally, glare (extremely high contrast between a source of light and the surrounding darkness – linked to the intensity of a luminaire) may affect bats over a greater distance than the target area directly illuminated by a luminaire (BCT, 2018). Ecological light pollution can be caused by glare, over-illumination, light clutter (unnecessary numbers of light sources), light trespass (unwanted light) and skyglow, where artificial light is directed towards the sky, scattered by atmospheric molecules and reflected back to earth (RCEP, 2009, Gaston et al., 2012 and Kyba and Hölker, 2013, as cited in Rowse et al., 2016).

Light trespass differs from spill light (light present away from its intended location) as it occurs from a building or window into the outside environment. Light trespass contributes to glare and exterior illuminance. It can be expected that, unmitigated, light trespass would occur within new developments, particularly strongly within industrial/office or retail classes but to a lesser extent in residential zones. The effects of glare on bats are poorly understood. As a nocturnal mammal using eyesight for partial environmental sensing, especially at dusk and dawn, it is reasonable to assume that strong glare (a light source in high contrast with its surroundings) can contribute to dissuasion in bats away from a location or an increased perceived predation risk (CWEC, 2017).

Even with downward-facing lights, the glare from streetlights, and even from car headlights, is visible in the horizontal plane over a distance of many kilometres with the issue exasperated in elevated positions such as hillsides (Mathews et al., 2015). According to Mathews et al., (2015) this may affect bats in two ways. Second, the high contrast between lights and the surrounding dark landscape might make it difficult or impossible for animals to see adjacent features used for foraging or roosting such as hedgerows, woodlands, buildings or lakes. The rod cells in the eye operate best at low light intensities, and over-stimulation, caused by viewing a bright light, results in the rods becoming unresponsive for periods of more than 10 minutes (Hulbert, 1951 and Rowland and Sloan, 1944, as cited in Mathews et al., 2015). The greater the contrast with the surrounding environment, the worse this problem becomes.

BCT (2018) recommends a no-lighting approach to be taken for foraging and commuting habitat for highly light-averse and rare species like Lesser horseshoe bat. Similarly, NPWS (2022) recommends that there is no significant increase in artificial lighting adjacent to roosts of importance, or along commuting routes within 2.5km of these roosts.

Existing artificial lighting on Port Road

Currently, Port Road is lit by traditional sodium public streetlights on its eastern side that illuminate the footpath, road and spill onto the Deenagh River/Port Road woodland corridor (see Appendix 3, Lighting report). The NPWS are concerned that the streetlights are having a negative effect on foraging Lesser horseshoe bat along the corridor. The eastern side of the corridor is also affected by artificial lighting from existing residential development, traffic and Killarney town.

A total of 340 Lesser horseshoe bats were recorded emerging from the roost (no. 296) during the dusk survey. Results from the Dusk Bat Survey and the Static Detector Survey along the River Deenagh/Port Road woodland corridor show the presence of Lesser horseshoe bat. It is likely that the corridor is used as a commuting route by a portion of the bats using the roost. Bat surveys recorded the usage of the western side of the corridor by Lesser horseshoe bats. The western side of the corridor is a mostly dark corridor suitable for the species. Zeale et al. (2018) showed the importance of preserving dark corridors for Lesser

horseshoe bats. It is unlikely that the Port Road side of the Deenagh River/Port Road woodland corridor is suitable for Lesser horseshoe bats preferring instead the unlit side.

Artificial lighting and the LRD
The Lighting report illustrates through lux contour mapping that light spill from the streetlighting with the proposed residential development onto the Deenagh River/Port Road woodland corridor will not occur (see Appendix 3).

While the proposed residential development is set back (~60m at its closest) from the Deenagh River/Port Road woodland corridor and separated by the road and existing cottages/houses and their gardens, the northern part of the site is elevated so associated glare from upperstorey lighting, streetlighting, car lights, security lighting in the horizontal plane without mitigation may be visible from the corridor. The apartment blocks are at a lower level set back about 220m at their closest from the woodland corridor, though are 4 storeys' high so will contribute artificial light to the surrounding area. The proposed residential development is likely to contribute to overall levels of glare and sky glow to the surrounding area and along the eastern side of the Deenagh River/Port Road woodland corridor. The species composition of the woodland corridor west of the main PD site is mainly broadleaved trees such as Beech with some Sycamore, Holly and shrubs including Bramble, Laurel (evergreen). Laurel is particularly dominant on the western side of the riverbank opposite the site entrance providing year-round screening coverage. A short gap in tree cover exists north of the site entrance. Artificial light associated with glare and glow from the residential development is likely to penetrate gaps formed by breaks in the tree cover and into the corridor during months when foliage is absent such as winter and early spring months. However, by then the young have been reared and there is considerably less activity during hibernation between October and March.

The nearest streetlighting within the main PD site is located at the site entrance about 15m from the woodland and while it doesn't cause any light spill into the woodland corridor it will contribute to overall glow in the vicinity of the corridor. Lights from cars turning in and out of the entrance will result in temporary increases in glare. The AADT (Annual Average Daily Traffic) for Port Road has been approximated at 10,000 veh/day based on 2023 traffic counts and this will increase by 1,100 veh/day generated by the PD indicating an increase in car usage on Port Road. Lesser horseshoe bats fly within a few metres of the ground so are likely to be affected by glare in woodland adjacent and close to Port Road rather than deeper into the woodland.

Screening provided by existing tree cover and the Landscape Plan
While light spill will be contained within the proposed residential development, some glare and glow on Deenagh River/Port Road woodland corridor from the development will occur. In the Lighting report (see Appendix 3), screening levels provided by existing tree cover along the western boundary of the PD site were estimated using tree locations, height and canopy/crown extents for every single tree 3m and above in height obtained from Bluesky. Cross-section drawings illustrate that the existing tree cover along the western boundary of the site will provide considerable screening of parts of the development from the Deenagh River/Port Road riparian woodland when in foliage.

Newly planted landscaping features within the site will provide screening, which will improve over time as the features establish (see section **3.2.3** for full summary of Landscape Plan). A high degree of screening will be provided by the Landscaping plan along the western and southern boundaries as follows:

- strengthening of the western site boundary between the site entrance and the rear of the cottages with planting a dense/tightly spaced strip of native species with Oak on the outside/boundary side and a mix of Birch and Scots Pine inside.

- strengthening of the western site boundary along the rear of the cottages and existing residential trees and hedgerow with planting a dense/tightly spaced strip of native species including Birch, Alder, Oak and Scots Pine.
- retention of existing trees and hedgerow on the southern college fields boundary of the western field with planting of a few scattered Birch.
- retention of existing trees and hedgerow on the southern boundary of the eastern field and remove adjacent woodland and replace with planting of Oak, Birch and Alder, mainly.
- retention of area of hedgerow and Oak trees separating the western and eastern fields will be retained.

Scots pine is the only evergreen species proposed and will provide some year-round screening once established.

6.6.3 Conservation Objectives

The assessment in the table below concludes that potentially significant individual or cumulative indirect artificial lighting effects from the PD could not be ruled out on the following attribute and target that contribute to the CO to maintain the favourable conservation condition of Lesser horseshoe bat:

- **Extent of potential foraging habitat**
- **Linear features**
- **Light pollution (Lux).**

Mitigation measures to manage species disturbance or displacement effects are required.

Table 7. Assessment of effects of PD on CO for Lesser horseshoe Bat

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Assessment of Potentially Significant Cumulative Effects	Mitigation
Population per roost (number)	Min. & max. numbers for roosts including min. no. of 176 in winter & 315 in summer for Roost ID 296	The main PD site lies 0.5km NNW of Roost 296. The works along the eastern side of Port Road include widening of the footpath and new lighting are closer at 0.3km NNW. Given the intervening distance, Port Road and woodland cover, it is considered that the PD will not result in direct or indirect significant effects on the population of Roost 296 or any other roost. The PD is likely to increase recreational use and associated disturbance in the eastern part of the KNP near the town. However, given that most recreational activities will likely occur during daylight hours, the increase is unlikely to affect bats. *Potentially significant effects are unlikely.*	The main cumulative pressures on bats include removal of small landscape features, livestock farming (anti-parasitic drugs effect dung fauna), clear-cutting & removal of trees, construction/modification of houses in existing urban areas (alteration of buildings used by bats), human intrusion and disturbance, flooding (caves) and artificial lighting. The roost is a large roost with stable numbers, and appears not to be affected by ongoing impacts including lighting from ongoing noise, traffic, artificial lighting, recreational disturbances in the area of Port Road/Cathedral/KMP entrance particularly as these impacts are greater during summer. *Potentially significant cumulative effects are unlikely.*	No mitigation required.
Winter roosts (condition)	No decline	Condition in this instance refers to the suitability of a winter/summer roost site to host Lesser horseshoe bats in numbers at or exceeding the MQS[13]. Roost 296 is currently well in excess of the MQS. Suitable sites in summer generally witness low levels of disturbance, have appropriate access points for Lesser horseshoe bats and achieve the microclimatic conditions required for raising young (NPWS 2018). Roost 296 is situated in a relatively busy part of KNP, yet the roost reports high summer numbers indicating optimum conditions. The roost has less numbers in the winter however is above the MQS indicating optimum conditions for winter.	The roost itself is well protected being located in KNP. Cumulative pressure in summer includes relatively high levels of usage of the building containing the roost and surrounding parkland. The PD may result in a small overall increase in recreational pressure on this area of the park; however, it should not directly or indirectly affect conditions of the roost. *Potentially significant cumulative effects are unlikely.*	No mitigation required.
Summer roosts (condition)	No decline			No mitigation required.

[13] The minimum qualifying standard (MQS) for an SAC roost was set as 100 bats for a summer roost and 50 bats for a winter roost (NPWS, 2018)

		The main PD site lies 0.5km NNW of Roost 296. The works along the eastern side of Port Road include widening of the footpath and new lighting are closer at 0.3km NNW. There will be no direct effects on summer or winter roosts, no damage or disturbance to a roost or to the habitat immediately surrounding a roost which could lead to a decline in its condition. *Potentially significant effects are unlikely.*		
Number of auxiliary roosts (number & condition)	No decline	Lesser horseshoe bats rely on a network of sites that may include satellite, transitional and night roosts along with summer and winter roost sites, to fulfil their lifecycle requirements within a locality (NPWS, 2018). The NBDC mapper shows Lesser horseshoe roost locations as occupied 1km squares. The site is not encompassed by an occupied 1km square (V9591). V9590 (roost[14] located 0.3km south of PD site) and V9690 (roost located 0.3km SE of PD site) are the closest 1km squares just south of New Road. V9692 (roost located 1km NE of PD site) is occupied and lies north of the N22 Killarney bypass road. Roosts may include suitable mature trees. No trees will be removed within the SAC and most of the trees within the site will be retained. Given the intervening distance between the PD site and the roosts, there will be no direct effects on auxiliary roosts, no damage or disturbance to a roost or to the habitat immediately surrounding a roost which could lead to a decline in its condition. *Potentially significant effects are unlikely.*	The main cumulative pressures on auxiliary roosts include clear-cutting & removal of trees, construction/modification of houses in existing urban areas (alteration of buildings used by bats), human intrusion and disturbance. The PD will not result in the loss of any auxiliary roosts. *Potentially significant cumulative effects are unlikely.*	No mitigation required.

[14] Small 100m squares mapped within the occupied 1km squares are considered to be the roost locations.

Extent of potential foraging habitat (ha)	No significant decline	Bats forage in woodland, hedgerow and river corridors within 2.5km of roosts. Potential foraging habitat (hedgerow, treelines, scrub woodland) for Lesser horseshoe bat occurs within the site, however, the species has not been recorded from the site during bat surveys. Most of the hedgerow around the main PD site will be retained, gappy areas will be filled and extensive further native planting of trees and hedgerow will be carried out. The presence of artificial lighting near the hedgerows along the site boundary is likely to reduce their potential usage by light-averse bats. Given the absence of Lesser horseshoe bat records from the main PD site, retention and planting of native trees and hedgerow, there will be no significant decline in the extent of potential foraging habitat within the site. However, the proposed residential development may result in increased artificial lighting on the Deenagh River/Port Road woodland corridor resulting in a barrier to the movement of Lesser horseshoe bat. This may result in the reduction in usage of the corridor and a reduction in the availability of potential foraging habitat for bats. *Potentially significant effects cannot be ruled out.*	The main cumulative pressures on the extent of potential foraging habitat for bats include removal of small landscape features, livestock farming (anti-parasitic drugs effect dung fauna), clear-cutting & removal of trees, new (residential developments, streetlighting) and existing artificial lighting. Artificial lighting associated with the PD may result in a reduction in usage of the woodland corridor by creating a barrier to movement. Additional artificial lighting associated with new residential developments in Killarney may increase barriers to movement of Lesser horseshoe bat. *Potentially significant cumulative effects cannot be ruled out.*	Mitigation required.
Linear features (km)	No significant loss, within 2.5km of qualifying roosts.	Potential linear features (hedgerow, treelines) for Lesser horseshoe bat occurs within the main PD site, however, the species has not been recorded from the site during any of the bat surveys. Most of the hedgerow around the site will be retained, gappy areas will be filled and new native mostly continuous planting will occur along the boundaries. There will be no significant decline in the extent of linear features within the main PD site given the retention of most of the hedgerow, and planting of native trees. However, the residential development may result in increased	The main cumulative pressures on the extent of linear features for bats include removal of small landscape features, clear-cutting & removal of trees, new (residential developments, streetlighting) and existing artificial lighting. Artificial lighting associated with the PD may result in a reduction in usage of the woodland corridor linear feature by creating a barrier to movement. Additional artificial lighting associated with new residential developments in Killarney may increase barriers to movement of Lesser horseshoe bat along linear features, reducing the length of available linear features for commuting and foraging.	Mitigation required.

		artificial lighting on the Deenagh River/Port Road woodland corridor resulting in a barrier to the movement of Lesser horseshoe bat along this linear feature. This may result in the reduction in usage of the corridor and a reduction in usage of the linear feature/corridor. *Potentially significant effects cannot be ruled out.*	*Potentially significant cumulative effects cannot be ruled out.*	
Light pollution (Lux)	No significant increase in artificial light intensity adjacent to named roosts or along commuting routes within 2.5km of those roosts.	The main PD site lies 0.5km NNW of Roost 296 and 0.3km north of nearest end of the Port Road footpath widening works. The intervening land between the roost and the works is mostly continuous woodland cover. Therefore, there will be no significant increase in artificial light intensity (illumination or glare) adjacent to the roost. Lesser horseshoe bat use the Deenagh River/Port Road woodland corridor. Artificial lighting from the proposed residential development could result in the avoidance of brightly lit areas by Lesser horseshoe bat and reductions in insect abundance/diversity along the corridor. Lighting can also create a barrier to movement by fragmenting habitats and disrupting commuting routes by altering commuting behaviour, reducing commuting activity. Lighting can fragment commuting routes causing bats to alter their behaviour with potentially negative consequences for their conservation. *Potentially significant effects cannot be ruled out.*	Cumulative lighting impact sources include existing urban/residential area, streetlights, traffic lights. Additional artificial lighting associated with new residential developments in the future will increase light pollution in the town and possibly the KNP SAC. *Potentially significant cumulative effects cannot be ruled out.*	Mitigation required.

6.7 Otter

Otters have two basic requirements: aquatic prey and safe refuges where they can rest. In Ireland, otter populations are found along rivers, lakes and coasts, where fish and other prey are abundant, and where the bank-side habitat offers plenty of cover. The otter is an opportunistic predator with a broad and varied diet. It is estimated that there are between 7,000 and 10,000 breeding females in the country (NPWS, 2019a). Otters are considered likely to forage in watercourses where they are sufficiently large to support an adequate food supply.

The NBDC have records of Otter all around Lough Leane, in the upper catchment as well as the lower catchment on the Laune River. Records include the lower reaches of the Deenagh River. The PD site is not suitable for Otter and the nearest likely occurrence is along the Deenagh River, west of Port Road.

The assessment in the table below concludes that potentially significant individual or cumulative indirect effects from the PD are unlikely on the attribute and targets that contribute to the CO to maintain the favourable conservation condition of Otter. No mitigation is required.

Table 8. Assessment of effects of PD on the CO of Otter

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Assessment of Potentially Significant Cumulative Effects	Mitigation
Distribution (& positive survey sites)	No significant decline	The likely nearest area supporting Otter is the Deenagh River, west of Port Road. The site is not suitable for Otter and neither is the Folly stream that runs along the southern boundary of the site suitable. The PD will not directly affect Otter distribution. The site is separated from the Deenagh River by Port Road, which has an AADT of 16,000 vehicles/day. This will increase to xx with the PD. It is not considered that Otter using the Deenagh River will be significantly affected by the increase in disturbance. The PD is likely to increase recreational use and associated disturbance in the eastern part of the KNP near the town, however, users are likely to stick the path and use it mainly in daylight hours, though Otters also active in daytime. The distribution of Otter along the Deenagh River or the KNP SAC is unlikely to be affected by the development. *Potentially significant effects are unlikely*.	NPWS (2019a) have not identified any pressures acting on Otter. Otter has a favourable conservation status nationally with an improving conservation trend. Cumulative effects from recreational users in the park, increase of usage of Port Road will occur, however, they are unlikely to interfere with the distribution of Otter on the Deenagh River. *Potentially significant cumulative effects are unlikely*.	No mitigation required.
Extent of terrestrial habitat (ha)	No significant decline. Area mapped along riverbanks, lake/pond shoreline	The likely nearest area supporting Otter is the Deenagh River, west of Port Road. The PD site is not suitable for Otter and neither is the Folly stream that runs along the southern boundary of the site. It is likely that Otter would use the terrestrial habitat on both sides of the Deenagh riverbanks though limited in extent on the eastern side with the road. Otter is also likely to use a commuting area of up to 250m from the shoreline of Lough Leane. The PD will not result in the loss of riverbanks or shoreline habitat and will not affect the available extent of these terrestrial habitats.	The Otter has a favourable conservation status nationally. Cumulative pressures on the extent of terrestrial habitat include changes in land use along commuting area of shoreline habitat and riverbank works. However, all shoreline habitat associated with Lough Leane and riverbanks are within the SAC so protected from development. Thus, it is unlikely that the PD will result in significant cumulative effects on the extent of available terrestrial habitat. *Potentially significant cumulative effects are unlikely*.	No mitigation required.

		Potentially significant effects are unlikely.		
Extent of marine habitat (ha)	No significant decline	The nearest marine habitat in the KNP SAC is in Dingle Bay on the foothills of Knocknadobar mountain, northeast of Caherciveen. The PD will not affect the available extent of marine habitats in the SAC. *Potentially significant effects are unlikely*.	No cumulative pressures are identified for Otter using marine habitats with the SAC. The PD is unlikely to result in a significant cumulatively effect on the available extent of marine habitats in the SAC. *Potentially significant cumulative effects are unlikely*.	No mitigation required.
Extent of freshwater (river) habitat (ha)	No significant decline	The site is not suitable for Otter and neither is the Folly stream that runs along the southern boundary of the site suitable. The likely nearest area supporting Otter is the Deenagh River, west of Port Road. The PD will not affect the extent of freshwater habitat, riverine or lake, or couching sites or holts, in the Deenagh River or elsewhere in the SAC. *Potentially significant effects are unlikely*.	Cumulative pressures affecting the extent of freshwater habitat in the SAC include severe water pollution. While the PD will result in cumulative water quality effects, it is not considered likely that they will result in significant cumulative effects on the extent of riverine or lake freshwater habitat, or couching sites or holts, in the SAC. *Potentially significant cumulative effects are unlikely*.	No mitigation required.
Extent of freshwater (lake) habitat (ha)	No significant decline			No mitigation required.
Couching sites and holts (no.)	No significant decline			No mitigation required.
Fish biomass availability (kg)	No significant decline	Otter is considered a fish specialist with salmonids (salmon and trout) making up about 70% of diet for river-based Otters, however, the percentage frequency of salmonids was negatively correlated with orthophosphates. Otter also take Perch and smaller fish like Stickleback and are It is also evident that individual otters are opportunistic in specialising on food items at certain times (Reid et al., 2013). A recent fish stock survey of Lough Leane recorded the presence (in order of abundance) of Brown trout, Perch, Rudd, Killarney shad, Salmon, Tench, Founder, Minnow, Arctic char, European eel. By far the most abundant was Brown trout, Perch and Rudd, and there was little change between numbers and biomass of these species, and shad, between	The main cumulative pressure on water quality in the catchment are agriculture and in Lough Leane, both agriculture and WWTP/urban discharges. Future cumulative pressures from climate change are likely. Fish species populations appear to be stable and are classified as Good in 2021 McCloone et al., 2022). The contribution of the water quality impacts together with cumulative impacts are not expected to make an appreciable difference to fish biomass especially when the favourable conservation status along with its improving conservation trend are considered.	No mitigation required.

		2005 and 2021. Eel appears to have declined in this period. Lough Leane was classified as Good in 2021 based on the fish populations present (McCloone et al., 2022). While potentially negative effects on water quality cannot be ruled out, the effects are unlikely to significantly affect fish biomass. *Potentially significant effects are unlikely*.	*Potentially significant cumulative effects are unlikely.*	
Barriers to connectivity (no.)	No significant decline	The PD will not result in any physical barriers to connectivity for Otter in the SAC. *Potentially significant effects are unlikely*.	Cumulative impacts affecting Otter movement in the SAC could potentially include severe pollution, however, severe pollution is not evident in the catchment. . *Potentially significant cumulative effects are unlikely*.	No mitigation required.

6.8 Slender Naiad (*Najas flexilis*)

Slender naiad occurs on flat to gently sloping areas of lakebed with soft substrata of mud, silt or fine sand and can occur at depths of 0.5-10m but is frequently associated with lower depths. It is usually found in clear-water, lowland lakes, favours mixed geological conditions and is characteristic of mesotrophic lakes though in Ireland appears to be strongly associated with lakes that are naturally oligotrophic i.e., low in dissolved and particulate forms of phosphorous and nitrogen (O'Connor, 2013). It is an annual species, an early coloniser and a poor competitor (Wingfield et al., 2004).

Slender naiad almost exclusively utilises phosphorous from the sediment; however, enrichment of the sediment appears to lead to declines/losses of the species. Research is required to further characterise the substratum type (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by the species in Ireland (NPWS, 2017b).

It is an annual species so relies on seeds for growth, dispersal and establishment. Seeds are produced from late summer to early Autumn and seedlings begin to appear in early summer. There is little knowledge on Slender naiad seedbank persistence competitor. Specific plant traits or combinations of traits are often used as indicators of a species' fitness and relates to seed production and survival, seedling survival and reproductive success. Seed production in Slender naiad appears to be reduced by both eutrophication and acidification (Wingfield et al., 2004).

6.8.1 Lough Leane Population

In 2007, Lough Leane was considered to support a 'Large' population of Slender naiad though categories are subjective, and difficulty exists in estimating population size (Roden, 2007). NPWS (2017b) acknowledged that while the population may experience annual variations, viable populations should not significantly change over time.

NPWS records from 2013 for the waters of Lough Leane around Ross Island recorded Slender naiad at eleven locations: eight in Ross Bay; two west of Ross Island in Hyde's Bay; and one in Castlelough Bay. Two 2018 NPWS records exist for Victoria Bay and a single 2018 record exists for west of Ross Island.

In 2021 Roden *et al*., completed a study of lakes with Slender naiad in Ireland. The study found that the population at Lough Leane is near extinction compared to a survey in 2013. It reported that, Lough Leane, the remaining large *Najas flexilis* type lake in Ireland appears to be in the process of degradation with the recent loss of many species found in *Najas flexilis*-type lakes, along with the almost complete disappearance of Slender naiad itself. The diverse flora present even in 2005 is now contracting and Slender naiad itself is reduced at best to a few isolated individuals. The lake was found to be seriously impacted by eutrophication (blanket of decaying algae at depth), having lost characteristic species and habitats. In the study, Slender naiad was only recorded at 1 location in Lough Leane. In 2019, only 1 plant could be found in Ross Bay (Roden et al., 2021).

The current status is *Inadequate* (NPWS, 2019b), however, Roden et al., (2021) concluded that may of *Najas flexilis*-type lakes such as Lough Leane are in *Bad* conservation condition indicating population has declined or become extinct. In Lough Leane the population is now considered to be near extinction compared to a 2013 survey. Previously, the conservation condition of Slender naiad at Lough Leane was considered Poor (O'Connor, 2013). The CO are based on a targeted survey of Slender naiad for NPWS (Roden and Murphy, 2014).

6.8.2 Existing Threats

Enrichment of water with these nutrients (eutrophication) is considered a significant pressure on the species, which grows at the lower level of the euphotic zone (where light is sufficient for the growth of plants) and can be easily outcompeted by perennials such as pondweeds and 'shaded' by abundant phytoplankton (O'Connor, 2013). As a result, sunlight is blocked from reaching plants underwater so they cannot photosynthesise. Acidification is another threat to Slender naiad with the plant becoming more elusive in lakes of pH < 7. It requires specific environmental conditions (depth, acidification, nutrients), which makes it more vulnerable to small environmental changes (Wingfield et al., 2004). Increased sediment loads (leading to sedimentation and turbidity) and increased water colour are other likely impacts (O'Connor, 2013).

NatureScot (2021) noted that the main threats to Slender naiad are considered to be nutrient enrichment and competition from invasive non-native species particularly *Elodea canadensis* and *E. nutallii*. Canadian Pondweed (*Elodea canadensis*) is considered a major ecological threat by out-competing native plants and has been linked to extinction of Slender naiad, and is present in Lough Leane (Roden *et al*., 2021). O'Connor (2013) reported the distribution of this non-native species overlapping very closely with that of Slender naiad, notably south-east of Ross Island and near the Muckross House boathouse.

6.8.3 Climate Change

Climate change has been highlighted as a potential risk to Slender naiad populations in Scotland by, for instance, causing increases in nutrient and sediment run-off from lake catchments with a predicted rise in the number and severity of storm events, particularly in summer months when seedlings are very vulnerable to disturbance (Gunn and Carvalho, 2020). Bishop ((2019), as cited in Gunn and Carvalho, 2020) does note the recurring pattern of Slender naiad being lost from many of its locations at its southern distributional limit in the British Isles, in continental Europe and in the USA. With climate change it is likely that primary productivity of freshwater ecosystems will increase with warming, leading to an increase in the negative effects of alkalinisation and eutrophication, as well as resulting in more extreme rainfall. The latter changes in rainfall patterns could potentially adversely affect the balance between the acid-run-off from upland catchments and underlying base-rich input from underlying geology that characterises many of the species current strongholds (Gunn and Carvalho, 2020).

Climate change poses a threat from increased drought and storm events releasing nutrients. According to O'Connor (2013) the likely effects of temperature increases may include earlier germination, could influence competition for resources and the spread of invasive alien species. Increased rainfall and storm events increase the release of nutrients to the water from agriculture and forestry and may put pressure on urban WWTP's, all of which may increase eutrophication of the Lough Leane.

By mid-century, increases in both dry periods and heavy precipitation events are predicted, resulting in increased flood risk and droughts risks[15]. Lower precipitation could lead to reduced flow in rivers and a decreased volume of water in lakes and reservoirs, reducing the dilution capacity of the waterbody. In the heatwave/drought in the summer of 2018, reduction in the assimilative capacity of waters receiving discharges resulted in water quality problems. Shifts in temperature may result in increased occurrence of invasive species and competitive pressures for our native species.

Increased frequency of dry periods resulting in increased risk of drought conditions during summer months may lower the lake levels in Lough Leane and increase the concentration of pollutants such as phosphorous and nitrogen and may increase the risk of eutrophication impacts during future drought conditions.

[15] https://www.epa.ie/our-services/monitoring--assessment/assessment/irelands-environment/climate/

6.8.4 Conservation Objectives

The conservation objective for Slender naiad is to maintain the favourable conservation condition of the QI in the Killarney National Park SAC, which is defined by the list of attributes and targets set out in the table below.

The assessment in the table below concludes that potentially significant individual or cumulative indirect water quality effects from the PD could not be ruled out on the following attribute and target that contribute to the CO to maintain the favourable conservation condition of Slender naiad:

- **Population extent, viability and abundance**
- **Habitat extent**
- **Lake substratum**
- **Water quality**
- **Associated species.**

Mitigation measures to manage water quality effects are required.

Table 9. Assessment of effects of PD on CO for Slender naiad (*Najas flexilis*)

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Assessment of Potentially Significant Cumulative Effects	Mitigation
Population extent (ha)	No change	Slender naiad is on the brink of extinction after a recent population collapse at Lough Leane due mainly to eutrophication and possibly, presence of Canadian pondweed. Only one plant was recorded at Ross Bay in 2019 and thus it is considered the population is now not viable. Evidence suggests the main cause is eutrophication. The PD has the potential to have negative water quality effects. *Potentially significant effects cannot be ruled out*.	Existing water quality cumulative pressures include agriculture, forestry, urban run-off and WWTP discharges. Competition from invasive non-native species such as Canadian pondweed risk out-competing Slender naiad and is present in Ross Bay. Climate change will likely result in increased eutrophication pressure on Slender naiad with increases in nutrient losses from the land. Increased risk of drought conditions posed by increased frequency of dry periods may contribute to the effects of eutrophication of the lake and Slender naiad. *Potentially significant cumulative effects cannot be ruled out*.	Mitigation required.
Population depth (m)	No change to depth range	Slender naiad was recorded at 3m in Lough Leane in 2019 with depths of 1-5m being particularly important for the species. Light penetration can be negatively affected by increases in phytoplankton biomass, water colour or turbidity. The PD will contribute to the hydraulic loading to the WWTP, however, the volumes in question are not expected to appreciably affect the depth of the lake. *Potentially significant effects are unlikely*.	Agricultural drainage activities can affect lake depth. Drought conditions associated with climate change can alter depth and increase nutrient concentrations. The construction and operation of the PD will contribute to GHG emissions globally though emission contributions are proportionally so small, they will not result in an appreciable effect on global warming. The PD will contribute to the hydraulic loading to the WWTP, however, the volumes in question are not expected to appreciably affect the depth of the lake. *Potentially significant cumulative effects are unlikely*.	No mitigation required
Population viability (traits)	No decline in plant fitness	Population viability relates to plant fitness: seed production and survival, seedling survival and reproductive success. Eutrophication can negatively affect seedling survival and reproductive success by reducing the ability of the plant to photosynthesise through increased turbidity and associated reduced light penetration as well as depleting stores of	Existing water quality cumulative pressures include agriculture, forestry, urban run-off and WWTP discharges. Competition from invasive non-native species such as Canadian pondweed risk out-competing Slender naiad. Climate change will result in increased eutrophication pressure and increased	Mitigation required.

		inorganic carbon. The PD has the potential to have negative water quality effects. *Potentially significant effects cannot be ruled out*.	temperature will potentially affect the timing of seed germination. The PD has the potential to have negative water quality effects and together with cumulative pressures may negatively affect population viability of Slender naiad. *Potentially significant cumulative effects cannot be ruled out.*	
Population abundance (m^2)	No change in cover	Population abundance likely varies annually, however, the most recent survey of Slender naiad in 2019 recorded only one plant in Ross Bay. The population is considered near extinct compared to the results of the 2013 survey. Negative water quality may affect population abundance. *Potentially significant effects cannot be ruled out*.	Together with cumulative pressures (eutrophication, climate change, invasive species) the PD may negatively affect population abundance and distribution of Slender naiad. *Potentially significant cumulative effects cannot be ruled out*.	Mitigation required.
Species distribution (occurrence)	No decline			Mitigation required.
Habitat extent (ha)	No decline	The lake habitat for Slender naiad relates to the lake area and habitat of the species within the lake, which appears to be widespread in the lake. The PD will not result in direct loss of lake or species habitat. Indirect loss through a reduction in water quality may affect extent of suitable habitat. *Potentially significant effects cannot be ruled out.*	The PD has the potential to have negative water quality effects and together with cumulative pressures (eutrophication, climate change, invasive species) may negatively affect suitable available habitat for Slender naiad. *Potentially significant cumulative effects cannot be ruled out.*	Mitigation required.
Hydrological regime: water level (m)	Maintain natural hydrological regime	Changes in hydrological regime include changes to water depths and increased water fluctuations, which can lead to changes to the lake substratum and associated species distribution, as well as nutrient release. The PD will contribute additional hydraulic loading to the WWTP, however, given the volumes in question the hydrological regime will not be appreciably affected. *Potentially significant effects are unlikely.*	Agricultural drainage activities can affect lake depth. Drought conditions associated with climate change can alter depth and result in increased water fluctuations and increase nutrient concentrations. The PD will contribute additional hydraulic loading to the WWTP. However, the volumes in question are considered too small to affect the lakes hydrological regime, either individually or in-combination with cumulative pressures, and is not expected to result in any appreciable negative effects. *Potentially significant cumulative effects are unlikely.*	No mitigation required.

Lake substratum quality (various)	Maintain appropriate substratum type	The target is to maintain appropriate substratum type, extent and chemistry to support the population of Slender naiad. The PD has the potential to have negative water quality effects. *Potentially significant effects cannot be ruled out.*	Cumulative effects on water quality listed above can negatively affect substratum chemistry. *Potentially significant cumulative effects cannot be ruled out.*	Mitigation required.
Water quality (various)	Maintain/restore appropriate water quality	Ross Bay is currently Moderate status with the objective to restore to Good status. The PD has the potential to have negative water quality effects. *Potentially significant effects cannot be ruled out*.	Restoration efforts may be hampered by cumulative effects (eutrophication, climate change effects). *Potentially significant cumulative effects cannot be ruled out.*	Mitigation required.
Acidification status (pH units)	Maintain appropriate water and sediment pH, alkalinity and carbon concentrations	Acidification occurs freshwater acidification is primarily caused by sulfur oxides (SOx) and nitrogen oxides (NOx) entering the water from atmospheric depositions and soil leaching[16]. Runoff from commercial conifer forestry is also a factor. The PD is unlikely to result in significant effects on acidification status of the lake. *Potentially significant effects are unlikely.*	Cumulative pressures from atmospheric deposition and forestry runoff increase the risk of acidification status of lakes. The PD is unlikely to result in significant effects on acidification status of the lake. *Potentially significant cumulative effects are unlikely.*	No mitigation required.
Water colour	Maintain appropriate water colour	The main source of increases in colour is from peatland runoff. Increase in foul to the WWTP may result in an increase in turbidity in the lake during summer months when the hydraulic loading of the WWTP increases. However, it is not considered that the PD will result in a measurable increase in water colour. *Potentially significant effects are unlikely.*	PD will contribute additional nutrient loading to the WWTP and lake and together with cumulative pressures (peat extraction, eutrophication, climate change, invasive species) the PD may negatively affect water colour. However, it is not considered that the PD will not result in a significant cumulative increase in water colour. *Potentially significant cumulative effects are unlikely.*	No mitigation required.
Associated species (composition	Maintain appropriate associated	In Lough Leane, the associated species of mixed *Najas flexilis* lake habitat type is contracting, losing its characteristic species and considered to be in Bad conservation condition. The PD has the potential to have negative water quality effects.	Cumulative eutrophication pressures are currently affecting the abundance and diversity of associated species.	Mitigation required.

[16] https://en.wikipedia.org/wiki/Freshwater_acidification

and abundance)	species and vegetation	*Potentially significant effects cannot be ruled out*.	*Potentially significant cumulative effects cannot be ruled out*.	

6.9 Oligotrophic Lake/Mixed *Najas flexilis* Lake Habitat

This habitat is a mix of two habitat types: oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae); and oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea referred to as Mixed *Najas flexilis* lake habitat for short.

Lough Leane, Muckross Lake and the Upper Lake, as well as other lakes in the SAC, are categorised as oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea (NPWS, 2017a). Lough Leane is mesotrophic rather than oligotrophic and has in the past suffered from eutrophication and Roden et al., (2021) concluded that Lough Leane is in ecological decline.. 'Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoeto Nanojuncetea' has been interpreted as a mixed Najas flexilis lake habitat in Ireland. The habitat occurs in lakes with circum-neutral, low-nutrient waters in catchments of mixed geology. The Annex II macrophyte *Najas flexilis* (Slender naiad) is a character species. The co-occurrence of *Potamogeton perfoliatus* and *Isoetes lacustris* is also characteristic. Owing to its rare species and relatively high species richness, habitat 3130 is of high conservation value. Ireland is a European stronghold for the habitat and for *Najas flexilis* (NPWS, 2019a). Roden et al., (2021) found that the remaining large Slender naiad type lake in Ireland, Lough Leane in Killarney, appears to be in the process of degradation with the recent loss of many species found in *Najas flexilis*-type lakes, along with the almost complete disappearance of Slender naiad itself. The diverse flora present even in 2005 is now contracting and Slender naiad itself is reduced at best to a few isolated individuals. The ecology, population and threats to Slender naiad are presented above in section **6.8**.

The assessment in the table below concludes that potentially significant individual or cumulative indirect water quality effects from the PD could not be ruled out on the following attribute and target that contribute to the CO to maintain the favourable conservation condition of Oligotrophic Lake/Mixed *Najas flexilis* lake habitat:

- **Habitat area and distribution**
- **Typical species**
- **Vegetation composition (characteristic zonation)**
- **Lake substratum**
- **Water quality (nutrients, phytoplankton biomass and composition, attached algal biomass, macropyte status)**
- **Fringing habitats.**

Mitigation measures to manage water quality effects are required.

Table 10. Assessment of effects of PD on CO for Oligotrophic Lake/Mixed *Najas flexilis* Lake

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Assessment of Potentially Significant Cumulative Effects	Mitigation Required
Habitat area (ha)	Stable or increasing	The characteristics and distribution of the lake habitat in Ireland are not yet fully understood. Presence of Slender naiad is considered to be characteristic of the habitat. The PD will not directly affect the area of the lake itself or the extent of the vegetation communities/zones that typify the habitat, typical plant species, the characteristic vegetation zones. Slender naiad is on the brink of extinction after a recent population collapse at Lough Leane due mainly to eutrophication and possibly, presence of Canadian pondweed. Only one plant was recorded at Ross Bay in 2019 and thus it is considered the population is now not viable on the basis of reduced water quality. The PD may negatively affect water quality. *Potentially significant effects cannot be ruled out*.	Cumulative pressures on the lake habitat include water quality impacts from agriculture, forestry, urban run-off and WWTP discharges. Competition from invasive non-native species such as Canadian pondweed risk out-competing Slender naiad and is present in Ross Bay. Climate change will likely result in increased eutrophication pressure on Slender naiad and other community plant species with increases in nutrient losses from the land. Increased risk of drought conditions posed by increased frequency of dry periods may contribute to the effects of eutrophication of the lake and Slender naiad. *Potentially significant cumulative effects cannot be ruled out*.	Mitigation required.
Habitat distribution (occurrence)	No decline			Mitigation required.
Typical species (occurrence)	In good condition			Mitigation required.
Vegetation composition: characteristic zonation (occurrence)	All characteristic zones present			Mitigation required.
Vegetation composition: max. depth (m)	Maintain max depth	The maximum depth of vegetation is likely to be specific to the lake shoreline. Light penetration can be negatively affected by increases in phytoplankton biomass, water colour or turbidity. The PD will contribute additional hydraulic loading to the WWTP, however, the volumes in question are not expected to appreciably affect the depth of the lake. *Potentially significant effects are unlikely*.	Agricultural drainage activities can affect lake depth. Drought conditions associated with climate change can alter depth and increase nutrient concentrations. The construction and operation of the PD will contribute to GHG emissions globally though emission contributions are proportionally so small, they will not result in an appreciable effect on global warming. The PD will contribute additional hydraulic loading of foul to the WWTP, however, the volumes in question are not expected to appreciably affect the depth of the lake.	No mitigation required

			Potentially significant cumulative effects are unlikely.	
Hydrological regime: water level fluctuations (m)	Maintain appropriate regime	Changes in hydrological regime include changes to water depths and increased water fluctuations, which can lead to changes to the lake substratum and associated species distribution, as well as nutrient release. The PD will contribute additional hydraulic loading to the WWTP, however, given the volumes in question the hydrological regime will not be appreciably affected. *Potentially significant effects are unlikely.*	Agricultural drainage activities can affect lake depth. Drought conditions associated with climate change can alter depth and result in increased water fluctuations and increase nutrient concentrations. PD will contribute additional hydraulic loading to the WWTP. However, the volumes in question are considered too small to affect the lakes hydrological regime, either individually or in-combination with cumulative pressures, and is not expected to result in any appreciable negative effects. *Potentially significant cumulative effects are unlikely.*	No mitigation required.
Lake substratum quality (various)	Maintain type, extent, chemistry	The target is to maintain appropriate substratum type, extent and chemistry to support the population of Slender naiad. The PD may negatively affect water quality in the lake. *Potentially significant effects cannot be ruled out.*	Cumulative effects on water quality listed above, particularly agriculture and WWTP can negatively affect substratum chemistry. *Potentially significant cumulative effects cannot be ruled out.*	Mitigation required.
Water quality: transparency (m)	Maintain, no decline	Mixed *Najas flexilis* lake habitat is associated with high water quality, with naturally low dissolved nutrients. It is naturally more productive than oligotrophic lake habitat (3110), probably reflecting higher concentrations of nutrients such as calcium, rather than P alone. Mixed *Najas flexilis* lake habitat may reach favourable condition slightly above the oligotrophic boundary for nutrients, but in the absence of habitat-specific targets, the targets are WFD ‘High Status’ or oligotrophic. The “good-	Restoration efforts may be further impeded by cumulative effects (eutrophication, climate change effects). *Potentially significant cumulative effects cannot be ruled out.*	Mitigation required.
Water quality: nutrients (µg/l P; mg/l N)	Maintain/restore the concentration of nutrients in the water column to sufficiently low levels to support			Mitigation required.

	the habitat & its typical species	moderate" boundary is too enriched to support the habitat. Annual average total phosphorus (TP) concentration should be ≤10µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N. The lake habitat is associated with naturally low algal growth (NPWS, 2017a). Phytoplankton status was Moderate and macrophyte status was High for Ross Bay in the 2016-2021 sampling period of the WFD. Lough Leane is currently at Good ecological status. Ross Bay is currently Moderate status with the objective to restore to Good status. The PD may negatively affect water quality in the lake. *Potentially significant effects cannot be ruled out*.		
Water quality: phytoplankton biomass (µg/l Chlorophyll a)	Maintain/restore high chlorophyll a status			Mitigation required.
Water quality: phytoplankton composition (EPA metric)	Maintain/restore high phytoplankton composition status			Mitigation required.
Water quality: attached algal biomass (algal cover & EPA metric)	Maintain/restore trace/absent attached algal biomass (<5%) and high phytobentos status			Mitigation required.
Water quality: macrophyte status (EPA metric)	Maintain/restore high macrophyte status			Mitigation required.
Acidification status (pH units; mg/l)	Maintain appropriate sediment and water levels	Acidification occurs freshwater acidification is primarily caused by sulfur oxides (SOx) and nitrogen oxides (NOx) entering the water from atmospheric depositions and soil leaching[17]. Runoff from commercial conifer forestry is also a factor. The PD is unlikely to result in significant effects on acidification status of the lake. *Potentially significant effects are unlikely.*	Cumulative pressures from atmospheric deposition and forestry runoff increase the risk of acidification status of lakes. The PD is unlikely to result in significant effects on acidification status of the lake. Significant cumulative effects to acidification status as a result of the PD are unlikely. *Potentially significant cumulative effects are unlikely.*	No mitigation required.

[17] https://en.wikipedia.org/wiki/Freshwater_acidification

Water colour (mg/l PtCo)	Maintain appropriate levels	No habitat-specific or national standards for water colour currently exist. The primary source of increased water colour in Ireland is disturbance to peatland. Increase in foul to the WWTP may result in an increase in turbidity in the lake during summer months when the hydraulic loading of the WWTP increases. However, it is not considered that the PD will result in a measurable increase in water colour. *Potentially significant effects are unlikely.*	The PD will contribute additional nutrient loading to the WWTP and together with cumulative pressures (peat extraction, eutrophication, climate change, invasive species) the PD may negatively affect water colour. However, it is not considered that the PD will result in a significant cumulative increase in water colour. *Potentially significant cumulative effects are unlikely.*	No mitigation required.
Dissolved organic carbon (DOC) (mg/l)	Maintain appropriate levels	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients (NPWS, 2017a). The PD is not expected to appreciably affect levels of DOC in the lake. *Potentially significant effects are unlikely.*	Cumulative pressures on DOC include degradation of peatlands. It is not considered that the PD will not result in a significant cumulative increase in water colour. *Potentially significant cumulative effects are unlikely.*	No mitigation required.
Turbidity (appropriate units)	Maintain appropriate levels	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. The PD is not expected to appreciably affect turbidity levels in the lake. *Potentially significant effects are unlikely.*	Cumulative pressures on turbidity include runoff of silts from agricultural and forestry land practices as well as eroding or worked peatlands. It is not considered that the PD will not result in a significant cumulative increase in turbidity. *Potentially significant cumulative effects are unlikely.*	No mitigation required.

Fringing habitat: area and condition (ha)	Maintain levels necessary to support the natural structure and functioning of the lake habitat	In Lough Leane, the associated species of mixed *Najas flexilis* lake habitat type is contracting, losing its characteristic species and considered to be in Bad conservation condition. The PD has the potential to have negative water quality effects, which may in turn negatively affect the associated species of the habitat type. *Potentially significant effects cannot be ruled out*.	Cumulative eutrophication pressures are currently affecting the abundance and diversity of associated species. *Potentially significant cumulative effects cannot be ruled out*.	Mitigation required.

6.10 Killarney Shad

The Killarney shad is unique to Ireland and is only recorded in Lough Leane in the Killarney National Park SAC. The Killarney shad is a landlocked, non-migratory subspecies of the twaite shad (*Alosa fallax*) that probably colonised Lough Leane thousands of years ago and became isolated there[18]. Anecdotal reports and observations indicate that the species spawns within Lough Leane along shallow gravelled shores and on gravel shoals adjoining the various islands. The adult fish live in shoals in the lake, feeding on zooplankton. Thus, the full life cycle is undertaken within the lake (NPWS, 2019a). Population numbers appear to be relatively stable between 2005 and 2021 (McCloone et al., 2022). While the conservation status of Killarney shad is favourable and trend is stable, the CO is to restore its favourable conservation condition. It is considered that the objective to restore relates primarily to the water quality in the lake and the requirement to achieve High ecological status under the WFD.

The assessment in the table below concludes that potentially significant individual or cumulative indirect water quality effects from the PD could not be ruled out on the following attribute and target that contribute to the CO to restore the favourable conservation condition of Killarney shad:

- **Water quality.**

Mitigation measures to manage water quality effects are required.

[18] https://www.fisheriesireland.ie/species/killarney-shad-alosa-fallax-killarnensis

Table 11. Assessment of effects of PD on CO for Killarney shad

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Assessment of Potentially Significant Cumulative Effects	Mitigation Required
Distribution (occurrence)	Widespread recording during appropriate fish sampling	Populations of Killarney shad appear to be relatively stable between 2005 and 2021 (McCloone et al., 2022). The PD is not expected to affect the distribution of the species. *Potentially significant effects are unlikely*.	Possible cumulative effects on distribution include eutrophication and angling. Given the favourable conservation status and the stable population trend since 2005, the PD is unlikely to result in significant cumulative effects. *Potentially significant cumulative effects are unlikely*.	No mitigation required.
Population structure: age classes (no. age classes)	Full range of age classes	Inland Fisheries Ireland (IFI) surveys for Water Framework Directive (WFD) purposes (Kelly et al., 2012, 2015 as cited in NPWS, 2017a) indicate on-going occurrence of this species, as well as recruitment to adult size. Trials with pelagic netting indicated a range of age classes when sampled in May 2014, including fish spawned in May 2013 (IFI, unpublished data as cited in NPWS, 2017a). Given the favourable conservation status and stable population trend since 2005 it is considered that the PD would not appreciably affect population structure. *Potentially significant effects are unlikely*.	Cumulative impacts acting on population structure include eutrophication. Given the favourable conservation status and stable population trend since 2005 it is considered that the PD would not appreciably affect population structure. *Potentially significant cumulative effects are unlikely*.	No mitigation required.
Extent and distribution of spawning habitat (m^2 & occurrence)	No decline	Anecdotal reports and observations indicate that the species spawns within Lough Leane along shallow gravelled shores and on gravel shoals adjoining the various islands. The PD will not affect the extent or distribution of spawning habitat. The PD could potentially affect the habitat quality through an increase in lake eutrophication. Considered satisfactory in terms of gravel composition and low levels of fine sediment	Cumulative impacts acting on suitable spawning grounds/gravels can include excessive algal growth associated with eutrophication, significant accumulations of silt from peat extraction, forestry and agricultural activity in a river catchment. However, given the favourable conservation status and stable population trend since 2005 it is considered that the PD would not appreciably affect spawning habitat quality.	No mitigation required.
Spawning habitat quality: filamentous algae; macrophytes;	Maintain stable gravel substrate with very little fine material, free of			No mitigation required.

sediment (occurrence)	filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth	accumulations in gravel bed areas due to the exposed nature of the site to wave action (NPWS, 2017a). However, given the favourable conservation status and stable population trend since 2005 it is considered that the PD would not appreciably affect spawning habitat quality. *Potentially significant effects are unlikely*.	*Potentially significant cumulative effects are unlikely*.	
Water quality: oxygen levels (mg/l)	No lower than 5mg/l	It is considered that the objective to restore the conservation condition of Killarney shad relates primarily to the water quality in the lake and the requirement to achieve High ecological status under the WFD. IFI surveys of 2008, 2011 and 2014 all allocated a WFD 'good' status in the context of the fish Ecological Quality Ratio (EQR) (Kelly et al., 2015 as cited in NPWS, 2017a). Oxygenation conditions were categorised as High in the 2016-2021 sampling period. The PD may negatively affect water quality in the lake and may impede restoration efforts for water quality in the lake, which may impede restoration of conservation of Killarney shad. *Potentially significant effects cannot be ruled out*.	Restoration efforts may be further impeded by cumulative effects (eutrophication, climate change effects). *Potentially significant cumulative effects cannot be ruled out.*	Mitigation required.

7 Assessment on integrity of the site

There will be no direct loss to QI or any other habitats within the KNP SAC thus the quality and condition of being whole will not be affected. Indirect effects to water quality attributes for Slender naiad, Mixed *Najas flexilis* lake habitat, Killarney shad arising from the contribution of foul to the Killarney WWTP, which is currently under performing, may also affect site integrity and undermine the ecological structure and functioning of the SAC.

It is considered that the objective to restore the conservation condition of Killarney shad relates primarily to the water quality in the lake and the requirement to achieve High ecological status under the WFD.

For Slender naiad and Mixed *Najas flexilis* lake habitat several attributes relating to water quality as well as others affected by poor water quality such as plant population, habitat area and distribution, typical species, vegetation composition (characteristic zonation), lake substratum, fringing habitats may be negatively affected. Mixed *Najas flexilis* lake habitat cannot currently sustain the Slender naiad and is in ecological decline thus the structure, function and ecological processes are being undermined. Good water quality sustains the structure and functioning of the QI. Existing pressures have compromised the ability of the SAC to meet its CO and are undermining the integrity of the SAC.

Barriers to movement along the nearby woodland corridor from an increase in artificial lighting from the residential development may affect Lesser horseshoe bat, which may in turn limit the woodland habitat available for foraging and have knock-on effects on ecological fitness including reproduction. This in turn may affect the integrity of the SAC.

In conclusion, it is considered that in the absence of mitigation measures, the PD could adversely affect the integrity of Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC.

8 Mitigation

8.1 Invasive Species

An Invasive Species Management Plan for the development has been prepared by MWP (2021) and submitted with the planning application. The aim of the plan is to appropriately treat and manage the invasive non-native species on site, namely Japanese Knotweed (*Fallopia japonica*), Butterfly Bush (*Buddleia davidii*) and Montbretia (*Crocosmia x crocosmiiflora*). The plan describes the location and extent, and details preferred treatment options, for each species. The preferred eradication method for all three species is excavation followed by deep burial in the middle of the northern part of the PD site. Post construction monitoring and treatment where required is detailed in the plan for Japanese Knotweed.

8.2 Green Procurement

Green Procurement is a process where buyers seek to source goods, services or works with a reduced environmental impact. It is recommended that the Developer and nominated Contractor use the 'Guide to Supporting Green Construction' published by CIF in 2020 in procuring goods, services, works and utilities for the construction and operation of the PD. The guide is designed to reflect the Government's policy on climate change and in particular to the EPA's Green Public Procurement Guide published in 2020.

8.3 Construction Phase

8.3.1 CEMP

A Construction Environmental Management Plan (CEMP) has been prepared detailing environmental protection measures. It includes the Construction and Demolition Plan. The CEMP sets out the role and responsibilities including that of the project ecologist. A nominated Environmental Engineer will be responsible for the implementation of the CEMP. They will be responsible for the management or execution of all environmental monitoring on site.

Water quality control measures (CIRA 2010 and ISO 14001:2015 – Environmental Management Systems and C741 Environmental good practice on site guide (4th edition) and CIRIA (2015)) will be put in place to protect water quality particularly that of the Folly stream. A wheel wash is proposed at the site entrance. Water quality control measures will also be implemented at Port Road and St. Margaret's road during works there. Surface water quality management plans will be put in place for the PD.

Biodiversity and invasive species protocols are included in the CEMP. A separate Invasive Species Management Plan has been prepared.

Site storage protocols are set out in the CEMP. The CEMP sets out Environmental Management Procedures to manage impact including for fuel and oil, traffic, waste, noise, dust and surface water management as well as procedures for emergency response, monitoring and auditing, incidents and corrective action, complaints, odour and light pollution.

8.3.2 Surface water management

Additional infrastructure and measures used to control water quality will include:

- Minimising exposed soil
- Stockpiles will be temporarily stored a minimum of 30m back from the Folly stream on level ground with a silt barrier installed at the base.
- If dewatering required as a result of surface water or groundwater, it will be pumped away from the Folly stream and allowed infiltrate to a designated percolation area.
- Provision of check dams on drains to slow water velocity
- Daily and weekly weather forecast monitoring

8.3.3 Site Clearance

Tree felling and vegetation clearance will be undertaken outside of the bird breeding period, March to August, inclusive. If there is any remaining felling or clearance during that period, a suitably qualified ecologist would need to confirm nesting birds are absent from the area to be cleared/felled before clearance can be carried out.

8.4 Operation Phase

8.4.1 Wastewater

The assessment in section **6** has identified impacts to water quality attributes for Salmon, Slender naiad, Mixed *Najas flexilis* lake habitat and Killarney shad as a result of increased foul loading to the Killarney WWTP. The plant discharges via the Folly stream is not meeting its objectives for Good ecological status under the WFD.

The Killarney sewer system is a combined sewer carrying both wastewater and surface water in a single pipe. Due to limited capacity in the existing foul/combined network in the local area, sections of surface water loading from the combined sewer along St. Margaret's Road will be removed from the combined system and assigned to a separate existing storm sewer network, which discharges directly to Lough Leane

via the Deenagh River. According to UÉ[19], due to limited capacity in the existing foul/combined network in the local area, storm water separation from the existing 450mm diameter combined sewer will be required for an area of 0.2ha to accommodate the proposed connection. This will alleviate current loading in the existing foul sewer network, thereby providing capacity for the site's generated foul flows. It will reduce the hydraulic loading and reduce the pressure of the PD on the performance of the WWTP particularly during summer months when loading on the plant increases. Works will be carried out by the developer.

On site wastewater infrastructure includes underground sewer lines and foul pumping station including 24-hour emergency storage. Uisce Éireann (UÉ) reviewed the applicants PD wastewater design in 2022 and based upon details concluded that the proposals were compliant with their code of practice. Once approved by UÉ the PD site will be connected to the existing foul sewer network, which is drained by gravity and flows into Killarney WWTP, which with the works at St. Margaret's Road has hydraulic capacity to receive wastewater from the PD. The WWTP treats wastewater to tertiary level with N&P removal.

8.5 Lesser Horseshoe Bats

The assessment in section **6** has identified impacts to foraging, linear features and artificial lighting attributes for Lesser horseshoe bat as a result of increased artificial lighting on the Deenagh River/Port Road woodland corridor, which is used by the species for foraging and commuting.

8.5.1 Construction Lighting

As per the CEMP, where construction lighting is required , lighting will be directed away from the woodland and aquatic habitat in Port Road. Directional lighting (i.e., lighting which only shines on the proposed project and not nearby countryside) will be used to prevent overspill. This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only. The extent of construction lighting will be kept to a minimum in the interests of landscape and visual amenity. The external lighting will be limited insofar as possible to the site compound area, the car park and site storage area to provide lighting for access and egress to and from the site. The lighting provided in the compound and the storage areas will be directed down locally to the required areas.

8.5.2 Proposed Landscaping at the Residential Development

The Landscape Design Plan for the PD accompanies the planning application, and a summary is provided in section **3.2.3**. The following is mitigation is recommended:

- Ensure the stock is local or at least of southwest of Ireland origin.
- Replace enough of the Birch and Alder with semi-mature/mature Holly (evergreen) along the western boundary to maximise screening of residential lighting from the SAC particularly during spring, autumn and winter months when broad leaf foliage is absent.
- Planting will take place as soon as is practically possible following receipt of permission to ensure it is in place prior to construction and once the PD becomes operational to give it time to establish.
- All root systems of existing and new landscaping trees and plants are to be protected prior to and during the construction of the PD.

These actions will be done by the developer under the steerage of an appointed Lesser horseshoe bat specialist and Landscaper.

[19] Confirmation of Feasibility Letter dated 10-04-2024 from UÉ to MHL & Associates

8.5.3 Planting Scheme along the Deenagh River/Port Road Woodland Corridor

The Deenagh River/Port Road woodland corridor route is defined as the Deenagh River and associated riparian (river) trees/woodland on either side stretching from the pedestrian entrance opposite Parkland homes as far south as the Cathedral entrance to the National Park, on the western side of Port Road. The western side of the corridor is considered to be a dark corridor used by Lesser horseshoe bats. The PD is going to result in an increase in artificial light sources and in turn increase the artificial lighting effects on this corridor from the eastern side.

Planting of Holly and other native trees where appropriate will be done along the corridor opposite the site entrance and 40m on either side, including the existing gap north of the site entrance, to avoid or minimise any punctuation of strong glare and illumination from traffic emerging from the main PD site onto Port Road. A good degree of screening already exists on the corridor opposite the proposed site entrance from Laurel growing along the western riverbank, which provides year-round screening. In discussions with NPWS, it was also agreed to plant a 40m long section of *Elaeagnus* × *submacrophylla* (Ebbinge's silverberry), which is a non-native (not invasive) deciduous evergreen bushy dense shrub, beside the footpath within the National Park (see Appendix 4 for landscape plan). This shrub line will provide continuous light screening between vehicle lights exiting the PD site entrance and woodland corridor route within the National Park/KNP SAC. Together with the existing vegetation on both sides of the bank, these measures will strengthen the integrity of the western dark corridor of the Deenagh River/Port Road woodland corridor. Refer to Appendix 5 for letter from NPWS detailing mitigation requirements.

This planting scheme will be done by the developer together with the Landscaper under the steerage of an appointed Lesser horseshoe bat specialist and local NPWS staff. Planting will take place as soon as is practically possible following receipt of permission to ensure it is in place and established prior to construction and once the PD becomes operational. Measures will be put in place to protect the root systems during construction.

All planting will be funded by the developer under the steerage of NPWS, an appointed Lesser horseshoe bat specialist and Landscaper.

Planting will reduce the impacts of glare and skyglow from the residential and associated traffic lighting on the Deenagh River/Port Road riparian woodland corridor by increasing vegetation screening in areas of the corridor affected by the development. This will reduce the potential for barrier to movement effects on Lesser horseshoe bats using the corridor.

Monitoring measures are crucial to check their successful and timely implementation and to detect any unexpected impacts requiring additional measures EC (2021). Planting will be evaluated annually by a suitably qualified ecologist or tree surveyor, and maintenance carried out as required to remove any damaged or diseased shrubs or trees and shall be replaced within the next planting season with similar species, so as to maintain effective visual screening and light barrier to the woodland.

8.5.4 Proposed development (PD) Lighting

The following will be considered when choosing luminaires (BCT, 2023):

- All luminaires will lack UV elements when manufactured. Metal halide, compact fluorescent sources should not be used.
- LED luminaires will be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability.
- A warm white light source (2700Kelvin or lower) will be adopted to reduce blue light component.

- Light sources will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats (Stone, 2012)
- Internal luminaires will be recessed (as opposed to using a pendant fitting where installed in proximity to windows to reduce glare and light spill.
- Waymarking inground markers (low output with cowls or similar to minimise upward light spill) to delineate path edges will be used.
- Column heights will be carefully considered to minimise light spill and glare visibility. This should be balanced with the potential for increased numbers of columns and upward light reflectance as with bollards.
- Only luminaires with a negligible or zero Upward Light Ratio, and with good optical control, will be considered.
- Luminaires will be mounted horizontally, with no light output above 90° and/or no upward tilt.
- Where appropriate, external security lighting will be set on motion sensors and set to as short a possible a timer as the risk assessment will allow. For most general residential purposes, a 1 or 2 minute timer is likely to be appropriate.
- Use of a Central Management System (CMS) with additional web-enabled devices to light on demand will be implemented.
- Use of motion sensors for local authority street lighting may not be feasible unless the authority has the potential for smart metering through a CMS.
- The use of bollard or low-level downward-directional luminaires will not be used. This is due to a considerable range of issues, such as unacceptable glare, poor illumination efficiency, unacceptable upward light output, increased upward light scatter from surfaces and poor facial recognition which makes them unsuitable for most sites. Therefore, they should only be considered in specific cases where the lighting professional and project manager are able to resolve these issues.
- Only if all other options have been explored, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed. However, due to the lensing and fine cut-off control of the beam inherent in modern LED luminaires, the effect of cowls and baffles is often far less than anticipated and so should not be relied upon solely.

The upperstorey windows of housing units and apartments will be subject to recessed internal lighting and/or appropriate glazing treatments on west and south facing windows to restrict and reduce light trespass. Specification is to be agreed with the appointed Lesser horseshoe bat specialist. The lighting design will ensure that lighting within the PD area will be contained within the site and no light spill will occur as shown on the light spill/contour map presented below (see Appendix 3 for Lighting report).

8.5.5 New streetlighting

As part of the proposed development, it is proposed to move the street lighting from its current location along the eastern footpath of Port Road to the western footpath at Port Road between the pedestrian crossing to the Fossa cycleway and the junction of Port Road and New Road. Locating streetlights to the western side of the road would allow for cowling of lanterns and reduce light spill into KNP; the installation of cowls will also reduce backscatter or back light of light into Park and reduce upward light to reduce the lighting spread/envelope. It is proposed to install new LED lanterns on the new streetlighting thus replacing the existing sodium lighting along Port Road (see Appendix 3 for MHL lighting report). LED luminaires have a sharp cut-off, lower intensity, good colour rendition and dimming capability. The new streetlighting will serve to direct lighting away from KNP SAC and reducing lighting to a minimum.

In terms of street lighting design, the following will be undertaken:

- All luminaires will lack UV elements when manufactured. Metal halide, compact fluorescent sources should not be used.
- LED luminaires will be used due to their sharp-cut-off, lower intensity, good colour rendition and dimming capability, A warm white light source, 2700 Kelvin or lower, will be adopted to reduce blue light component of luminaires. The progression of LED technology means that the majority of luminaires are available at 2700 Kelvins and lower.
- Light sources will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats. Consideration of using red lighting, particularly for road street lighting directly adjacent to the River Deenagh, will be investigated (i.e. Local Authority street lighting). However, if red light is considered too “different” of a light source, >550nm should be the minimum standard set for this project. This is to be agreed by the appointed Lesser horseshoe bat specialist and KCC.
- Use of a Central Management System (CMS) with additional web-enables devices to light on demand. If possible, it should be determined if the Local Authority street lighting immediately adjacent to the River Deenagh and particular luminaires of concern, can be managed in a manner to reduce the amount of lighting required as the night progresses (i.e. reduction in lighting for specific hours of the night). This Part-Night lighting may require further survey work to determine if dimming is of value to local lesser horseshoe bat population.

8.5.6 Summary of Lesser horseshoe bat mitigation measures

The Lesser horseshoe mitigation measures can be summarised as follows:

- Minimal and spatially limited temporary construction lighting to minimise sky glow and avoid glare.
- Additional planting of suitable evergreen species along the western boundary of the main PD site to minimise light spread and glare from the PD.
- Planting of a 40m long section of *Elaeagnus* × *submacrophylla* (Ebbinge's silverberry) beside the footpath within the National Park to exclude glare from traffic headlights exiting the PD site entrance.
- All planting to take place prior to construction phase to speed up establishment prior to the site becoming operational.
- All planting details including specific locations, species mix and density to be agreed with the appointed Lesser horseshoe bat specialist and NPWS.
- Sensitive residential lighting within the main PD site in accordance with BCT (2023) guidance.
- Relocation of current street lighting from the eastern to the western side of Port Road between the Fossa cycleway pedestrian entrance north of the PD site entrance and the junction of Port Road and New Road with new LED lanterns of 2700 Kelvin or lower and installation of cowls. This new sensitive lighting design will reduce lighting to a minimum.

It is considered that the strict implementation of these measures will reduce the potential negative impact proposed and existing lighting on local lesser horseshoe bat populations commuting along the River Deenagh. It is concluded that the with the full implementation of the mitigation measures, the PD will not result in any significant adverse effects on the CO for Lesser horseshoe bat in the KNP SAC.

9 Summary

The table below provides a summary assessment of the significance of the residual effects of the PD on potentially impacted QI.

Table 12. Summary results of the assessment after implementation of mitigation measures

QI	Summary of potentially significant effect	Summary of potentially significant cumulative effect	Mitigation	Expected significance/results following mitigation
Slender naiad	Population in Bad conservation status in Lough Leane. Potentially significant effects on water quality cannot be ruled out.	Potential for cumulative nutrient impacts from agriculture and urban runoff cannot be ruled out.	- CEMP. - Additional surface water mitigation measures. - Diversion of hydraulic loading of surface water from combined sewer along St. Margaret's Road to mitigate against PD hydraulic loading of foul. - Once approved by UÉ the PD will be connected to the WWTP.	Significant individual and cumulative effects unlikely.
Mixed *Najas flexilis* lake habitat	Slender naiad in Bad conservation status and Lough Leane in ecological decline. Potentially significant effects on water quality cannot be ruled out.	Potential for cumulative nutrient impacts from agriculture and urban runoff cannot be ruled out.		Significant individual and cumulative effects unlikely.
Killarney shad	Restoration of water quality in the lake may be impeded by PD. Potentially significant effects on water quality cannot be ruled out.	Potential for cumulative nutrient impacts from agriculture and urban runoff cannot be ruled out.		Significant individual and cumulative effects unlikely.
Lesser horseshoe	Artificial lighting from PD may cause a barrier to movement resulting in negative effects on the extent of available foraging habitat and linear features for bats. Potentially significant effects cannot be ruled out.	Cumulative impacts from existing (Killarney urban area, traffic) and new sources (residential developments) of artificial lighting.	- Replacing Alder and Birch planting with enough Holly to screen western site boundary. - Planting of screening vegetation opposite site entrance junction along Deenagh River/Port Road corridor. - Sensitive residential lighting design to reduce lighting to a minimum. - Moving existing streetlights along the eastern side of Port Road to the western side, use of new LED lanterns and cowls to reduce the spread and backscatter of light into the National Park and reduce lighting to a minimum,	Significant individual and cumulative effects unlikely.

10 Conclusion of the NIS

Provided the mitigation measures are implemented in full, it can be objectively concluded that there is no likelihood of significant effects, either individually or cumulatively, arising from the proposed LRD that would undermine the conservation objectives of the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365), or affect the integrity of the site.

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Appendix 1 – Screening for Appropriate Assessment report (MWP, 2024)

MWP

APPROPRIATE ASSESSMENT SCREENING REPORT

Port Road Housing Development

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Appendix 1: ABP Order

Project No.	Doc. No.	Rev.	Date	Prepared By	Checked By	Approved By	Status
19554	6001	B	16/11/2021	MKy	PR	MKe	Final
19554	6001	C	08/08/2023	PR	KF	KF	Draft
19554	6001	D	24/08/2023	KF	KF	KF	Draft
19554	6001	E	29/04/2924	PR	KF	KF	Final

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1. Introduction

A Large-scale Residential Development (LRD) Planning Application is being lodged to Kerry County Council by Portal Asset Holdings Ltd. for a site at Port Road, Killarney, Co. Kerry. Malachy Walsh and Partners (MWP) has been engaged by HW Planning to undertake a screening for Appropriate Assessment of the project.

In August 2022 An Bord Pleanála (ABP) refused permission for a previous application for this proposal [ABP-312987-22] on the grounds that it could not be concluded that the proposed development would not adversely affect the integrity the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365) in view of the site's Conservation Objectives, specifically with regard to impacts on the foraging activities of the population of lesser horseshoe bat (*Rhinolophus hipposideros*) for which the site is selected. A copy of the board's Order [ABP-312987-22] is included in Appendix 1.

This screening for Appropriate Assessment has been undertaken to determine whether the proposal is likely to have a significant effect on any European site (i.e. Natura 2000 Sites), in view of the sites' Conservation Objectives.

1.1 Legislative Context

The Habitats Directive (92/43/EEC) seeks to conserve natural habitats and wild fauna and flora by the designation of Special Areas of Conservation (SACs) and the Birds Directive (2009/147/EC)[1] seeks to protect birds of special importance by the designation of Special Protection Areas (SPAs). It is the responsibility of each member state to designate SPAs and SACs, both of which form part of Natura 2000, a network of protected sites throughout the European Community. Further information is available at:

http://ec.europa.eu/environment/nature/legislation/habitatsdirective/

http://www.npws.ie/planning/appropriateassessment/

The current assessment was conducted within this legislative framework and also the relevant guidelines. As outlined in these, it is the responsibility of the proponent of the project, in this case Portal Asset Holdings Ltd., to provide a comprehensive and objective screening for Appropriate Assessment, which can then be used by the competent authority.

1.2 Stages of Appropriate Assessment

The Appropriate Assessment process is a three-stage process with issues and tests at each stage. The purpose of the screening assessment is to record in a transparent and reasoned manner the likely effects on Natura 2000 sites of a proposed development. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

[1] This is the codified version of Directive 79/409/EEC as amended (see http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm)

2. Assessment Methodology

2.1 Appropriate Assessment Guidance

This screening for Appropriate Assessment, or Stage 1, has been undertaken with regard to the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC 2001, 2021), the European Commission Guidance '*Managing Natura 2000 Sites*' (EC 2000, 2018), *Appropriate Assessment of Plans & Projects - Guidance for Planning Authorities* prepared by the NPWS (DoEHLG, 2009) and *Appropriate Assessment Screening for Development Management* prepared by the Office of the Planning Regulator (OPR, 2021).

2.2 Desk Study

In order to complete the screening for Appropriate Assessment certain information on the existing environment is required. A desk study was carried out to collate available information on the subject site's natural environment. This comprised a review of the following publications, data and datasets:

- OSI Aerial photography and 1:50000 mapping
- National Parks and Wildlife Service (NPWS)
- National Biodiversity Data Centre (NBDC) (on-line map-viewer)
- BirdWatch Ireland
- Teagasc soil area maps (NBDC website)
- Geological Survey Ireland (GSI) area maps
- Environmental Protection Agency (EPA) water quality data
- South Western River Basin District (SWRBD) datasets (Water Framework Directive)
- Other information sources and reports footnoted in the course of the report

2.3 Field Surveys

Field surveys were undertaken between 2018 and 2021 and repeated in 2023. These included habitat surveys and mapping, mammal surveys including a bat activity transect, badger activity surveys, aquatic habitat value surveys, bird surveys and invasive alien plant species surveys.

3. Screening for Appropriate Assessment

The task of establishing whether a plan or project is likely to have an effect on a Natura 2000 Site is based on a preliminary impact assessment using available information and data, including that outlined above, and other available environmental information, supplemented as necessary by local site information and ecological surveys. This is followed by a determination of whether there is a risk that the effects identified could be significant. The precautionary principle approach is required.

Once the potential impacts that may arise from the proposal are identified the significance of these is assessed through the use of key indicators:

- Habitat loss
- Habitat alteration
- Habitat or species fragmentation
- Disturbance and/or displacement of species
- Water quality and resource.

Screening for Appropriate Assessment (Stage 1) determines the need for a full Appropriate Assessment (Stage 2) and consists of a number of steps, each of which is addressed in the following sections of this report:

3.1 Establish whether the proposal is necessary for the management of a Natura 2000 Site

3.3 Description of the proposal

3.5 Identification of Natura 2000 Sites potentially affected

3.6 Identification and description of potential individual and cumulative impacts of the works

3.7 Assessment of the significance of the impacts on the integrity of Natura 2000 Sites

3.8 Conclusion of screening stage

The purpose of the screening assessment is to record in a transparent and reasoned manner the likely effects, on relevant Natura 2000 Sites, of the proposed works.

3.1 Management of Natura 2000 Sites

The proposal is not connected with or necessary to the conservation management of a Natura 2000 Site.

3.2 Description of the Site

The proposed development site comprises an agricultural grassland (greenfield) site that slopes from a highpoint in the northwest down to Port Road on the west, and to the southeast. Along the western boundary of the site is a connection to the R877 road. Also, along this boundary are the rear gardens of the Port Road Cottages. The northern and eastern boundaries of the site adjoin existing residential developments. The southern boundary adjoins the playing fields of Killarney Community College. The lands subject to the permitted development are unoccupied and undeveloped. Previously the site was used for the grazing of livestock as it once formed part of the Mercy Order farm and school. The existing land-uses in the vicinity of the subject site comprise primarily residential properties, with a number of local amenities in the form of a national school, two secondary schools, churches, a community hospital, and a nursing home (within 500 m).

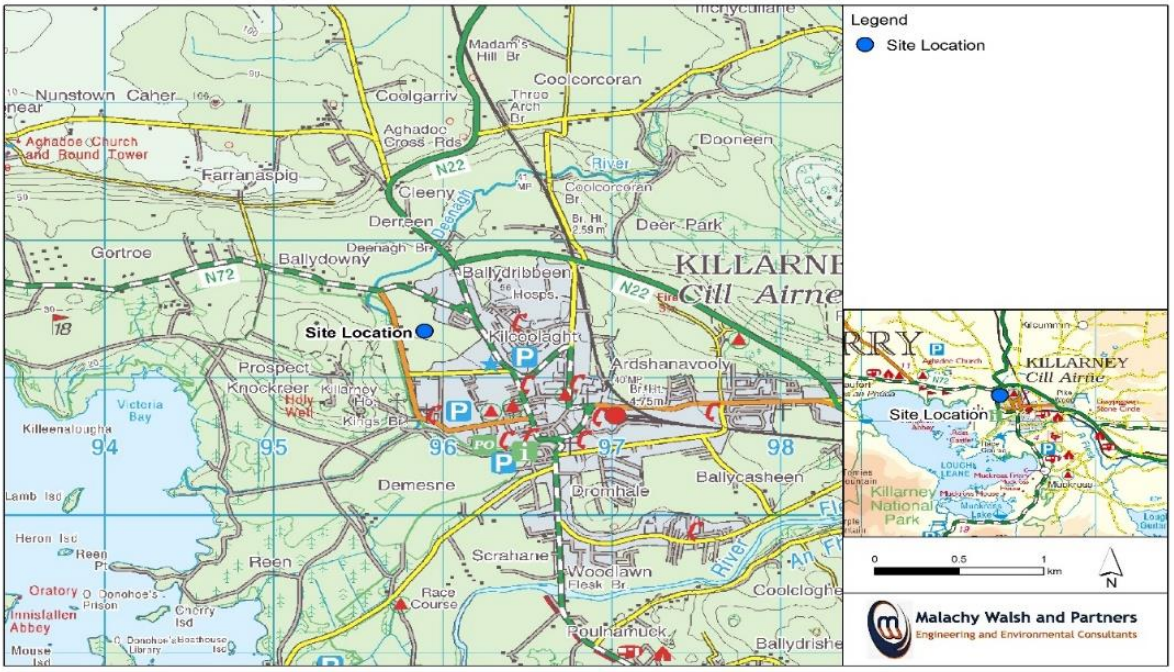

Figure 1: Site location map

Figure 2: Lands within and adjacent to the PD

There is 1 site access point located in the northwestern corner of the site across the road from Killarney National Park. This serves the crèche initially and then connects into the residential aspect of the scheme. A footpath connecting the development to Port Road links the site with local bus routes and Killarney town centre ensuring that alternative modes of transport are provided as a substitute for the car.

The northern part of the subject site is generally flat with the terrain lowering towards the Folly Stream at the southern boundary. The proposed scheme has been carefully considered to respond to the existing topography in order to minimise cut/fill on site. Most of the existing hedgerows, treelines and riparian woodland along the site boundaries will be retained. The trees along the boundaries are not suitable for roosting lesser horseshoe bats, a species which has a low dependence on trees as roosting sites (Kelleher *et al*., 2006) and the site is sub-optimal for foraging lesser horseshoe bat.

The site is within the Deenagh sub-catchment 22_1. However, there are no watercourses within the site that join the Deenagh River which is located 100 m to the west on the opposite side of the R877/Port Road and within the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365). The river channel is situated below the level of the road and is delineated by a high embankment of trees and concrete walls and is separated from the road by a stone wall and footpath on the western side of the R877 (see Photograph 1). The proposed development site is further separated from the river by the Port Road Cottages which are located between the western boundary of the site and the R877/Port Road.

The Folly Stream, a watercourse that has little to no habitat value for fish or other aquatic prey, forms the boundary of the Inch and Coolagrean townlands (see **Figure 3**). It is not connected to, or tributary of, any other watercourse and comprises a shallow, shaded, slow moving and ephemeral drain, with heavy silt and mud substrate. It rises to the east of Port Road, within the site, 400 metres upstream of New Road. The old 6" and 25" maps show the stream extending south to what is now the Killarney Plaza Hotel and it does not appear on the surface beyond this point. The last 350 metres is now covered over, and it flows into a culvert about 250 m to the south of New Street, where it joins the municipal combined storm and sewer network which is directed to the Killarney WWTP at Ross Road. The total exposed length is now 650 metres[2].

Three invasive plant species listed in the European Communities (Birds and Natural Habitats) Regulations (2011-2021) are present in an area of previously disturbed ground the south-eastern section of the site. These are Japanese knotweed (*Fallopia japonica*),montbretia (*Crocosmia X crocosmiflora*) and butterfly bush (*Buddleja davidii*).

Evidence of red fox (*Vulpes vulpes*) and rabbit (*Oryctolagus cuniculus*) were recorded at the main PD site. An active badger (*Meles meles*) sett was identified in a cluster of oak trees (*Quercus* spp.) that separates the western and south-eastern sections of the site. Subsequent surveys identified one active main sett and three outlier setts within the boundary of the site. Badgers are not protected under the EU Habitats Directive (92/43/EEC). They are, however, protected under the Wildlife Act 1976, as amended and, therefore, the management and protection of this sett is considered in the Ecological Impact Assessment that will be submitted as part of the planning application.

[2] MWP (2014) Flood Level Assessment New Road

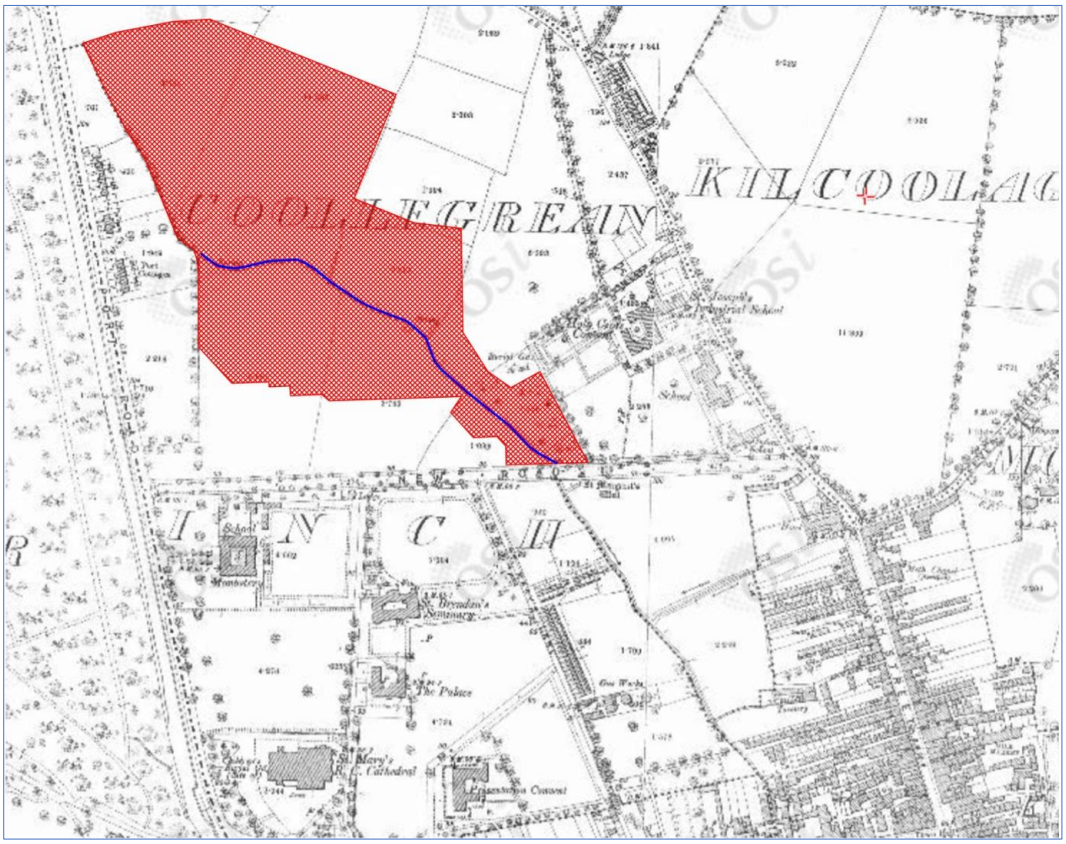

Figure 3: Course of field boundary drain

Photograph 1: R877 Port Road facing south, with eastern bank of River Deenagh on RHS of image

3.3 Description of Project

Portal Asset Holdings Ltd. intend to apply for planning permission for a Large-Scale Residential Development (LRD) at Port Road and St Margaret's Road, Coollegrean, Inch, Knockreer, Ardnamweely, Derreen (townlands), Killarney, Co. Kerry. The proposed development (PD) will comprise 224. residential units, consisting of 76 housing units, 52 ground floor and duplex apartments, and 96 apartment units within 3 blocks. The development also includes a 2 storey crèche, and all associated site development works. The proposed scheme and the layout has been

organised into specific areas with larger housing units at the entrance to the north-west, higher density duplex units to the south and large apartment blocks on the south-eastern part of the site, the eastern field. It includes for 320 car parking spaces and 26 E.V. parking spaces and 350 bicycle spaces. Ancillary infrastructure development works on the main PD site will include relocation/undergrounding of ESB powerlines, wastewater infrastructure including foul pumping station, surface water storage/infiltration, improvements to the stormwater network on St. Margaret's Road', water utility services, public lighting, bin stores, bicycle stores, ESB substation, and all associated site development works.

The PD will provide for a new vehicular access and pedestrian entrances onto Port Road, upgrades to Port Road comprising reduction in carriageway widths, provision of shared pedestrian/cycle path and uncontrolled pedestrian crossing, and a pedestrian connection to Millwood Estate. Construction site access will use the main access. A main spine road and connected local roads will connect the housing units on site while the main spine road will access the apartment blocks close to the northern site boundary.

A summary description of the proposal is provide in the table below, Further detail is then provided in **Sections 3.3.1** and **3.3.2**.

Size, scale, area, land-take	The residential developable area is 4.75 ha. There will be no land-take from any Natura 2000 site.
Details of physical changes that will take place during the various stages of implementing the proposal	• Construction of 224 residential units, a 2 storey crèche, and associated green space. • On site vehicle streets with associated car parking provision. • A mix of independent pedestrian and cyclist infrastructure together with shared street spaces. • Drainage and water supply infrastructure to accommodate the proposed development. • Public lighting, power and communications infrastructure to accommodate the development. • Diversion of existing 10 kV ESB overhead electrical cables. • Improvement works along nearside footpath on R877 for pedestrian/cycle way. • All ancillary ground works including car parking, fencing and landscaping.
Description of resource requirements for the construction/operation and decommissioning of the proposal (water resources, construction material, human presence etc)	*Plant and machinery* • Hydraulic excavators. • Mobile cranes. • Dumpers. • Concrete saw cutting. • Volvo dump trucks. • Ready-mix concrete trucks. • Pump unit for ready-mix. • Concrete. • Vibrating rollers. • HGV – 20-foot trailers. • HGV – 40-foot trailers. • Telescopic site handlers. • Road sweeping equipment.

	• Welding gear. • Elevation platforms. • Small tools – grinders, saws, drills, kango hammers, powerfloats, temporary lights, water pumps, concrete vibrators. *No. of personnel* • 50 *Materials* • Concrete, sub-structures • Steel reinforcement used in concrete. • Structural steelwork used for equipment support, roof structure, hand railings. • Partitions incorporating studwork and panelled walls. • Secondary steel work. • Masonry concrete block work. • Stone fill. Water supply for the construction facilities will be taken from the mains supply which is adjacent the site. Power for the pumps and small power requirements for construction activities will be supplied from diesel generators until such time as the permanent site power supply is available. The operational development will be connected to the mains water supply and the municipal foul and storm network.
Description of timescale for the various activities that will take place as a result of implementation (including likely start and finish date)	Phasing as described above is expected to take a combined 3.5 years, with an expected start date of October 2025.
Description of wastes arising and other residues (including quantities) and their disposal	During the construction phase, typical wastes arising include: • Excavation wastes • Construction waste from building materials such as Off Cuts of Metal and Insulation • Pipe Off Cuts, Wrapping, Insulation, Weld Rods • Materials Wrapping • Oils, Filters and Cleaning Materials • Food Waste, Packaging Materials, Dry Recyclables • Metal, Wire • Construction water • Topsoil excavated will be stored for re-use on the site. All waste will be managed, collected, stored, and segregated in separate areas and removed off site by a licensed waste management contractor at regular intervals during the works. All concrete trucks will have to return to their respective yards for washout.
Identification of wastes arising and other residues (including quantities) that may be of particular concern	It is anticipated that a significant amount of material arising from the works will be classified for re-use as fill material under roads and pavements. The objective is to ensure the absolute minimum amount of material leaves the site as waste.

in the context of the Natura 2000 network	Construction wastewater will be collected in filter drains and directed towards an interceptor & soak away where it will disperse to ground.
Description of any additional services required to implement the project or plan, their location and means of construction	A temporary site compound will be established within the Phase 1 construction area, and will include provisions for: • Offices, canteen and toilet / changing facilities c/w temporary water supplies and wastewater treatment unit. • Secure compound and containers for storage of materials and plant. • Temporary vehicle parking areas. • Contained area for machinery refuelling and construction chemical storage. • Wheel-washing facilities for vehicles leaving the site.

3.3.1 Construction Phase

It is proposed to develop the site in three phases over a 3.5-year period.

1. Phase 1: The total developable Phase 1 site is to contain 76 dwellings in total and the childcare facility and is envisaged to take approximately 15 months to complete.
2. Phase 2: The total developable Phase 2 site is to contain 52 duplex units and is envisaged to take 12 months to complete.
3. Phase 3: The total developable Phase 3 site is to contain 96 apartments, including under croft parking, and is envisaged to take 15 months to complete.

A temporary site compound will be established in the centre of the northern part of the site. It will contain offices, canteen, changing facilities, water supply, portable toilets and wastewater treatment unit. It will provide secure storage for materials, plant and chemicals, and a refuelling area.

The main stages of construction will proceed as follows:

- Enabling works including set-up of temporary compound.
- Site clearance will include bult excavation and cut and fill.
- Construction of drainage, water supply and utility services.
- Construction of buildings.
- Landscaping.
- Building fit-out and commissioning.

The PD also includes offsite works to the carriageway and footpath at Port Road and sewer network at St. Margarets Road.

Details of the construction methodology are set out in the Construction Environmental Management Plan (CEMP) and are summarised here. Pre-construction activities will include demarcation of the site, detailed ground investigations, excavation and burial of invasive species, establishment of temporary site compound. Construction activities for each phase will involve bulk excavation – removal and temporary storage of large amount of soil, rock or other material in preparation for construction - and associated cut and fill of that material (approximate earthworks volume: 33,500 m^3 cut, 5,700 m^3 fill) with excess material will be removed off site to an appropriately licenced waste facility. Early works will involve the installation of underground utilities to provide the infrastructure required for stormwater drainage, foul water drainage, water supply, power and building utility

systems. Civil works will include the pouring of foundations followed by concrete block construction followed by external finishing and roofing. Works on external services including water mains, foul sewers, storm sewers, roads, footpaths and public lighting will be carried out in conjunction with the completion of the units. Landscaping works will take place in tandem with other construction. Details of a temporary internal roadway and associated drainage to be constructed on site and a list of typical construction plant and equipment is provided in the CEMP. Principal construction material used on site will include stone, concrete, timber, and steel.

Working hours will be between 7 a.m. and 7 p.m. Monday to Friday, and to 4 p.m. on Saturday. No work on Sundays of bank holidays. The working day may extend at times when critical elements of work need to be advanced. Longer working days can occur when there is a planned concrete pour. If extended working hours are required, these will be agreed in advance with the planning authority. It is expected that a maximum of 50 construction personnel will be on site daily. 7,000 mm[3]

3.3.1.1 Landscaping

The design approach directly relates to defining the existing natural features that exist on site and incorporating them into the scheme where possible to give the development a very distinctive quality that is unique to its location. There are treelines, a barrow[3] and a stream that exist on site that are proposed to be integrated into the scheme. A detailed Landscaping Plan has been developed incorporating high quality, usable spaces. Areas of high-quality existing vegetation have been mostly preserved and existing sensitive areas have been identified and removed from the buildable area of the proposal.

A pocket of mature specimen oak (*Quercus* spp.)trees adjacent to the active badger sett divides the main PD site into two areas – a western and eastern field. The southern boundary of the site is outlined by mature specimen trees most of which are located outside of the site boundary on the neighbouring college lands. Pockets of wet grassland/marsh habitat occur inside the site near the stream here. A mix of trees and scrub to the rear of residential gardens form a substantial landscape along the western boundary. A mixed fragmented hedgerow forms along the northern field boundaries of both fields and the eastern boundary of the western field.

For the most part existing hedgerow and trees will be maintained and protected at the main PD site with gaps to be filled with native species. Trees will be lost in the eastern field and around the site entrance with the removal of scrub and woodland. There will be selected removal of vegetation in the northern hedgerow and retained trees will be protected by temporary fencing during construction works. In an anti-clockwise direction from the proposed site entrance, the Landscaping Plan proposes to:

- strengthen the western site boundary between the site entrance and the rear of the cottages with planting a dense/tightly spaced strip of native species with oak (on the outside/boundary side) and a mix of birch (*Betula* spp.) and Scots pine (*Pinus sylvestris*) inside.
- strengthen the western site boundary along the rear of the cottages and existing residential trees and hedgerow with planting a dense/tightly spaced strip of native species including birch, alder (*Alnus glutinosa*), oak and Scots pine.
- retain existing trees and hedgerow on the southern college fields boundary of the western field with planting of a few scattered birch.
- retain existing trees and hedgerow on the southern boundary of the eastern field and remove adjacent woodland and replace with planting of oak, birch and alder, mainly.
- remove hedge con eastern side of eastern field and replace with a 'Screen Planting' mix of holly (*Ilex aquifolium*), wild cherry (*Prunus avium*), dog rose (*Rosa canina*), blackthorn (*Prunus spinosa*), hawthorn

[3] An archaeological feature.

(*Crataegus monogyna*) and hazel (*Corylus avellana*) inside which a treeline mix of oak, birch, alder, wild cherry and Dutch elm (*Ulmus hollandica*) cultivar[4] will be planted.

- remove hedge on northern side of eastern field and replace with a 'Native Hedgerow Planting Mix' mix of holly, blackthorn and hawthorn inside which a treeline mix of oak, birch, wild cherry and rowan (*Sorbus aucuparia*) will be planted.
- retain existing trees and hedgerow for the most part on the northern boundary of the western field and plant up gaps with oak, rowan and birch inside which some further planting of oak, birch and rowan will be done.

Further planting of native trees is proposed within the LRD associated with the housing units and green spaces. The area of hedgerow and oak trees separating the western and eastern fields will be retained. It is proposed to retain the existing wet grassland/marsh habitat where feasible near the southern boundary of the western field. Full details of the Landscaping Plan are provided in the Landscape Design Report and drawings accompany this application.

3.3.1.2 Water

The site will connect to an existing watermain at the entrance to the PD site. Kerry Central Regional Water Supply Scheme, which abstracts water from Lough Guitane and Owgariff River, supplies water to Killarney as well as other parts of Kerry. Lough Guitane via the Finow River flows into the Owgariff River before joining the River Flesk, which in turn flows into Lough Leane.

3.3.1.3 Stormwater Management

The MHL Engineering Report (2024) report confirms that storm water management proposals for the site have been informed by the relevant standards and comply with best practice in terms of SuDS (Sustainable Urban Drainage Design). Rainfall falling on roofs, paved areas, roads, soft landscaped/green areas will infiltrate to ground through a mix of gullies, permeable paving, soakaways and bioretention features (swales, catchpits, treepits and rain gardens) into a piped stormwater network. Green roofs, which are planted surfaces, will be incorporated into the proposed apartment blocks which will intercept rainfall before being discharged to the network. Underground attenuation and associated flow control devices will restrict stormwater flows to greenfield runoff rates before being discharged via full retention Class 1 oil interceptors. Four underground attenuation tanks are proposed, the two northerly tanks, 1 and 2, will infiltrate to ground (with Tank 2 having overflow to Tank 3) while the two southerly tanks, 3 and 4, will discharge to the Folly Stream via headwalls. Flows from large rainfall events will bypass the bio-retention area and be conveyed directly to the sewer system. Stormwater entering bioretention features will also infiltrate to soils and groundwater. Infiltration storage to be provided up to the 100-year storm event allowing for 10% climate change.

According to the engineering report, regular maintenance of the flow control device will be required to remove any blockages, particularly in the wake of heavy rainfall events or local floods. It recommends that the petrol interceptors be fitted with an audible high-level silt and oil alarm for maintenance and safety purposes. Regular inspection and maintenance are recommended for the petrol interceptors.

[4] Extremely resistant to Dutch elm disease. Source: https://en.wikipedia.org/wiki/Ulmus_%27Columella%27

3.3.1.4 Wastewater Management

The estimated Dry Weather Flow (DWF)[5] average from the PD is 9.635 l/s. Uisce Éireann (UÉ) reviewed the applicants PD wastewater design in 2022 and based upon details concluded that the proposals were compliant with their code of practice. Once approved by UÉ the PD site will be connected to the existing foul sewer network, which is drained by gravity and flows into Killarney WWTP. The Killarney sewer system is a combined sewer carrying both wastewater and surface water in a single pipe. According to UÉ[6], due to limited capacity in the existing foul/combined network in the local area, storm water separation from the existing 450 mm diameter combined sewer will be required for an area of 0.2ha to accommodate the proposed connection. Sections of surface water loading from the combined sewer along St. Margaret's Road will be removed from the combined system and assigned to a separate existing storm sewer network, which discharges directly to Lough Leane via the Deenagh River. This will alleviate current loading in the existing foul sewer network, thereby providing capacity for the site's generated foul flows. Works will be carried out by the developer. On site wastewater infrastructure includes underground sewer lines and foul pumping station including 24- hour emergency storage.

3.3.1.5 Lighting

Residential lighting comprises streetlights and internal and external lighting from housing units and apartments. As part of this application, it is proposed to move the street lighting along Port Road from its current location along the eastern side of Port Road to the western side of the road and replace the existing public lighting heads/lanterns with LEDs.

3.3.1.6 Traffic

The AADT (Annual Average Daily Traffic) for Port Road has been approximated at 10,000 veh/day based on 2023 traffic counts. 1,100 veh/day will be generated by the PD.

3.3.1.7 Waste management

A Construction and Demolition Waste Management Plan has been prepared and included in the CEMP. It lists the types of waste likely to be generated. It stipulates that wastes will be managed, collected, stored, and segregated in separate areas and removed off site by a licensed waste management contractor at regular intervals during the works. All concrete trucks will have to return to their respective yards for washout. Turfs and topsoil will be stored separately. Stock-piles will be located away from drainage features.

3.3.2 Operational Phase

The site will be connected to the municipal foul network. The existing foul/combined network in the local area was identified at pre-planning stage as having limited capacity to accommodate emissions from the site. It has been decided to remove sections of surface water loading from the combined sewer along St. Margaret's Road. This section of road will be removed from the combined system and assigned to a separate storm sewer line. The effect of this will be to alleviate current loading in the existing foul network, thereby providing capacity for the site's generated foul flows. This proposal has been agreed with Irish Water.

The proposed landscape will play a key role in helping to achieve green field runoff rates on the development. Carparking will be on permeable grasscrete material. The development layout creates contiguous greenspaces,

[5] The average daily flow to a waste water treatment works (WWTW) during a period without rain.

[6] Letter dated 10-04-2024 from UÉ to MHL & Associates

particularly at the centre and around the western and southern edge, that provide larger permeable surface area. The retention of existing trees supported by additional tree, hedgerow and shrub planting in these areas will increase evapotranspiration rates. Green roofs will be incorporated into the proposed apartment blocks which will intercept and slow the surface water run off rate at source. Soakaways will be incorporated in the gardens of the individual dwelling houses to contribute to take advantage of the permeability of the site. This design will ensure that the proposed development's runoff rate matches the existing site's greenfield runoff rate.

A network of bioswales will be incorporated into streets and open spaces across the scheme. Surface water will be diverted into these features where it will percolate at a reduced rate into the ground. The bioswale features will include overflow pipes that will take excess water away to buried storage tanks in extreme weather events. These tanks will connect to a new outfall to the Folly stream at the southern boundary of the site. Storm water will be attenuated on site through infiltration and will only be discharged to the Folly stream when required i.e., during extreme weather events.

Foul and storm water emissions will be discharged to the mains from the operational development. The proposed works on St. Margaret's Road, will alleviate the local capacity issues and ultimately provide separate storm and foul networks in this area. The site will then be connected to the municipal foul network which is directed to and treated at the Killarney WWTP. The Killarney WWTP provides tertiary Nitrogen & Phosphorus removal to the wastewater it processes. The most recent Annual Environmental Report (AER) (2022)[7] reports that the final effluent is non-compliant with Emission Limit Values (ELVs) set in the Wastewater Discharge Licence. The ecological status of Ross Bay, into which the Folly stream discharges, is Poor and restoration measures are planned to restore compliance with the WFD.

3.4 Identification of Other Projects or Plans or Activities

The plans relevant to this proposal are the Kerry County Development Plan (2022-2028), the Killarney Municipal District LAP (2018-2024) and Variation No. 4 to the Killarney Town Development Plan (2009-2015).

Developments in the vicinity of the proposal include construction, alteration, extension, and retention of private and community residences. The proposal site, and the sites surrounding it have been subject to a number of planning applications over the years which have lapsed. The most recent applications in the vicinity of the site are:

- Planning Ref No. 19813: Planning approval granted to the Kerry Education and Training Board (for the development of an ASD unit in lands located to the south of the proposal site, within the grounds of the Killarney Community College,
- Planning Ref. No. 23267: Planning approval to construct staff accommodation on the grounds of the existing Lake Hotel on Muckross Road comprising of 4 detached single storey units, each individual unit consists of 4 single bedrooms and 1 double bedroom, and all associated site works.at a location approximately 3 km to the south
- Planning Ref. No. 23305: An application to construct 9 dwelling houses with all associated site works adjacent to the north of this application's proposed site entrance off Port Road.
- Planning Ref. No. 23523: Planning approval to demolish existing garage and boiler house, construct a two storey granny flat with link corridor at both levels, and construct a double garage and all associated site works at a location approximately 200 m to the north west.

[7] https://www.water.ie/docs/aers/2022/D0037-01_2022_AER.pdf

The site is situated within the urban fabric of Killarney town. The Killarney National Park is located west of the proposal site. The on-going activities in the area are recreation, and wastewater treatment. The Killarney Waste Water Treatment Plant (WWTP) discharges to Lough Leane at Ross Bay, c. 2 km downstream of the proposal site.

3.5 Identification of Natura 2000 Sites

3.5.1 Zone of Impact Influence

The identification of relevant European sites was undertaken using the Source-Pathway-Receptor approach to establish ecological connections or links between the proposal site and SAC's/SPA's or European sites.. The zone of impact is the area over which ecological features may be subject to significant effects as a result of the proposed development and associated activities (CIEEM, 2018). The zone of impact will vary with different ecological features, depending on their sensitivities to an environmental change. SACs and SPAs within the zone of potential significant impact influence of the proposal site, including their proximity are shown in **Table 1** below.

Table 1. Natura 2000 Sites potentially within zone of influence

Designated Site	Site Code	Proximity of Site to Nearest Point of Designated Site	Hydrological/Ecological Connection?
Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC	000365	100 m W	Direct connection due to proximity of PDS to SAC. Indirect connection via the Folly stream through Killarney WWTP to Lough Leane.
Killarney National Park SPA	004038	100 m W	Direct connection due to proximity of PDS to SAC. Indirect connection via the Folly stream through Killarney WWTP to Lough Leane.
Sheheree (Ardagh) Bog SAC	000382	3.7 km SE	No connection
Castlemaine Harbour SAC	000343	5 km N	Indirect connection via the Folly stream through Killarney WWTP and Lough Leane to the Laune River
Old Domestic Building Curraglass Wood	002041	15 km SE	No Connection
Erik Bog SPA	004108	16.5 km SW	No Connection

3.5.2 Characteristics of Natura 2000 Sites

Table 2 lists the Qualifying Interests (QI) of SACs of Special Conservation Interest (SCI) for SPA's that potentially lie within the zone of impact of the subject site. Information pertaining to the Natura 2000 sites is from site synopses, conservation objectives and other information available on www.npws.ie.

Table 2. Natura 2000 sites with qualifying features of Special Conservation Interest.[8]

Natura 2000 Site	Qualifying features of Special Conservation Interest
Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365)	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* [3130] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Juniperus communis formations on heaths or calcareous grasslands [5130] Calaminarian grasslands of the *Violetalia calaminariae* [6130] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Blanket bogs (* if active bog) [7130] Depressions on peat substrates of the Rhynchosporion [7150] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]* *Taxus baccata* woods of the British Isles [91J0]* *Geomalacus maculosus* (Kerry Slug) [1024] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Euphydryas aurinia* (Marsh Fritillary) [1065] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303] *Lutra lutra* (Otter) [1355] *Trichomanes speciosum* (Killarney Fern) [1421] *Najas flexilis* (Slender Naiad) [1833] *Alosa fallax killarnensis* (Killarney Shad) [5046]
Killarney National Park SPA (004038)	Merlin (*Falco columbarius*) [A098] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]

[8] Asterisk indicates a priority habitat under the Habitats Directive.

Natura 2000 Site	Qualifying features of Special Conservation Interest
Sheheree (Ardagh) Bog SAC (000382)	Active raised bogs [7110]* Degraded raised bogs still capable of natural regeneration [7120]
Castlemaine Harbour SAC (000343)	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]* Dunes with *Salix repens* ssp. *Argentea* (*Salicion arenariae*) [2170] Humid dune slacks [2190] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae)* [91E0]* *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Petalophyllum ralfsii* (Petalwort) [1395]
Old Domestic Building Curraglass Wood SAC (002041)	*Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303]

3.5.3 Conservation Objectives

According to the Habitats Directive, the *conservation status of a natural habitat* will be taken as 'favourable' within its biogeographic range when:

- its natural range and areas it covers within that range are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable as defined below.

According to the Habitats Directive, the conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' within its biogeographic range when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and

- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Conservation Objectives Series documents are available for the following sites:

- Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC 000365. Published 23 October 2017.
- Castlemaine Harbour SAC 000343. Published 19 July 2011.
- Sheheree (Ardagh) Bog SAC 000382. Published 12 November 2015.
- Old Domestic Building Curraglass Wood 002041. Published 27 August 2018

First Order Site-specific Conservation Objectives were available for:

- Killarney National Park SPA 004038. Published 12/10/2022.

These were accessed on the 29/04/2024. No management plan is available for any of these sites. All conservation objectives together with other Natura 2000 site information are available on http://www.npws.ie/protectedsites/.

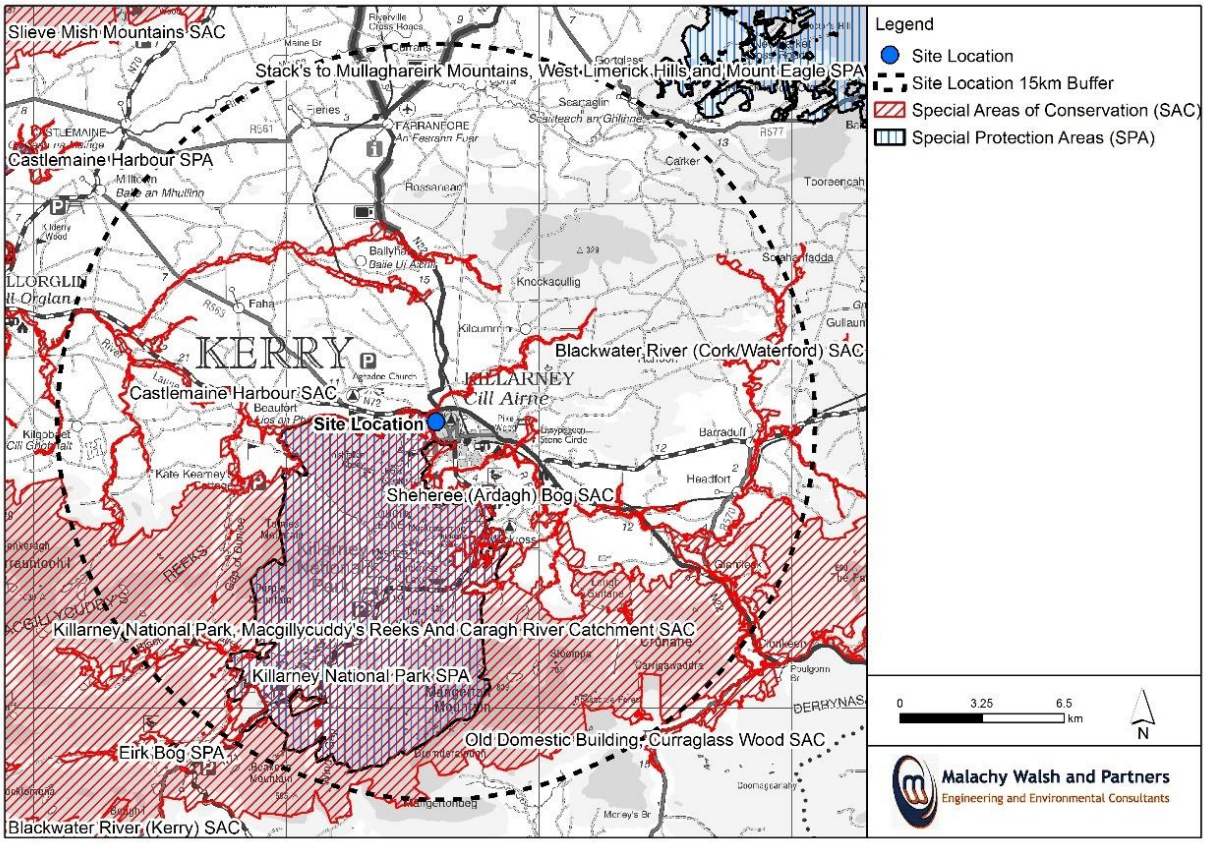

Figure 4: Natura 2000 sites potentially within zone of impact

3.6 Identification of Potential Impacts

Potential likely ecological impacts arising from the project are identified in this section.

Description of elements of the project likely to give rise to potential ecological impacts.	Excavations and earthworks to form levels. Associated increased noise and activity. Foul and storm water emissions
Describe any likely direct, indirect or secondary ecological impacts of the project (either alone or in combination with other plans or projects) by virtue of: *Size and scale;* *Land-take;* *Distance from Natura 2000 Site or key features of the Site;* *Resource requirements;* *Emissions;* *Excavation requirements;* *Transportation requirements;* *Duration of construction, operation etc.; and* *Other.*	<u>Size and scale</u> The area of development is 4.75 ha. Boundaries will be retained. There will be additional works at Port Road and St, Margaret's Road, within the existing footprint. <u>Land-take</u> There will be no land-take from any Natura 2000 site. <u>Distance from Natura 2000 sites or key features of the site</u> The Killarney National Park SAC is located west of site, across the R877 Port Road. The site is indirectly hydrologically connected to the SAC through the Folly stream which joins the combined sewer network under Killarney town at New Street and eventually discharges to Lough Leane via the Killarney WWTP c. 2 km downstream (SE) of the site. <u>Resource requirements</u> The resources required for the project are described in **Section 3.3**, above. <u>Emissions</u> Noise emissions will increase during the construction and operation of the project. Water emissions will be to ground during the construction phase. New foul water connections will be established on the mains for the operational development. Storm water will be infiltrated. Attenuated storm water during heavy rainfall events will be discharged to the Folly stream at Greenfield rates. Air emission sources during construction include gases and particulates associated with vehicles, machinery, plant equipment as well as indirect emissions associated with material extraction, manufacturing, and transport. Air emission sources during operation of the development include gases and particulates associated with electricity usage. During the operational phase, the new street lighting may alter the light levels within the commuting corridors used by lesser horseshoe bats within the woodland most adjacent to Port Road. <u>Excavation requirements</u> The areas of the site which are currently above the required levels shall be excavated using machinery to remove the topsoil, subsoil, and underlying bedrock, as necessary. The materials removed from the cut areas shall where possible be used to provide the fill to raise the height of lower areas on site.

	While any excess materials which are surplus to the fill requirements will be removed from site, minimising the volume of material to be removed from site will be a key consideration in the civil design, and in the determination of the most appropriate site levels. Transportation requirements Deliveries will be coordinated to prevent queuing of vehicles which could adversely affect traffic flow and to minimise disruption to local traffic. Deliveries will be timed and coordinated to avoid conflict with collection of waste, other deliveries (particularly adjoining landowners) and rush hour traffic (AM & PM peak hours as identified in the Traffic & Transportation report). Large deliveries will be scheduled outside peak hours to minimise disruption. On occasion, with the agreement of the planning authority, out of hours deliveries and collections shall be implemented to facilitate the smooth continuation of works and minimise disruption. Duration of construction and operation The combined construction duration, consisting of three separate phases, will be 3.5 years. The operation of the proposed development will be permanent.

3.7 Assessment of Significance of Potential Impacts

This section considers the list of sites identified in Section 3.5, above, together with the potential ecological impacts identified in the previous section and determines whether the project is likely to have significant effects on a European site. When assessing impact, European sites are only considered relevant where a credible or tangible source-pathway-receptor link exists between the proposed development and a protected species or habitat type. In order for an impact to occur there must be a risk initiated by having a 'source' (e.g. excavation), and an impact pathway between the source and the receptor (e.g. a waterbody which connects the proposal site to the protected species or habitats). An evaluation based on these factors to determine which European sites are the plausible ecological receptors for potential impacts of the proposed works will be conducted in Sections 3.7.1 to 3.7.4, below. The evaluation takes cognisance of the scope, scale, nature and size of the project, its location relative to the European sites listed in Table 1, above, and the degree of connectedness that exists between the project and each European site's potential ecological receptors.

The likelihood of significant effects to a European site from the project was determined based on several indicators including:

- Water quality and resource
- Habitat loss
- Habitat alteration
- Habitat or species fragmentation
- Disturbance and/or displacement of species

The likelihood of significant in-combination effects is assessed in Section 3.7.5.

3.7.1 Water Quality

3.7.1.1 Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365)

In light of ABP's determination that it cannot be concluded that significant disturbance or displacement to the population of lesser horseshoe bats for which the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365) has been selected, will not occur, it will be necessary to prepare a Natura Impact Statement (NIS). The purpose of the NIS will be to provide adequate information to enable ABP to undertake and complete an Appropriate Assessment of the proposed development. It will comprise a scientific examination of the proposed development and the aforementioned SAC. It will identify and characterise any possible implications of the proposed development, on its own or in combination with other plans or projects, on the conservation objectives of said SAC. It will include an assessment of the potential for adverse water quality effects.

3.7.1.2 Killarney National Park SPA (004038)

Notwithstanding that the SPA site boundary encompasses the water of Lough Leane, the Upper Lake and some of the connected river systems, the site is not selected for the protection of any SCI species reliant on, or strongly associated with, riparian or lacustrine habitats (see Section 3.7.3.2 for detail). It is concluded, therefore, that significant direct, indirect, or secondary impacts as a result of water quality impacts ensuing from the proposed development on Killarney National Park SPA (004038) are not likely, in view of the sites' conservation objectives.

3.7.1.3 Sheheree (Ardagh) Bog SAC (000382)

This bog is ombrotrophic,[9] i.e., it receives water and nutrients from precipitation, rather than from streams or springs. As a result, there is no hydrological link between the proposed development site and the SAC and, therefore, no impact pathway exists. In light of the characteristics of the project described in Section 3.3, bearing in mind the impacts identified in Section 3.6, and the evidence provided in the preceding sentence, it is concluded that significant direct, indirect, or secondary water quality impacts ensuing from the proposed development on Sheheree (Ardagh) Bog SAC (000382) are not likely, in view of the sites' conservation objectives..

3.7.1.4 Castlemaine Harbour SAC (000343)

The waters of Lough Leane, which intervene between the environs of Killarney and this SAC, drain to the SAC at its point outflow to the River Laune. There is, therefore, a viable impact pathway, for waterborne impacts, connecting the proposed development site to the SAC. However, the surface area of Lough Leane is 1,978 ha and it has a mean depth of 13 m and a maximum depth of 66 m[10]. Using the surface area and the mean depth, the volume within the lake was calculated as being 257,140,000 m^3. It is clear, therefore, in light of the volume of water within the lake, that the potency of the pathway is, at best, tenuous and weak, due to diluting and attenuating effect of the volume of water within the lake, even for adulterants held in solution.

The SAC is not selected for the protection of any aquatic annexed habitat types therefore, no annexed aquatic habitats will be exposed to direct, indirect, or secondary impacts. In light of the characteristics of the project

[9] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000382.pdf

[10] https://www.fisheriesireland.ie/sites/default/files/2023-02/fish_stock_survey_leane_2021.pdf

described in Section 3.3, bearing in mind the impacts identified in Section 3.6, and the evidence provided in the preceding sentence and paragraph, it is concluded that significant direct, indirect, or secondary water quality impacts ensuing from the proposed development on Castlemaine Harbour SAC (000343) are not likely, in view of the sites' conservation objectives.

The SAC is, however, selected for the protection of populations of 3 QI fish species, 1 semi-aquatic QI species of mammal, and 1 QI woodland habitat type that is restricted in its distribution to riparian, river bank, corridors. An assessment of waterborne, indirect or secondary, disturbance or displacement of species impacts is provided in Section 3.7.3.3. An assessment of waterborne, indirect or secondary, habitat loss or alteration impacts is provided in Section 3.7.2.4.

3.7.1.5 Old Domestic Building Curraglass Wood SAC (002041)

This site is situated at a remove of 15 km from the proposed development site and is not selected for any ground or surface water associated habitat. Neither pathway nor receptor exists. Significant direct, indirect, or secondary water quality impacts ensuing from the proposed development on this SAC are not likely, in view of the sites' conservation objectives.

3.7.2 Habitat Loss, Alteration, or Degradation

3.7.2.1 Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365)

In light of ABP's determination that it cannot be concluded that significant disturbance or displacement to the population of lesser horseshoe bats for which the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365) has been selected, will not occur, it will be necessary to prepare a Natura Impact Statement (NIS). The purpose of the NIS will be to provide adequate information to enable ABP to undertake and complete an Appropriate Assessment of the proposed development. It will comprise a scientific examination of the proposed development and the aforementioned SAC. It will identify and characterise any possible implications of the proposed development, on its own or in combination with other plans or projects, on the conservation objectives of said SAC. It will include an assessment of the potential for adverse habitat loss or alteration effects.

3.7.2.2 Killarney National Park SPA (004038)

Notwithstanding that the SPA site is encompassed within the SAC it is not selected for the protection of any annexed habitat. Therefore, in light of the characteristics of the project described in Section 3.3, and bearing in mind the impacts identified in Section 3.6, it is concluded that significant direct, indirect, or secondary habitat loss or alteration impacts, are not likely, in view of the sites' conservation objectives.

An assessment of disturbance or displacement of species impacts is provided in Section 3.7.3.2.

3.7.2.3 Sheheree (Ardagh) Bog SAC (000382)

Section 3.7.1.3 concluded that that significant water quality impacts ensuing from the proposed development on Sheheree (Ardagh) Bog SAC (000382) are not likely. In light of this finding, it is concluded that significant direct, indirect, or secondary habitat loss or alteration impacts, as a result of water quality impacts ensuing from the proposed development on Sheheree (Ardagh) Bog SAC (000382) are not likely, in view of the sites' conservation objectives for the Annex 1 habitat for which it is selected (see Table 2).

3.7.2.4 Castlemaine Harbour SAC (000343)

This site is selected for the protection of 13 Annex 1 habitat types which are all, with the exception of 1 alluvial woodland habitat type, coastal or halophytic in their distributions. Included amongst these are saltmarsh, sand dune, estuarine and shore habitat types. Mapping of the distributions of these (NPWS, 2011) indicates that all of these coastal habitats are at a remove of in excess of 20 river kilometres downstream of the point of outflow of Lough Leane to the River Laune. There are 5 sites within the SAC that support the alluvial woodland habitat type; 2 of these or located downstream of Lough Leane (Map 7: NPWS 2011). The nearest of these (Site No. 1915) is approximately 8 river kilometres downstream of the point of outflow of Lough Leane to the River Laune.

The coastal and halophytic distributions of the other annexed habitat types and their ecological characteristics[11], preclude any significant habitat loss or alteration impacts as a result of water quality impacts, ensuing from the proposed development. A viable pathway, comprising Lough Leane and the River Laune, to the alluvial woodland at Site No. 1915 does exist. However, because the habitat type is terrestrial rather than aquatic, albeit reliant on periodic flooding, it is not continuously exposed to the river waters. This characteristic, when combined with the diluting effect of the volume of waters in Lough Leane and the River Laune, will reduce any impacts to an imperceptible level.

In light of the characteristics of the project described in Section 3.3, bearing in mind the impacts identified in Section 3.6 and the evidence provided in the preceding sentences, it is concluded that significant direct, indirect, or secondary habitat loss or alteration impacts, as a result of water quality impacts ensuing from the proposed development on Castlemaine Harbour SAC (000343) are not likely, in view of the sites' conservation objectives for these habitats (see Table 2).

3.7.2.5 Old Domestic Building Curraglass Wood SAC (002041)

This site is situated at a remove of 15 km from the proposed development site and no pathway exists for habitat loss or alteration impacts. In light of the impacts identified in Section 3.6, and bearing in mind that the intervening distance precludes any habitat loss or alteration impacts, it is concluded that significant direct, indirect, or secondary habitat loss or alteration impacts ensuing from the proposed development on this SAC are not likely, in view of the sites' conservation objectives.

3.7.3 Disturbance and/or Displacement of Species

3.7.3.1 Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365)

ABP refused permission for a previous application for this proposal [ABP-312987-22] on the grounds that it could not be concluded that the proposed development would not adversely affect the integrity the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365) in view of the site's Conservation Objectives, specifically with regard to impacts on the foraging activities of the population of lesser horseshoe bat for which the site is selected.

In light of the board's determination, it cannot be concluded that significant disturbance and/or displacement of species impacts to the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365) are not, in view of the site's conservation objectives, likely. Potential for indirect effects to foraging and

[11] See mapping in NPWS, 2011.

commuting lesser horseshoe bats in the woodland west of Port Road is possible as a result of lighting associated with the development.

In light of ABP's determination, it will be necessary to prepare a Natura Impact Statement (NIS). The purpose of the NIS will be to provide adequate information to enable ABP to undertake and complete an Appropriate Assessment of the proposed development. It will comprise a scientific examination of the proposed development and the aforementioned SAC. It will identify and characterise any possible implications of the proposed development, on its own or in combination with other plans or projects, on the conservation objectives of said SAC. It will include an assessment of the potential for adverse species disturbance or displacement effects.

3.7.3.2 Killarney National Park SPA (004038)

This site is selected for the protection of 2 SCI species, namely:

- Merlin (*Falco columbarius*) [A098]
- Greenland white-fronted goose (*Anser albifrons flavirostris*) [A395]

3.7.3.2.1 Merlin

The SPA is selected for the protection of a breeding population of this species (estimated, in 2014, to be 5 pairs[12]). The species breeds in open and semi open areas such as moorland, mountain, and blanket bog. In open country eggs are laid in a scrape on the ground amid bushes, but in forested areas the tree nests of crows, rooks, or magpies are used. A hunting merlin will normally set up a vigil from an elevated perch like a fence post or tree stump awaiting smaller birds, typically in the 1 to 2-ounce range, that it catches in midair. Once on the wing it is nimble in flight and will pursue its prey for extended periods, accelerating towards the prey throughout. They attack at high speed, horizontally or even from below, chasing the prey upwards until they tire.

As can be seen from Section 3.2, the habitats within the site are not suitable as breeding habitat for this SCI species. It is concluded, therefore, that direct, indirect, or secondary impacts on the breeding activity of the population of this species for which this site is selected are not reasonably foreseeable.

While there is some limited possibility that the species hunts at the site, it is unlikely that the site is essential to the ecological resources, within and around the SPA, that support the structure and function of the resident population. The natural range of the species within the SPA will not be reduced, as a result of the proposed development and there is, and will continue to be, a sufficiently large habitat to maintain its population on a long-term basis in the 10, 328 ha[13] encompassed within the site boundary.

In light of the characteristics of the project described in Section 3.3, bearing in mind the impacts identified in Section 3.6 and the evidence provided in the preceding paragraphs, it is concluded, therefore, that significant direct, indirect or secondary disturbance or displacement effects as a result of the proposed works on Killarney National Park SPA (004038) are not, in view of the sites' conservation objectives for this species, likely as a result of either the construction or operational phases of the proposed development.

3.7.3.2.2 Greenland white-fronted goose

The SPA is selected for the protection of a non-breeding, over-wintering population[14] of this species. Traditionally, the species wintered predominantly in bogs. Over time, due to habitat damage, flocks began to winter increasingly

[12] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004038.pdf
[13] https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=IE0004038
[14] < 20 birds (see https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004038.pdf)

in freshwater marshes, wet grasslands[15] and on intensively managed grasslands. Flocks are highly sensitive to disturbance and have abandoned favoured feeding areas if the level of human disturbance increases (Fox *et al.*,1998).

As can be seen from Section 3.2, the habitats within the site are not suitable as foraging or rooting habitat for this SCI species. In fact, the urban setting alone is sufficient to ensure that the species has and will continue to actively avoid the location. In light of these characteristics, it is considered that the population of this species for which this site is selected will not be present within the zone of influence of any impact identified in Section 3.6. The natural range of the species within the SPA will not be reduced and there is, and will continue to be, a sufficiently large habitat to maintain its population on a long-term basis.

In light of the characteristics of the project described in Section 3.3, bearing in mind the impacts identified in Section 3.6 and the evidence provided in the preceding paragraphs, it is concluded that significant direct, indirect or secondary disturbance or displacement effects, as a result of the proposed development on Killarney National Park SPA (004038) are not, in view of the sites' conservation objectives for this species, likely as a result of either the construction or operational phases of the proposed development.

3.7.3.3 Castlemaine Harbour SAC (000343)

The SAC is selected for the protection of populations of 3 QI fish species, 1 semi-aquatic QI species of mammal and a non-vascular plant QI species. As outlined previously, in Section 3.7.1.4, The waters of Lough Leane, which intervene between the environs of Killarney and this SAC comprise a volume in excess of 257,140,000 m^3. It is clear, therefore, in light of the volume of water within the lake, that the potency of the pathway is, at best, tenuous and weak, due to diluting and attenuating effect of the volume of water within the lake, even for adulterants held in solution.

3.7.3.3.1 Sea Lamprey, River Lamprey & Salmon

In the case of these species, it is secondary disturbance or displacement impacts, due to a reduction in the extent and distribution of spawning habitat, or a reduction in water quality, due to impacts ensuing from the proposed development, which must be assessed. The key indicator is whether the impacts identified in Section 3.6 are likely to cause a reduction in the Q value[16] in the waters of the Laune which for salmon, the species, of these three, with the highest requirements, must be maintained at least at Q4 (WFD Status: Good) (NPWS, 2011).

In light of the characteristics of the project described in Section 3.3, and bearing in mind the impacts identified in Section 3.6 and considering the content in Section 3.7.1.4, summarised at 3.7.3.3, preceding, it is concluded that the requirement that at least 85% of all sites sampled on the Laune by the EPA must achieve at least Q4 (NPWS, 2011) will not be compromised by the proposed development and there will be no reduction in the extent and distribution of spawning habitat for any of these species.

It is concluded that significant indirect, or secondary disturbance or displacement impacts as a result of water quality impacts ensuing from the proposed development on Castlemaine Harbour SAC (000343) are not likely, in view of the sites' conservation objectives for these species.

3.7.3.3.2 Otter

In the case of this species, it is secondary disturbance or displacement impacts due to a reduction in fish prey biomass caused by water quality impacts ensuing from the proposed development that must be assessed. In light

[15] https://www.wexfordwildfowlreserve.ie/wildlife-2/greenland-goose/
[16] Biotic indices ("Q Values") reflect average water quality at any location. See https://epawebapp.epa.ie/qvalue/webusers/

of the impacts identified in Section 3.6 and, bearing in mind the conclusion in Section 3.7.3.3.1, preceding, it is concluded that significant indirect, or secondary, disturbance or displacement impacts as a result of water quality impacts ensuing from the proposed development on Castlemaine Harbour SAC (000343) are not likely, in view of the sites' conservation objectives for this species.

3.7.3.3.3 Petalwort

This species of liverwort is restricted in its distribution within the SAC to dune slacks at Inch and Rosbehy In excess of 25 km from the proposed development site. Therefore, no plausible impact pathway connects these locations to the proposed development site. As a result, impacts of any kind on this species as a result of the proposed development are not reasonably foreseeable. In light of the characteristics of the project described in Section 3.3, bearing in mind the impacts identified in Section 3.6 and the evidence provided in the preceding sentences, it is concluded that significant, indirect or secondary, disturbance or displacement impacts ensuing from the proposed development on Castlemaine Harbour SAC (000343), as a result of water quality impacts, are not likely, in view of the sites' conservation objectives for this species.

3.7.3.4 Old Domestic Building Curraglass Wood SAC (002041)

This site, which is selected for the protection of a population of lesser horseshoe bats and the internationally significant summer roost they occupy (NPWS, 2018) is situated some 15 km from the proposed development site, a distance which precludes any of the impacts identified in Section 3.6 from exerting any impact or effect on this population. In light of the impacts identified in Section 3.6 and bearing in mind that the intervening distance precludes any impacts it is concluded that significant direct, indirect, or secondary disturbance or displacement impacts ensuing from the proposed development on this SAC are not likely, in view of the sites' conservation objectives.

3.7.4 Habitat or Species Fragmentation

Habitat fragmentation has been defined as 'reduction and isolation of patches of natural environment' (Hall *et al.*, 1997 cited in Franklin *et al.*, 2002) which results in spatial separation of habitat areas which had previously been in a state of greater continuity. Adverse effects of habitat fragmentation on species or populations can include the increased isolation of populations which can detrimentally impact on the resilience or robustness of the populations thereby reducing overall species diversity and altering species abundance.

3.7.4.1 Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365)

In light of ABP's determination that it cannot be concluded that significant disturbance or displacement to the population of lesser horseshoe bats for which the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365) has been selected, will not occur, it will be necessary to prepare a Natura Impact Statement (NIS). The purpose of the NIS will be to provide adequate information to enable ABP to undertake and complete an Appropriate Assessment of the proposed development. It will comprise a scientific examination of the proposed development and the aforementioned SAC. It will identify and characterise any possible implications of the proposed development, on its own or in combination with other plans or projects, on the conservation objectives of said SAC. It will include an assessment of the potential for adverse habitat or species fragmentation effects.

3.7.4.2 Killarney National Park SPA (004038)

Section 3.7.1.2 concluded that significant direct, indirect or secondary water quality impacts within this SPA are not, in view of the site's conservation objectives, likely. Section 3.7.2.2 concluded that direct, or indirect, significant habitat loss, alteration, or degradation effects within this SPA are not expected to ensue and Section 3.7.3.2 concluded that significant species disturbance or displacement impacts are not predicted. Having regard to the location, nature and scale of the proposed works and the conclusions cited, it is concluded that significant direct, indirect, or secondary habitat or species fragmentation effects within the Killarney National Park SPA (004038) are not, in view of the site's conservation objectives, likely as a result of either the construction or operational phases of the proposed development.

3.7.4.3 Sheheree (Ardagh) Bog SAC (000382)

Section 3.7.1.3 concluded that significant direct, indirect or secondary water quality impacts within this SAC are not, in view of the site's conservation objectives, likely. Section 3.7.2.3 concluded that direct, or indirect, significant habitat loss, alteration, or degradation effects within this SPA are not expected to ensue and, as the site is not selected for the protection of any QI species, there is no potential for significant species disturbance or displacement impacts. Having regard to the location, nature and scale of the proposed works and the conclusions cited, it is concluded that significant direct, indirect, or secondary habitat or species fragmentation effects within the Sheheree (Ardagh) Bog SAC (000382) are not, in view of the site's conservation objectives, likely as a result of either the construction or operational phases of the proposed development.

3.7.4.4 Castlemaine Harbour SAC (000343)

Section 3.7.1.4 concluded that significant direct, indirect or secondary water quality impacts within this SAC are not, in view of the site's conservation objectives, likely. Section 3.7.2.4 concluded that significant direct, indirect, or secondary habitat loss, alteration, or degradation effects within this SPA are not expected to ensue and Section 3.7.3.3 concluded that significant species disturbance or displacement impacts are not predicted. Having regard to the location, nature and scale of the proposed works and the conclusions cited, it is concluded that significant habitat or species fragmentation effects within the Castlemaine Harbour SAC (000343) are not, in view of the site's conservation objectives, likely as a result of either the construction or operational phases of the proposed development.

3.7.4.5 Old Domestic Building Curraglass Wood (002041)

Section 3.7.1.5 concluded that significant direct, indirect or secondary water quality impacts within this SPA are not, in view of the site's conservation objectives, likely. Section 3.7.2.5 concluded that significant direct, or indirect habitat loss, alteration, or degradation effects within this SPA are not expected to ensue and Section 3.7.3.4 concluded that significant species disturbance or displacement impacts are not predicted. Having regard to the location, nature and scale of the proposed works and the conclusions cited, it is concluded that significant direct, indirect, or secondary habitat or species fragmentation effects within the Old Domestic Building Curraglass Wood (002041) are not, in view of the site's conservation objectives, likely as a result of either the construction or operational phases of the proposed development.

3.7.5 In-combination Impacts

When in-combination impacts are assessed, it is necessary to identify the types of impacts that may ensue from the project under consideration and from other sources in the existing environment that, cumulatively, are likely to affect the relevant Natura 2000 sites (EC, 2001, EC, 2021). The Plans and the existing and proposed

developments with which the proposed development could interact synergistically to create significant effects on the integrity of the Natura 2000 sites listed in **Table 1** have been identified in **Section 3.4**, above.

When assessing in combination impacts it is necessary not only to take full consideration of the magnitude, duration or intensity of the impacts ensuing from the proposal and from the other plans or projects, but to also be cognisant of the requirement that, for synergistic interaction to occur, a plausible and functional source-pathway-receptor link must exist between the proposed development and the other plans or projects. An additional consideration is that there are different boundaries for different kinds of impacts and for different ecological receptors: the boundary that pertains to species disturbance or displacement impacts is likely to be quite localised while the boundary that pertains to water quality impacts may, if there is a hydrological link, extend to locations at a remove from the proposed development itself.

3.7.5.1 Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365)

In light of ABP's determination that it cannot be concluded that significant disturbance or displacement to the population of lesser horseshoe bats for which the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365) has been selected, will not occur, it will be necessary to prepare a Natura Impact Statement (NIS). The purpose of the NIS will be to provide adequate information to enable ABP to undertake and complete an Appropriate Assessment of the proposed development. It will comprise a scientific examination of the proposed development and the aforementioned SAC. It will identify and characterise any possible implications of the proposed development, on its own or in combination with other plans or projects, on the conservation objectives of said SAC. It will include an assessment of the potential for adverse in-combination effects.

3.7.5.2 Other Natura 2000 Sites

The Kerry County Development Plan (2022-2028), the Killarney Municipal District LAP (2018-2024) and Variation No. 4 to the Killarney Town Development Plan (2009-2015) will have the necessary environmental safeguards in place to prevent significant effects to Natura 2000 sites. Adherence to the overarching policies and objectives of the Kerry County Development Plan (2022-2028) and any future development plans will ensure that local planning applications and subsequent grant of planning will comply with the core strategy of proper planning and sustainability and with the requirements of relevant EU Directives, National Legislation and environmental considerations, and will ensure that there is no potential for significant in combination effects on the other Natura 2000 sites listed in **Table 1.**

With regard to the other development applications identified in **Section 3.4:** in light of the nature of the proposed developments, and bearing in mind the assessments in **Sections 3.7.1 to 3.7.4**, inclusive, it is unlikely that the magnitude, duration or intensity of any putative impacts ensuing from these projects, would be sufficient to synergistically interact with the impacts described in **Section 3.6**.

In light of the impacts identified in **Section 3.6** and having regard to the location, nature and scale of the proposed works, described in **Section 3.3**, and the assessments in **Sections 3.7.1** to **3.7.4**, inclusive, it is concluded that significant in-combination effects as a result of synergistic interaction between the proposed works and other plans and projects, identified in **Section 3.4**, within the other Natura 2000 sites listed in **Table 1** are not, in view of those sites' conservation objectives, likely as a result of either the construction or operational phases of the proposed development**.** The Natura 2000 sites are:

- Killarney National Park SPA (004038)
- Sheheree (Ardagh) Bog SAC (000382)
- Castlemaine Harbour SAC (000343)

- Old Domestic Building Curraglass Wood (002041)

3.8 Conclusion of Screening Stage

In conclusion, to determine the potential impacts, if any, of the project on nearby Natura 2000 sites, a screening process for Appropriate Assessment was undertaken. It has been concluded beyond reasonable scientific doubt, based on objective information, and considering the conservation objectives of the relevant European sites, that significant impacts from the project, individually or in combination with other plans and projects, on the following Natura 2000 sites can be excluded:

- Killarney National Park SPA (004038)
- Sheheree (Ardagh) Bog SAC (000382)
- Castlemaine Harbour SAC (000343)
- Old Domestic Building Curraglass Wood (002041)

The rationales supporting this conclusion are summarised in Table 3, below.

Table 3: Summary of Assessment Rationales

Natura 2000 Site	Water Quality	Habitat Loss, Alteration, or Degradation	Species Disturbance/Displacement	Habitat or Species Fragmentation
Killarney National Park SPA (004038)	See Section 3.7.1.2. Notwithstanding that the SPA site boundary encompasses the water of Lough Leane, the Upper Lake and some of the of the connected river systems, the site is not selected for the protection of any SCI species reliant on, or strongly associated with, riparian or lacustrine habitats.	See Section 3.7.2.2 and column 2 'Water Quality'. Notwithstanding that the SPA site is encompassed within the SAC it is not selected for the protection of any annexed habitat type. There is no overlap between the proposed development and the SPA. All habitat loss or alteration impacts will be restricted to the proposed development site.	See Section 3.7.3.2. The SPA is selected for a breeding population od merlin and a migratory, overwintering, population of Greenland white-fronted geese. Habitats within the proposed development site are not suitable as either breeding or foraging habitat for either of the SCI species and the locations within the SPA utilised by these species are not in proximity to the proposed development site.	See Section 3.7.4.2.
Sheheree (Ardagh) Bog SAC (000382)	See Section 3.7.1.3. This bog is ombrotrophic, i.e., it receives water and nutrients from precipitation, rather than from streams or springs. As a result, there is no hydrological link between the proposed development site and the SAC and, therefore, no impact pathway exists.	See Section 3.7.2.3 and column 2 'Water Quality'. There is no overlap between the proposed development and the SAC which is situated at a remove of 3.7 km. There is no pathway for indirect, or secondary, waterborne impacts.	This site is not selected for the protection of any QI or SCI species.	See Section 3.7.4.3.
Castlemaine Harbour SAC (000343)	See Section 3.7.1.4. The SAC is not selected for the protection of any aquatic annexed habitat types. Therefore, while there is a hydrological link between the proposed development site and the SAC, no receptor annexed aquatic habitats will be exposed to direct, indirect, or secondary impacts. The site is, however, selected for the protection of 1 woodland habitat type that is distributed along riparian, river bank, corridors. As a result, there is some albeit limited potential for indirect or secondary habitat loss, alteration or degradation impacts as a result of waterborne impacts. (See Section 3.7.2.4 and	See Sections 3.7.2.4 and 3.7.1.4. This site is selected for the protection of 13 Annex 1 habitat types which are all, with the exception of 1 woodland habitat, coastal or halophytic in their distributions and at a remove of in excess of 20 river kilometres downstream of the point of outflow of Lough Leane to the River Laune NPWS, 2011). The nearest of the woodland habitat sites (Site No. 1915) is approximately 8 river kilometres downstream of the point of outflow of Lough Leane to the River Laune. The distances intervening, when combined with the diluting effect of the volume of	See Section 3.7.3.3. This site is selected for the protection, during the freshwater phases of their life cycles, of the following aquatic QI fish species; sea lamprey, river lamprey & salmon; for otter and for the QI plant species petalwort. For the reasons outlined in Section 3.7.3.3 significant, indirect or secondary, disturbance or displacement impacts ensuing from the proposed development on these species are not likely.	See Section 3.7.4.4.

Natura 2000 Site	Water Quality	Habitat Loss, Alteration, or Degradation	Species Disturbance/Displacement	Habitat or Species Fragmentation
	Column 3 "Habitat Loss, Alteration or Degradation") The site is also selected for the protection, during the freshwater phases of their life cycles, of the following aquatic QI fish species; sea lamprey, river lamprey & salmon; for otter and for the QI plant species petalwort. See Section 3.7.3.3 and Column 4 "Species Disturbance/Displacement"	waters in Lough Leane, and those of the River Laune, any impacts will be reduced to an imperceptible level.		
Old Domestic Building Curraglass Wood SAC (002041)	See Section 3.7.1.5. This SAC is situated at a remove of 15 km from the proposed development site and is not selected for any ground or surface water associated habitat. Neither pathway nor receptor exists.	See Section 3.7.2.5 The SAC it is not selected for the protection of any annexed habitat type. There is no overlap between the proposed development and the SAC, and a separation distance of 15 km intervenes.	See Section 3.7.3.4. This site is selected for the protection of a population of lesser horseshoe bat. The roosts the population, for which the SAC is selected, are situated some 15 km from the proposed development site, a distance which precludes any significant impacts.	See Section 3.7.4.5.

With regard to the remaining site, namely the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365), ABP refused permission for a previous application for this proposal [ABP-312987-22] on the grounds that it could not be concluded that the proposed development would not adversely affect the integrity the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365) in view of the site's Conservation Objectives, specifically with regard to impacts on the foraging activities of the population of lesser horseshoe bat (Rhinolophus hipposideros) for which the site is selected.

In light of ABP's determination, it will be necessary to prepare a Natura Impact Statement (NIS). The purpose of the NIS will be to provide adequate information to enable ABP to undertake and complete an Appropriate Assessment of the proposed development. It will comprise a scientific examination of the proposed development and the aforementioned SAC. It will identify and characterise any possible implications of the proposed development, on its own or in combination with other plans or projects, on the conservation objectives of the Killarney National Park, MacGillycuddy's Reeks and Caragh River Catchment SAC (000365).

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Appendix 1

ABP Order

An Bord Pleanála

Board Order

ABP-312987-22

Planning and Development Acts 2000 to 2021

Planning Authority: Kerry County Council

Application for permission under section 4 of the Planning and Development (Housing) and Residential Tenancies Act 2016, as amended, in accordance with plans and particulars, lodged with An Bord Pleanála on the 11th day of March 2022 by Portal Asset Holdings Limited care of HW Planning of 5 Joyce House, Barrack Square, Ballincollig, County Cork.

Proposed Development comprises of the following:

The construction of a residential development of 228 number residential units with ancillary two storey crèche, landscaping, road improvements, pedestrian and cycleways, storm water upgrades and associated site development works.

(a) The proposed development makes provision for 76 number houses comprising of:

- eight number two storey two-bed semi-detached,
- 28 number two storey three-bed townhouses,
- 10 number two storey three-bed semi-detached,
- 30 number two storey four-bed semi-detached.

(b) The proposed development includes 152 number apartments and duplexes to be provided as follows:

- Block 1 (seven number two-bed and three number two-bed over three storeys),

- Block 2 (three number two-bed and three number two-bed over three storeys),
- Block 3 (four number 1-bed, 10 number two-bed and six number three-bed over three storeys),
- Block 4 (10 number one-bed and 10 number two-bed over three storeys),
- Block J (32 number two-bed over four storeys),
- Block K (16 no. one-bed apartments and 16 number two-bed apartments over four storeys)
- Block L (32 number two-bed apartments over four storeys).

(c) The proposed development will provide for a new vehicular access and pedestrian entrances onto Port Road, upgrades to Port Road comprising reduction in carriageway widths, provision of shared pedestrian and bicycle path and uncontrolled pedestrian crossing, and a pedestrian connection to Millwood Estate.

(d) It is proposed to upgrade the stormwater network on Saint Margaret's Road (approximately 140 metres north of the main development site) to support the development.

(e) Ancillary infrastructure development works will include relocation and undergrounding of electricity supply board powerlines, wastewater infrastructure including foul pumping station, surface water attenuation, water utility services, public lighting, bin stores, bicycle stores, electricity supply board substation, and all associated site development works all located at Port Road and Saint Margaret's Road, Coollegrean, Inch, Knockreer, Ardnamweelt, Derreen, Killarney, County Kerry.

Decision

Refuse permission for the above proposed development based on the reasons and considerations under and subject to the conditions set out below.

Reasons and Considerations

Having regard to the proximity of the subject site to the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment candidate Special Area of Conservation (Site Code: 000365) it is considered that:

The proposed development may result in increased artificial lighting generated at both the construction and operational phases of the development and that may impact on Lesser Horseshoe Bats that commute along routes to the west of the Port Road and Deenagh River. The submitted Appropriate Assessment Screening Report does not provide sufficient scientific reasoning to clearly eliminate the likelihood of significant adverse effects.

In view of the site's Conservation Objectives and qualifying interests, the applicant has failed through the submitted Appropriate Assessment Screening Report to demonstrate that the proposed development would not adversely affect the integrity of a European Site and it is considered that the proposed development would, therefore, be contrary to the proper planning and sustainable development of the area.

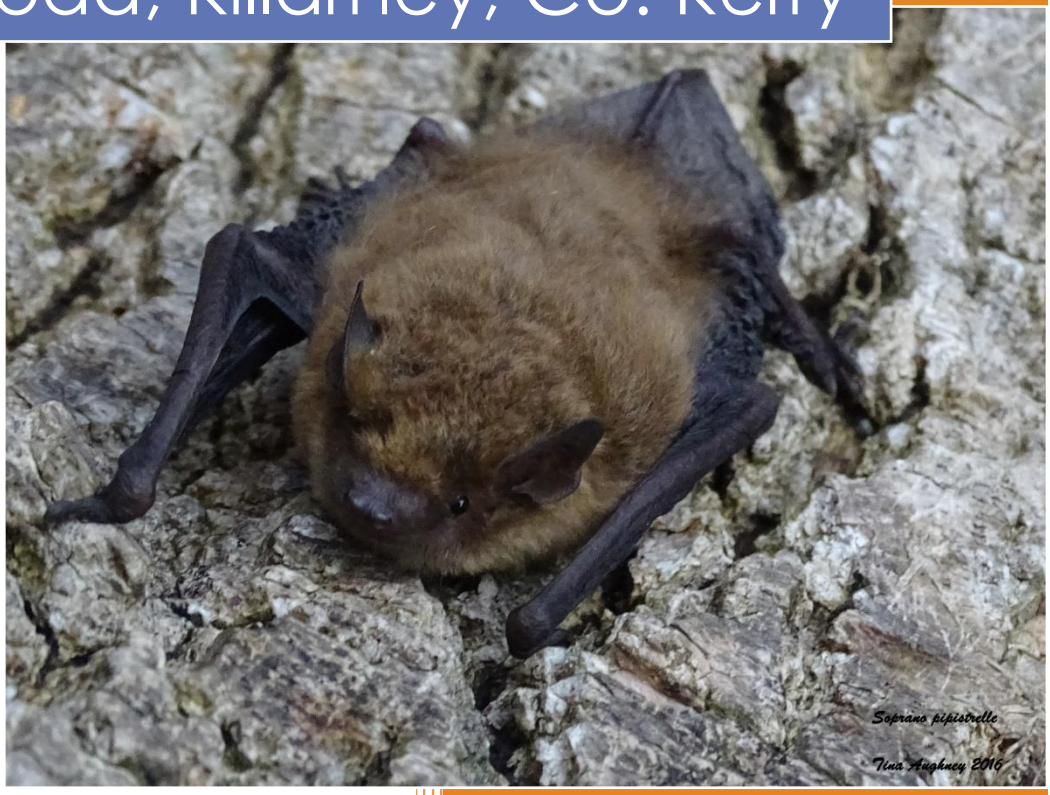
Michelle Fagan
Member of An Bord Pleanála
duly authorised to authenticate
the seal of the Board.

Dated this 22nd **day of** August **2022**

Appendix 2 – Bat survey report, Port Road Killarney
(Dr Tina Aughney, Bat Eco Services, 2024)

2023

Supplementary Bat Survey – Port Road, Killarney, Co. Kerry



Dr Tina Aughney

Bat Eco Services

Bat Eco Services, Ulex House, Drumheel, Lisduff, Virginia, Co. Cavan. A82 XW62.

Licensed Bat Specialist: Dr Tina Aughney (tina@batecoservices.com, 086 4049468)
NPWS licence C17/2023 (Licence to handle bats, expires 23rd January 2026);
NPWS licence 27/2023 (Licence to photograph/film bats, expires 31st December 2024);
NPWS licence DER/BAT 2022-36 (Survey licence, expires 24th March 2025).

Statement of Authority: Dr Aughney has worked as a Bat Specialist since 2000 and has undertaken extensive survey work for all Irish bat species including large scale development projects, road schemes, residential developments, wind farm developments and smaller projects in relation to building renovation or habitat enhancement. She is a monitoring co-ordinator and trainer for Bat Conservation Ireland. She is a co-author of the 2014 publication *Irish Bats in the 21st Century.* This book received the 2015 CIEEM award for Information Sharing. Dr Aughney is a contributing author for the Atlas of Mammals in Ireland 2010-2015.

All analysis and reporting is completed by Dr Tina Aughney. Data collected and surveying is completed with the assistance of a trained field assistant.

Mr. Shaun Boyle (Field Assistant) NPWS licence DER/BAT 2022-37 (Survey licence, expires 24th March 2025).

Client: Malachy Walsh & Partners

Project Name & Location: Port Road, Killarney, Co. Kerry.

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
9th August 2023	Draft 1	By email
30th September 2023	Draft 2	By email
2nd October 2023	Final	By email
24th April 2024	Review/Comments	By email

Purpose

This document has been prepared as a Report for Malachy Walsh & Partners. Only the most up to-date report should be consulted. All previous drafts/reports are deemed redundant in relation to the named site.

Bat Eco Service accepts no responsibility or liability for any use that is made of this document other than by the client for the purposes for which it was originally commissioned and prepared.

Carbon Footprint Policy

It is the policy of Bat Eco Services to provide documentation digitally in order to reduce carbon footprint. Printing of reports etc. is avoided, where possible.

Bat Record Submission Policy

It is the policy of Bat Eco Services to submit all bat records to Bat Conservation Ireland database one year post-surveying. This is to ensure that a high level bat database is available for future desktop reviews. This action will be automatically undertaken unless otherwise requested, where there is genuine justification.

Executive Summary

Project Name & Location: Port Road, Killarney, Co. Kerry

Proposed work: Residential development.

Bat Survey Results - Summary

Bat Species	Roosts	Foraging	Commuting
Common pipistrelle *Pipistrellus pipistrellus*		√	√
Soprano pipistrelle *Pipistrellus pygmaeus*		√	√
Nathusius' pipistrelle *Pipistrellus nathusii*			
Leisler's bat *Nyctalus leisleri*		√	√
Brown long-eared bat *Plecotus auritus*			
Daubenton's bat *Myotis daubentonii*		√	√
Natterer's bat *Myotis nattereri*		√	√
Whiskered bat *Myotis mystacinus*		√	√
Lesser horseshoe bat *Rhinolophus hipposideros*	√	√	√

Bat Survey Duties Completed (Indicated by red shading)

Tree PBR Survey	◯	Daytime Building Inspection	◯
Static Detector Survey	◯	Daytime Bridge Inspection	◯
Dusk Bat Survey	◯	Dawn Bat Survey	◯
Walking Transect	◯	Driving Transect	◯
Trapping / Mist Netting	◯	IR Camcorder filming	◯
Endoscope Inspection	◯	Other	◯
		Thermal Imagery filming	

Citation: Bat Eco Services (2023) Supplementary Bat Survey of Port Road, Killarney, Co. Kerry. Unpublished report prepared for Malachy Walsh & Partners.

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1. Introduction

Bat Eco Services was commissioned to provide consultation in relation to the potential impact of a proposed development along the boundary of the Killarney National Park and the Port Road in Killarney, Co. Kerry. Concerns were expressed about the potential impact of proposed street lighting and lighting of the proposed development on lesser horseshoe bats, particularly on individuals commuting and foraging along the River Deenagh boundary with Port Road. Further information was requested on lesser horseshoe bat activity within this area.

Malachy Walsh & Associates undertook static surveillance while Bat Eco Services undertook additional bat surveys to supplement this static surveillance.

To complete this action, the following was undertaken:

- Emergence survey of lesser horseshoe bat roost in the Tea House, Killarney National Park;
- Investigation of potential commuting of lesser horseshoe bats along the River Deenagh.

1.1 Relevant Legislation & Bat Species Status in Ireland

1.1.1 Irish Statutory Provisions

A small number of animals and plants are protected under Irish legislation (Nelson, *et al.,* 2019). The principal statutory provisions for the protection of animal and plant species are under the Wildlife Act 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. The Flora (Protection) Order 2015 (S.I. no. 356 of 2015) lists the plant species protected by Section 21 of the Wildlife Acts. See www.npws.ie/ legislation for further information.

The codes used for national legislation are as follows:

- WA = Wildlife Act, 1976, Wildlife (Amendment) Act, 2000 and other relevant amendments
- FPO = Flora (Protection) Order, 2015 (S.I. No. 356 of 2015)

1.1.2 EU Legislation

The Birds Directive (Directive 2009/147/EC) and Habitats Directive (Council Directive 92/43/EEC) are the legislative instruments which are transposed into Irish law, *inter alia,* by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) ('the 2011' Regulations), as amended.

The codes used for the Habitats Directive (Council Directive 92/43/EEC) are:

- Annex II Animal and plant species listed in Annex II
- Annex IV Animal and plant species listed in Annex IV
- Annex V Animal and plant species listed in Annex V

The main aim of the Habitats Directive is the conservation of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status. These annexes list habitats (Annex I) and species (Annexes II, IV and V) which are considered threatened in the EU territory. The listed habitats and species represent a considerable proportion of biodiversity in Ireland and the Directive itself is one of the most important pieces of legislation governing the conservation of biodiversity in Europe.

Under Article 11 of the Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive. In April 2019, Ireland submitted the third assessment of conservation status for 59 habitats and 60 species. There are three volumes with the third listing details of the species assessed.

Article 12 of the Habitats Directive requires Member States to take measures for the establishment of a strict protection regime for animal species listed in Annex IV(a) of the Habitats Directive within the whole territory of Member States. Article 16 provides for derogation from these provisions under defined conditions. These provisions are implemented under Regulations 51 and 54 of the 2011 Regulations.

1.1.3 IUCN Red Lists

The International Union for the Conservation of Nature (IUCN) coordinates the Red Listing process at the global level, defining the categories so that they are standardised across all taxa. Red Lists are also produced at regional, national and subnational levels using the same IUCN categories (IUCN 2012, 2019). Since 2009, Red Lists have been produced for the island of Ireland by the National Parks and Wildlife Service (NPWS) and the Northern Ireland Environment Agency (NIEA) using these IUCN categories. To date, 13 Red Lists have been completed. The Red Lists are an assessment of the risk of extinction of each species and not just an assessment of their rarity. Threatened species are those species categorised as Critically Endangered, Endangered or Vulnerable (IUCN, 2019) – also commonly referred to as 'Red Listed'.

1.1.4 Irish Red List - Mammals

Red Lists in Ireland refer to the whole island, i.e. including Northern Ireland, and so follow the guidelines for regional assessments (IUCN, 2012, 2019). The abbreviations used are as follows:.

- RE Regionally Extinct
- CR Critically Endangered
- EN Endangered
- VU Vulnerable
- NT Near Threatened
- DD Data Deficient
- LC Least Concern
- NA Not Assessed
- NE Not Evaluated

There are 27 terrestrial mammals species in Ireland, which includes the nine resident bat species listed. The terrestrial mammal, according to Marnell *et al.,* 2019, list for Ireland consists of all terrestrial species native to Ireland or naturalised in Ireland before 1500. The IUCN Red List categories and criteria are used to assess that status of wildlife. This was recently completed for the terrestrial mammals of Ireland. Apart from the two following two mammal species (grey wolf *Canis lupus* (regionally extinct) and black rat *Rattus rattus* (Vulnerable)), the remaining 25 species were assessed as least concern in the most recent IUCN Red List publication by NPWS (Marnell *et al*., 2019).

1.1.5 Irish Bat Species

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat *Rhinolophus hipposideros* is further listed under Annex II. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is an offence. The most recent guidance document is "Guidance document on the strict protection of animal species of Community interest un the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final".

Regulation 51(2) of the 2011 Regulations provides –

(*"(2) Notwithstanding any consent, statutory or otherwise, given to a person by a public authority or held by a person, except in accordance with a licence granted by the Minister under Regulation 54, a person who in respect of the species referred to in Part 1 of the First Schedule—*

(a) deliberately captures or kills any specimen of these species in the wild, (b) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,

(c) deliberately takes or destroys eggs of those species from the wild,

(d) damages or destroys a breeding site or resting place of such an animal, or

(e) keeps, transports, sells, exchanges, offers for sale or offers for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive,

shall be guilty of an offence."

The grant of planning permission does not permit the commission of any of the above acts or render the requirement for a derogation licence unnecessary in respect of any of those acts.

Any works interfering with bats and especially their roosts, may only be carried out under a derogation licence granted by National Parks and Wildlife Service (NPWS) pursuant to Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law).

There are eleven recorded bat species in Ireland, nine of which are considered resident on the island. Eight resident bat species and one of the vagrant bat species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure inside the pinna of the ear). Vesper bats are distributed throughout the island. Nathusius' pipistrelle *Pipistrellus nathusii* is a recent addition while the Brandt's bat has only been recorded once to-date (Only record confirmed by DNA testing, all other records has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf

structure on the face, distinguishing it from the vesper bats. This species' current distribution is confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. The eleventh bat species, the greater horseshoe bat, was only recorded for the first time in February 2013 in County Wexford and is therefore considered to be a vagrant species. A total of 41 SACs have been designated for the Annex II species lesser horseshoe bat (1303), of which nine have also been selected for the Annex I habitat 'Caves not open to the public' (8310).

Irish bat species list is presented in Table 1 along with their current status.

Table 1: Status of the Irish bat fauna (Marnell *et al.,* 2019).

Species: Common Name	Irish Status	European Status	Global Status
Resident Bat Species ^			
Daubenton's bat *Myotis daubentonii*	Least Concern	Least Concern	Least Concern
Whiskered bat *Myotis mystacinus*	Least Concern	Least Concern	Least Concern
Natterer's bat *Myotis nattereri*	Least Concern	Least Concern	Least Concern
Leisler's bat *Nyctalus leisleri*	Least Concern	Least Concern	Least Concern
Nathusius' pipistrelle *Pipistrellus nathusii*	Least Concern	Least Concern	Least Concern
Common pipistrelle *Pipistrellus pipistrellus*	Least Concern	Least Concern	Least Concern
Soprano pipistrelle *Pipistrellus pygmaeus*	Least Concern	Least Concern	Least Concern
Brown long-eared bat *Plecotus auritus*	Least Concern	Least Concern	Least Concern
Lesser horseshoe bat *Rhinolophus hipposideros*	Least Concern	Least Concern	Least Concern
Possible Vagrants ^			
Brandt's bat Myotis brandtii	Data deficient	Least Concern	Least Concern
Greater horseshoe bat *Rhinolophus ferrumequinum*	Data deficient	Near threatened	Near threatened

^ Roche *et al.,* 2014

1.2 Relevant Guidance Documents

This report will draw on guidelines already available in Europe and will use the following documents:

- National Roads Authority (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes
- Collins, J. (Editor) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London
- McAney, K. (2006) A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland (Version 1: Kelleher & Marnell, 2006).
- The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats,

Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.

- Bat Conservation Trust (2023) Bats and artificial lighting at night. Guidance Note GN08/23. BCT, London & Institution of Lighting Professionals (ILP), Warwickshire.
- Guidance document on the strict protection of animal species of Community interest un the Habitats Directive (Brussels, 12.10.2021 C(2021) 7391 final.
- EPA (2017) Guidelines on the information to be contained in Environmental Impact Assessment Reports.

Collins (2016) is the principal document used to provide guidance in relation to bat survey effort required but the level of surveying is assessed on a case-by-case basis taking into consideration the historical bat records for the survey area, presence of built, structures and trees potentially suitable for roosting bats and the presence of suitable bat habitats for foraging and commuting. Additional reference is made to this document in relation to determining the value of buildings, trees etc. as bat roosts. The tables referred to from this document are described in the following section and in the section on methodology.

Marnell *et al.* (2022) is referred to for guidance in relation to survey guidance (timing and survey design), derogation licences and mitigation measures.

1.2.1 Bat Survey Requirements & Timing

With reference to Collins (2016) and Marnell *et al.* (2022), the information presented in this section is used to determine the bat survey requirements for the proposed development site. Collins (2016) provides a trigger list in relation to determining if a bat survey is required and this is presented Appendix 3 (Figure B) for reference. In addition, Chapter 2 of Collins (2016) discusses that a bat survey is required when proposed activities are likely to impact on bats and their habitats. The level of surveying is to be determined by the ecologist and these are influenced by the following criteria:

- Likelihood of bats being present;
- Type of proposed activities;
- Scale of proposed activities;
- Size, nature and complexity of the site;
- Species concerned;
- No. of individuals.

Collins (2016) also provides the following table detailing when different survey components should be undertaken.

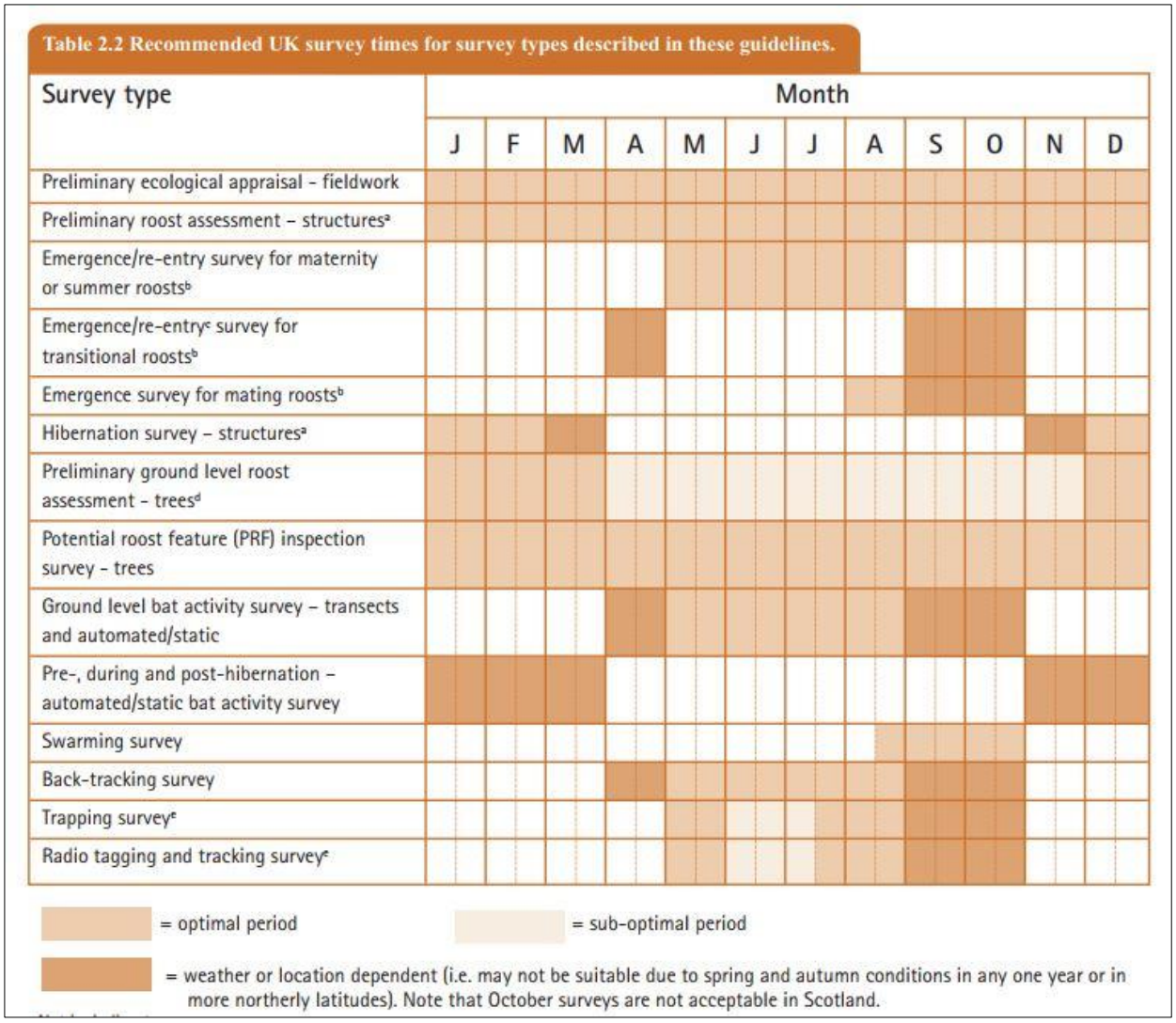

Table 2.2 Recommended UK survey times for survey types described in these guidelines.

Survey type	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Preliminary ecological appraisal - fieldwork												
Preliminary roost assessment – structures[a]												
Emergence/re-entry survey for maternity or summer roosts[b]												
Emergence/re-entry[c] survey for transitional roosts[b]												
Emergence survey for mating roosts[b]												
Hibernation survey – structures[a]												
Preliminary ground level roost assessment - trees[d]												
Potential roost feature (PRF) inspection survey - trees												
Ground level bat activity survey – transects and automated/static												
Pre-, during and post-hibernation – automated/static bat activity survey												
Swarming survey												
Back-tracking survey												
Trapping survey[e]												
Radio tagging and tracking survey[e]												

= optimal period

= sub-optimal period

= weather or location dependent (i.e. may not be suitable due to spring and autumn conditions in any one year or in more northerly latitudes). Note that October surveys are not acceptable in Scotland.

Figure 1a: Table 2.2 reproduced from Collins (2016).

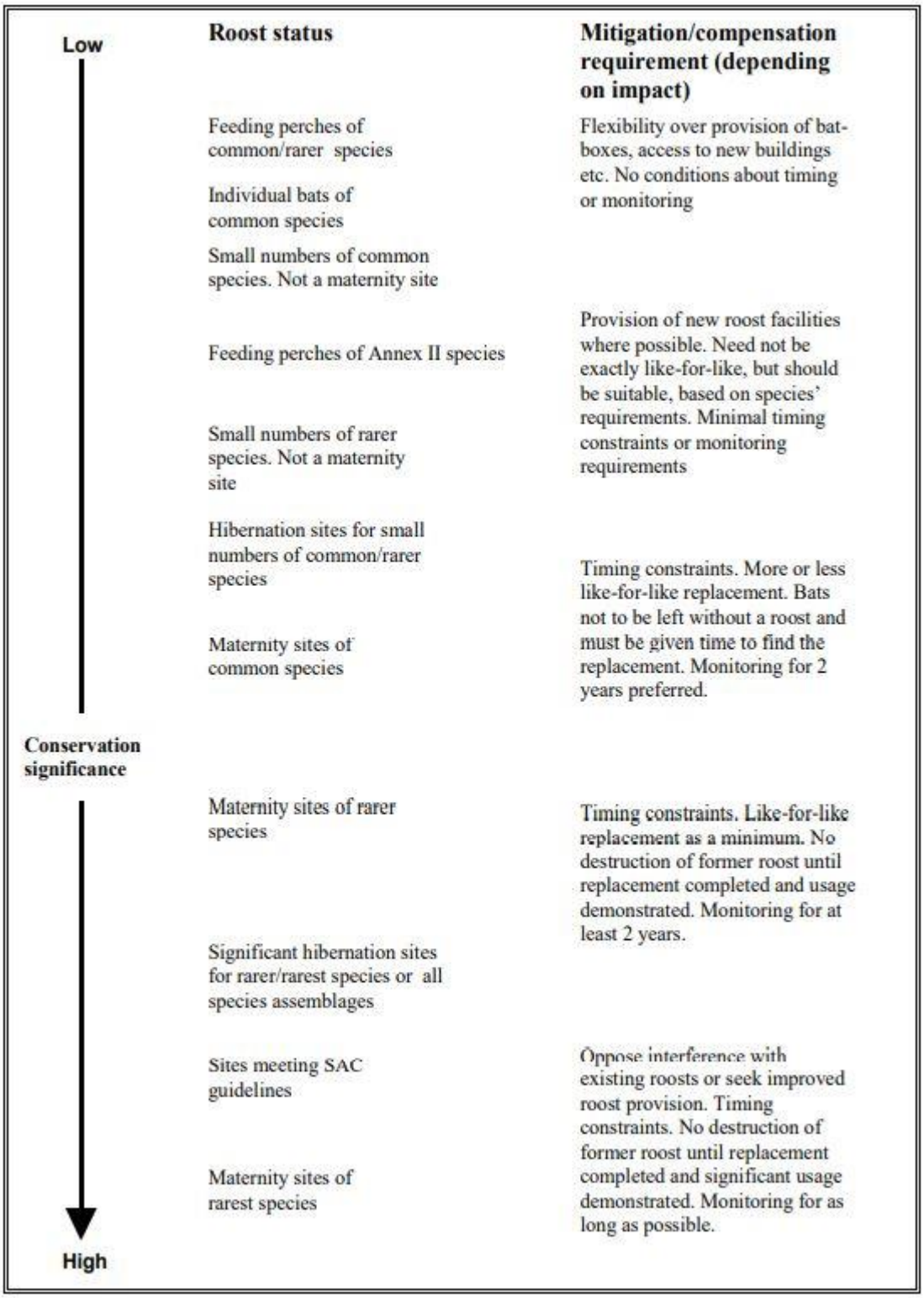

Figure 20 Guidelines for proportionate mitigation. The definition of common, rare and rarest species requires regional interpretation.

Figure 1c: Figure 20 (p 46) Reproduced from Marnell *et al.* (2022).

Table 4 The scale of main impacts at the site level on bat populations. [**NB** This is a general guide only and does not take into account species differences. Medium impacts, in particular, depend on the care with which any mitigation is designed and implemented and could range between high and low.]

Roost type	Development effect	Scale of impact		
		Low	Medium	High
Maternity	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Temporary disturbance outside breeding season	✓		
	Post-development interference			✓
Major hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference			✓
Minor hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction, modification		✓	
	Modified management		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference		✓	
	Temporary destruction, then reinstatement	✓		
Mating	Destruction		✓	
	Isolation caused by fragmentation		✓	
	Partial destruction	✓		
	Modified management	✓		
	Temporary disturbance	✓		
	Post-development interference	✓		
	Temporary destruction, then reinstatement	✓		
Night roost	Destruction	✓		
	Isolation caused by fragmentation	✓		
	Partial destruction	✓		
	Modified management	✓		
	Temporary disturbance	✓		
	Post-development interference	✓		
	Temporary destruction, then reinstatement	✓		

Figure 1d: Table 4 (p 44) Reproduced from Marnell *et al.* (2022).

Different parameters are considered for the overall assessment of the potential impact(s) of a proposed development on local bat populations.

The overall impacts of the proposed project on local bat populations is assessed using the following criteria:

- Impact Quality using the parameters Positive, Neutral or Negative Impact (based on EPA, 2017)

Table 2a: Criteria for assessing impact quality based on EPA, 2017,

Quality of Effect	Criteria
Positive	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Negative	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

- Impact Significance of potential impact parameters on specific bat species in relation to particular elements (e.g. roosting sites, foraging area and commuting routes) are assessed with reference to the following:
    - Table 4 of Marnell *et al.* (2022) (Figure 1a);
    - the known ecology and distribution of the bat species in Ireland;
    - bat survey results including type of roosts (if any recorded), pattern of bat usage of the survey area, level of bat activity recorded etc.
    - and bat specialist experience.

- Impact Significance of the proposed development on local bat populations maybe determine, where applicable, using the parameters listed in Table 2b (based on EPA, 2017).

Table 2b: Criteria for assessing significance of effects based on EPA, 2017,

Significance of Effects	Definition
Imperceptible	An effect capable of measurement but without significant consequences.
Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics

The following terms will be used, where possible and applicable, when quantifying the duration of the potential effects (selected from EPA, 2017):

- Temporary – effects lasting less than a year
- Short-term – effects lasting 1 to 7 years
- Medium term – effects lasting 7 to 15 years
- Long term – effects lasting 15 to 60 years
- Permanent – effects lasting over 60 years
- Reversible – effects that can be undone, for example through remediation or restoration.

1.3 Lesser Horseshoe Bat

The Further Information Request placed a specific emphasis on the Annex II bat species Lesser horseshoe bat. The following text is a literature review of this species with information on designations for this species in proximity of the proposed development site.

1.3.1 Lesser Horseshoe Bats – Morphology & Ecology

The lesser horseshoe bat is a relatively small sized species of *Rhinolophus.* Typically it weighs between 4-8g and has a wingspan of 225-250mm (McAney, 2016). It is easily distinguishable from other Irish bat species by the fleshy, circular nose-leaf structure surrounding the nostrils. This species echolocation call is a distinctive melodic warble when heard on a bat detector tuned to 110 kHz.

This bat species will typically feed on a range of insects including midges, craneflies, caddisflies, lacewings and moths (McAney, 2016). The BCIreland Landscape Model indicates that the species' habitat preference is for areas with broadleaf and mixed woodland and that a mosaic of habitats is important (Roche *et al.,* 2014). It tends to commute along distinct linear habitat features such as stonewalls and hedgerows and avoids flying out in the open. It travels short distances from summer roosts to foraging areas, typically 2km.

Females form maternity colonies in buildings from April to September with a single pup born in June or July. The knowledge of roosting sites for this species is extensive as a result of an intensive survey completed in six Counties by the Vincent Wildlife Trust between 1994 and 2004 (McAney *et al*., 2013). In general, this species has a preference for buildings constructed prior to the 1900s, built of stone with slate rooves (Schofield, 2008). Such sites are also relatively undisturbed and uninhabited by people. Kelleher (2006) documented a demise in the quality of buildings used by lesser horseshoe bats in Ireland. Many summer roosting sites are now in one-storey buildings often roofed with corrugated iron and this may be an indication that optimal sites are less available to the species (McAney *et al.,* 2013).

Hibernation typically occurs from October to March and hibernation sites in Ireland are typically found underground, although at a number of buildings have been recorded as hibernation sites. The bats have been recorded hibernating in ground storey rooms during the winter months and there is a general trend in such hibernacula towards greater numbers of bats in buildings with two storeys or more (Roche *et al*., 2012).

1.3.2 Lesser Horseshoe Bats – Global Status & Status in Ireland

The lesser horseshoe bat is distributed across Europe from Portugal and Ireland to the Ukraine and Poland. It is present in northern Africa and parts of the middle east (Csorba *et al.,* 2003).

The lesser horseshoe bat is mainly found in counties on Ireland's western seaboard (Mayo, Galway, Clare, Limerick, Kerry and Cork) and its strongholds are found in County Kerry, west Cork and County Clare. A single animal has also been recorded in Co. Roscommon in 2004 (B. Keeley, pers. comm.) and bat droppings were recorded in Tubercurry, Co. Sligo (C. Kelleher, pers. comm.). A single bat (male) was also recorded in Ballina, Co. Tipperary in 2015 (pers. comm, Dr Áine Lynch, NPWS). The lesser horseshoe bat is Ireland's only Annex II-listed bat species (EU Habitats Directive [92/43/EU]). As a consequence, a roost monitoring scheme is operated by NPWS and managed by Bat Conservation Ireland (BCIreland). BCIreland carried out analysis of the lesser horseshoe bat database in 2012, and concerns were expressed about the state of deterioration of many of its roosting sites (McAney, 2014; Roche *et al.*, 2015) as well as the finding that there are genetically distinct clusters within the Irish population (Dool *et al.*, 2013) that are likely to have arisen due to landscape connectivity constraints.

In Roche *et al*. (2015), the status of the roosting resource of the lesser horseshoe bat was closely examined and the results highlighted a number of locations in Ireland where clusters of roosts or hibernacula appear to have declined, including in parts of Co. Limerick. Figures 2a and 2b, below, are taken from the monitoring report from BCIreland (Aughney *et al.,* 2018) and illustrate the changes in winter and summer roosts monitored annually by NPWS.

As discussed previously, the modelled Core Area for lesser horseshoe bat s is a relatively small area is restricted to the Counties on the western seaboard (5,993km^2). Given this small range, significant impacts on this species may occur even with small levels of habitat modification or changes to roost availability (Roche *et al,* 2014).

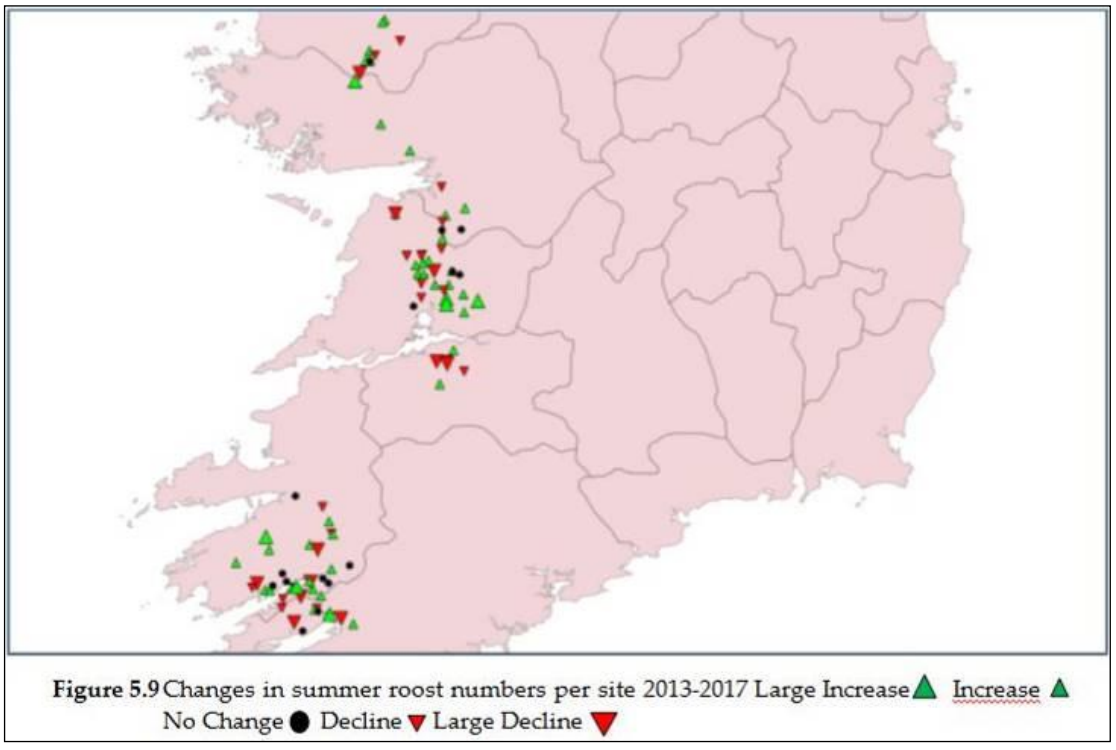

Figure 2a: Changes in Lesser horseshoe bat summer roost numbers (Aughney *et al.,* 2018)

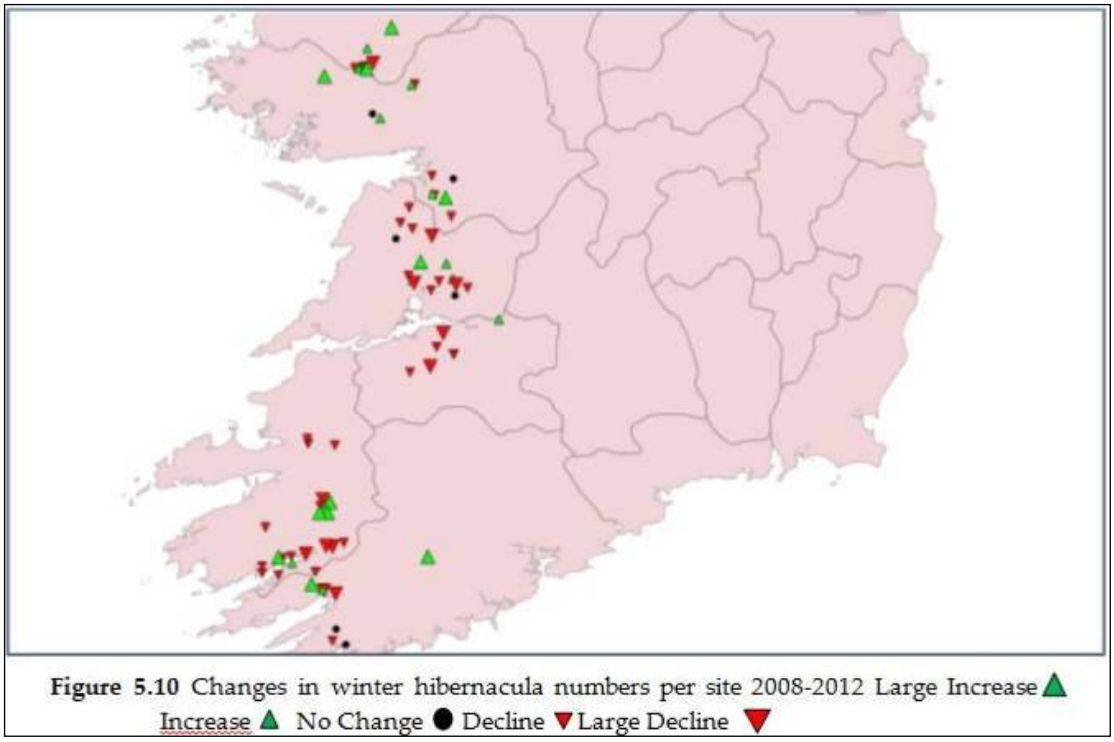

Figure 2b: Changes in Lesser horseshoe bat winter roost numbers (Aughney *et al.,* 2018)

According to Roche *et al,* 2014 the primary concerns for this species is as follows:

- Increased urbanisation;
- Mono cultural landscape (e.g. large swathes of coniferous forestry and high intensity farmed landscapes);
- Roost loss due to deterioration, demolition or renovations;
- Street lighting;
- Recreational cave visits etc to hibernation sites;
- Natural flooding of underground site.

Additional research present by Dr Andrew Harrington on the population genetics of lesser horseshoe bat in Ireland (Dr Harrington's Ph.D. thesis Title: The Development of Non-Invasive Genetic Methods for Bats of the British Isles, July 2018) examined the lesser horseshoe bat's range across Ireland with DNA samples from 21 colonies examined. This was to determine the level of interbreeding and possible risk of inbreeding within this population.

Harrington *et al. (*2019) at All Ireland Mammal Symposium (AIMS) stated that maintaining the gene flow within the Irish population is essential to "prevent the future risk of inbreeding depression or local extinctions". His research work showed that the Irish lesser horseshoe population was further sub-divided than previously thought with evidence of isolated subpopulations in Cork-Kerry (Southern), Limerick, Clare-South Galway (Central) and North Galway-Mayo (Northern). As a consequence, this means that this species is in serious risk of negative effects of operations that increase barriers to dispersal to these current sub-populations. The study further identified that the point separating the North Galway-Mayo population from the Clare-South Galway population is an area to the south-east of Galway City (the Galway Gap).

One aspect of the study was to determine the sex ratio of colonies examined (Harrington *et al.,* 2017). Previously, it was assumed that 25% of the maternity roost colonies was comprised of 25% males. However, Dr Harrington's work showed that in reality the percentage of males can be much higher with a range of 14.2% to 74.3% recorded. As a result the estimated population of lesser

horseshoes in Ireland is considered to be lower than previously reported (14,010 individuals as reported by Roche *et al.,* 2012).

Article 17 reporting (NPWS, 2019) for this species of bat concluded the following:

- Range = Inadequate
- Population = Favourable
- Habitat for species = Inadequate
- Overall Assessment of Conservation Status = Inadequate
- Overall trend in Conservation Status = Deteriorating

1.3.3 Bat Mitigation Measures

1.3.3.1 Bats & Lighting

All European bat species, including Irish bat species, are nocturnal. Light levels as low as typical full moon levels, i.e. around 0.1 LUX, can alter the flight activity of bats (Voigt *et al.* 2018). Any level of artificial light above that of moonlight can mask the natural rhythms of lunar sky brightness and, thus, can disrupt patterns of foraging and mating and might, for instance, interfere with entrainment of the circadian system.

Artificial light pollution is an increasing global problem (Rich and Longcore, 2006) and Artificial light at night (ALAN) is considered a major threat to biodiversity, especially to nocturnal species. As urbanisation expands into the landscape, the degree of street lighting also expands. Its ecological impacts can have a profound affect the behaviour of nocturnal animals including impacts on reproductive behaviours, orientation, predator-prey interaction and competition among others, depending on the taxon and ecosystem in question (Longcore and Rich 2004). It is considered by Hölker *et al.* (2010) to be a key biodiversity threat to biodiversity conservation. In relation to bats, the potential impacts of artificial night lighting can result in habitat fragmentation (Hanski, 1998), delay in roost emergence (Downs *et al.,* 2003) and a reduction in prey items.

In the context of behavioural ecology, lights can work to attract or repel certain animals. Many groups of insects, including moths, lacewings, beetles, bugs, caddisflies, crane flies, midges, hoverflies and wasps, can be attracted to artificial light (Eisenbeis and Hassel 2000; Frank 1988; Kolligs 2000). Attraction depends on the spectrum of light. In the context of street lights, white (mercury vapour) lamps emit a white light that includes ultraviolet. High pressure sodium lights (yellow) emit some ultraviolet, while low pressure sodium lamps (orange) emit no ultraviolet light (e.g. Rydell 2006). As a result of the attractiveness of lights to aerial invertebrates, swarms of insects often occur in and around street lights and, particular bat species such as aerial insect predators, can exploit the swarming insects to their advantage. Such attraction can also take prey items away from dark zones where light sensitive species are foraging, thus reducing their likelihood of feeding effectively.

Rydell (2006) divides bats into four categories in terms of their characteristic behaviours at street lamps. The four categories are based on bat size, wing morphology and echolocation call characteristics which were highlighted by Norberg and Rayner (1987) to determine flight speed, manoeuvrability, and prey detection capabilities of bats. Rydell (2006) stated that the large, fast flying bats, which are confined to open airspace, fly high over lit areas and are rarely observed near ground level. None of these, typically large free-tailed bats (e.g. large species of the family Molossidae), are found in Ireland. The second category are the medium-sized fast flying species, including the *Nyctalus* species, which patrol the street well above the lights and can be seen occasionally as they dive for prey into the light cone. This group includes the Leisler's bat, which is found in Ireland. Rydell's third category describes the small but fast flying bats that are manoeuvrable enough to

forage around light posts or under the lights, and includes the small *Pipistrellus* species of the old world, three of which are found in Ireland. The fourth category includes broad-winged slow flyers, most of which are seldom or never observed at lights. Slow flying bat species may be more vulnerable to predation by diurnal birds of prey and this may restrict their exploitation of insects around artificially illuminated areas (e.g. Speakman 1991). There are also the concerns that some bat species are more light sensitive and therefore actively avoid lit up areas. This is particularly relevant for lesser horseshoe bats. Therefore from this, we can categorise the suite of Irish bats species as follows (please note that the sensitivity category is the author's description):

Table 3a: Potential light sensitivity of the Irish bat fauna using categories described by Rydell, 2006.

Species: Common Name	Rydell Category	Sensitivity
Daubenton's bat *Myotis daubentonii*	Category 4	Light sensitive
Whiskered bat *Myotis mystacinus*	Category 4	Light sensitive
Natterer's bat *Myotis nattereri*	Category 4	Light sensitive
Leisler's bat *Nyctalus leisleri*	Category 2	Light tolerant
Nathusius' pipistrelle *Pipistrellus nathusii*	Category 3	Semi-tolerant
Common pipistrelle *Pipistrellus pipistrellus*	Category 3	Semi-tolerant
Soprano pipistrelle *Pipistrellus pygmaeus*	Category 3	Semi-tolerant
Brown long-eared bat *Plecotus auritus*	Category 4	Light sensitive
Lesser horseshoe bat *Rhinolophus hipposideros*	Category 4	Light sensitive

The ability of different bat species to exploit insects gathered around street lights varies greatly. Gleaning species such as *Myotis* bats rarely forage around street lights (Rydell and Racey, 1995). The ecological effects of illuminating aquatic habitats are also poorly known. Moore *et al.* (2006) found that light levels in an urban lake, subject simply to sky glow and not direct illumination from lights, reached the same order of magnitude as full moonlight.

All European bat species, including Irish bat species, are nocturnal. As a consequence, the scientific literature provides evidence that artificial lighting does impacts on bats. The degree of impact depends on the light sensitivity of the bat species and the type of luminaire. Lesser horseshoe bats are light sensitive and therefore adversely effected by the presence of lighting in all aspects of their life strategies (e.g. foraging, commuting, drinking and roosting).

The potential impacts of street lighting can be summarised as follows:

- Attracting Prey Items

Lights can work to attract or repel certain animals. Many groups of insects can be attracted to artificial light and this attraction depends on the spectrum of light. As a result of the attractiveness of lights to aerial invertebrates, swarms of insects often occur in and around street lights. Such attraction can also take prey items away from dark zones where light sensitive species, such as lesser horseshoe bats, are foraging, thus reducing their likelihood of feeding effectively.

- Reducing Foraging Habitat

The research documents that there is less bat species diversity foraging in habitats lit up by artificial lighting. Only bat species considered to be light tolerant are generally able to exploit habitats with lighting present, but overall, all bat species activity tends to be less in lit up habitats compared to non-lit up habitats.

- Fragmenting The Landscape

Scientific evidence shows that lighting is a barrier to the movement of light sensitive bat species, such as lesser horseshoe bats. Light sensitive bat species will actively seek dark corridors to commute along and therefore the presence of lighting in commuting habitats will restrict their movement of such species in the landscape.

- Reducing Drinking Sites

There is increasing evidence that drinking sites for bats is an essential component for local bat population survival and that the presence of artificial lighting at waterbodies prevents bats from availing of this resource.

Lighting, including street lights come in an array of different types but for street lights they typically include High Pressure Sodium, Low Pressure Sodium, Mercury Vapour and the more modern Light Emitting Diodes (LED). An array of field-based research has been undertaken to document the potential impact of lighting on bat flight activity. LED lighting is predicted to constitute 70% of the outdoor and residential lighting markets by 2020. While the use of LEDs promotes energy and cost savings relative to traditional lighting technologies, little is known about the effects these broad-spectrum "white" lights will have on wildlife, human health, animal welfare, and disease transmission. As a consequence, a large array of research has been undertaken recently on the potential impact of LED on bats.

Stone *et al.* (2012) undertook research in relation to "Cool" LED street lights on an array of local bat species in England. Overall the presence of LED street lights had a significant negative impact on lesser horseshoe bats and *Myotis* spp. for all light treatments investigated while there was no sign impact of light treatment type on *Pipistrellus pygmaeus* (soprano pipistrelle – a common Irish bat species) or *Nyctalus* (Leisler's bats is part of this bat family and is a common Irish bat species)/*Eptesicus* species. This research paper also documented behavioural changes for the different bat species. Lesser horseshoe bats and *Myotis* spp. did not avoid lights by flying along the other side of the hedge but altered their commuting behaviour altogether. It was concluded that LEDs can fragment commuting routes causing bats to alter their behaviour with potentially negative conservation consequences. Lesser horseshoe bat activity was significantly lower during high intensity treatment than medium, but at all treatment levels (even as low as 3.6 LUX), activity was significantly lower than unlit control (LUX level measurements were taken at 1.7m at the hedge below the light).

Russo *et al.* (2017) investigated the impact of LED lighting on drinking areas for bats in Italy. Drinking sites are considered to be important components for the survival of local bat populations. Drinking sites were illuminated with a portable LED outdoor light emitting (48 high-power LEDs generated a light intensity of 6480 lm (4000–4500 K) at 25°C, two peaks of relative luminous flux at 450 and 590 nm). *Plecotus auritus* (brown long-eared bat – resident in Ireland), *Pipistrellus pygmaeus* (soprano pipistrelle – resident in Ireland) and *Rhinolophus hipposideros* (lesser horseshoe bat – resident in Ireland) did not drink when troughs were illuminated.

Rowse *et al.* (2018) researched the impacts of LED lights (portable lights, 97W 4250K LED on 10m high poles) in England on local bat populations. Treatments were either 100% light intensity; dimmed

(using pulse width modulation) at 50% or 25% light intensity; and unlit. Sites were in suburban areas along busy roads but with vegetation and tree lines adjacent. High light levels (50% & 100% light treatments) increased activity of opportunistic *Pipistrellus pipistrellus* (common pipistrelle – resident in Ireland) but reduced activity of *Myotis* species group. Conversely 25% and unlit sites had no difference from each other. The research paper conclude that dimming could be an effective strategy to mitigate ecological impacts of street lights.

Wakefield *et al.* (2017) stated that an important factor to be aware of in relation to LED is the direction of the light projected. Therefore it is recommended that highly focused/shielded LEDS designed to filter out short wavelengths of light may should be used as they attract relatively fewer insects. Less insects attracted to street lights means less insects leaving dark zones where light sensitive bat species primarily feed.

Martin *et al.* (2021) showed that LED street lights lead to a reduction in the total number of insects captured with light traps in a wide range of families. Coleoptera and Lepidoptera orders were the most sensitive groups to ecological light pollution in the study area. The paper suggested that LED was the least attractive light system for most of the affected groups both because of its very little emitted short-wavelength light and because of its lower light intensity. They also concluded that reduction in insect attraction to LED could be even larger with current LED technologies emitting warmer lights, since other research showed that LED emitting “warmer white” colour light (3000 K) involves significantly lower attraction for insects than “colder white” LED (6000 K).

Wilson *et al.* (2021) investigate the impact of LED on biting insects and concluded because LED is highly malleable with regard to spectral composition, they can be tailored to decrease or increase insect catches, depending on situation. Therefore this design control of LED could greatly assist in reducing impact of street lighting on local bat populations.

Stone *et al*. (2015) reviewed the impacts of ALAN on bat roosts and flight paths in order to provide recommendations in relation to street lighting. The principal recommendations were to avoid lighting places where bats are present and to ensure that there are interconnected light exclusion zones and variable light regimes with reduced intensity of light in specific areas (e.g. important foraging and commuting habitats) as responses to street lighting may vary between species. It recommends that there should be a 'light threshold'.

1.3.3.1.1 Lighting Guidelines – Effective Mitigation Measures

As a consequence of this extensive amount of research there are two principal guideline documents available for best practice for effective mitigation relating to outdoor lighting.

EUROBATS (Voigt *et al.,* 2018) guidelines recommends the following:

- ALAN should be strictly avoided, and artificial lighting should be installed only where and when necessary coupled with the following:
    - Dynamic lighting schemes, where possible.
    - Use a minimal number of lighting points and luminaires on low positions in relation to the ground for minimising light trespass to adjacent bat habitats or into the sky.
    - Use focused light, e.g. by using LED or shielded luminaires which limit the light flux only to the required areas and prevent light trespass into adjacent bat habitats.
    - Create screens, either by erecting walls or by planting hedgerows or trees, to prevent light trespass, e.g. from illuminated roads, to surrounding bat habitats.
    - Exits of bat roosts and a buffer zone around them should be protected from direct or indirect lighting to preserve the natural circadian rhythm of bats.

This BCT (2018) guidelines provided a list of recommendations in relation to luminaire design, which was based on the extensive research completed at the time on the potential impact of lighting on bats, and therefore provides best practice mitigation measures. These recommendations have been updated with the new BCT (2023) guidelines:

- All luminaires should lack UV elements when manufactured. Metal halide, compact fluorescent sources should not be used.
- LED luminaires should be used where possible due to their sharp-cut-off, lower intensity, good colour rendition and dimming capability,
- A warm white light source (2700 Kelvin or lower) should be adopted to reduce blue light component.
- Light sources should feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.

DEFINITION: Red Light refers to the light sources in the red spectrum and mainly consist of long wavelength light above 600nm with an RA value of 60 (for good colour recognition). This wavelength of light is considered to the have the least impact on bats.

- Internal luminaires can be recessed (as opposed to using a pendant fitting) where installed in proximity to windows to reduce glare and light spill.
- Waymarking inground markers (low output with cowls or similar to minimised upward light spill) to delineate path edges.
- Column heights should be carefully considered to minimise light spill and glare visibility. This should be balanced with the potential for increased numbers of columns and upward light reflectance as with bollards.
- Only luminaires with a negligible or zero Upward Light Ration, and with good optical control, should be considered.
- Luminaires should always be mounted horizontally, with no light output above 90^{o} and/or no upward tilt.
- Where appropriate, external security light should be set on motion sensors and set to as short a possible a timer as the risk assessment will allow (e.g. 1-2 minute timer).
- Use of a Central Management System (CMS) with additional web-enables devices to light on demand.
- Use of motion sensors for the local authority street lighting may not be feasible unless the authority has the potential for smart metering through a CMS.
- The use of bollard or low-level downward-directional luminaires is strongly discouraged.
- Only if all other options have been explored, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed.

Due to the large array of research undertaken on the potential impact of ALAN on bats, the new guidelines from the BCT (2023) have provided an updated table on the potential impact of ALAN on UK bat species. Extracting data from this table, the following is a summary of the effect of LAN on Irish Bat species. Please note that this information is drawn from European studies and as does not have information for all Irish bat species for each of the various topics listed, it is indicative only.

Table 3b: Potential light sensitivity of the Irish bat fauna using categories described by Rydell, 2006.

YELLOW: Positive effect GREY: No effect BLUE: Negative effect NA: No data available

Species	Roost	Flight Corridor	Foraging Area	Drinking Site	Migration	Landscape Level	Habitat Type
Lesser horseshoe bat			NA	NA	NA		Clutter
Brown long-eared bat					NA		Clutter
Natterer's bat		NA	NA		NA	NA	Clutter
Daubenton's bat	NA			NA	NA		Edge
Whiskered bat	NA	NA	NA	NA	NA	NA	Edge
Common pipistrelle	NA				NA		Edge
Soprano pipistrelle				NA			Edge
Nathusius' pipistrelle	NA	NA	NA	NA			Edge
Leisler's bat	NA	NA	NA		NA		Open

BCT (2023) also state key messages in this document, some of which are presented below:

Key Message 1.18

"It is important to minimised ALAN close to vegetation, particularly for slower-flying species, and the need to increase dense vegetation in urban landscape to provide, not just roosting opportunities, but also protection against ALAN for open-space foraging bats in city landscapes".

Key Message 1.20

"When considering how bats move through the landscape, ALAN has been shown to be particularly harmful along river corridors, near woodland edges and hedgerows".

Key Message 1.39

"This research highlights the importance of integrating avoidance measures (as per the first step of the mitigation hierarchy see Figure 2) into the development design, by retaining ecologically functional 'dark corridors' within scheme where feasible, and in preference to seeking lighting mitigation strategies".

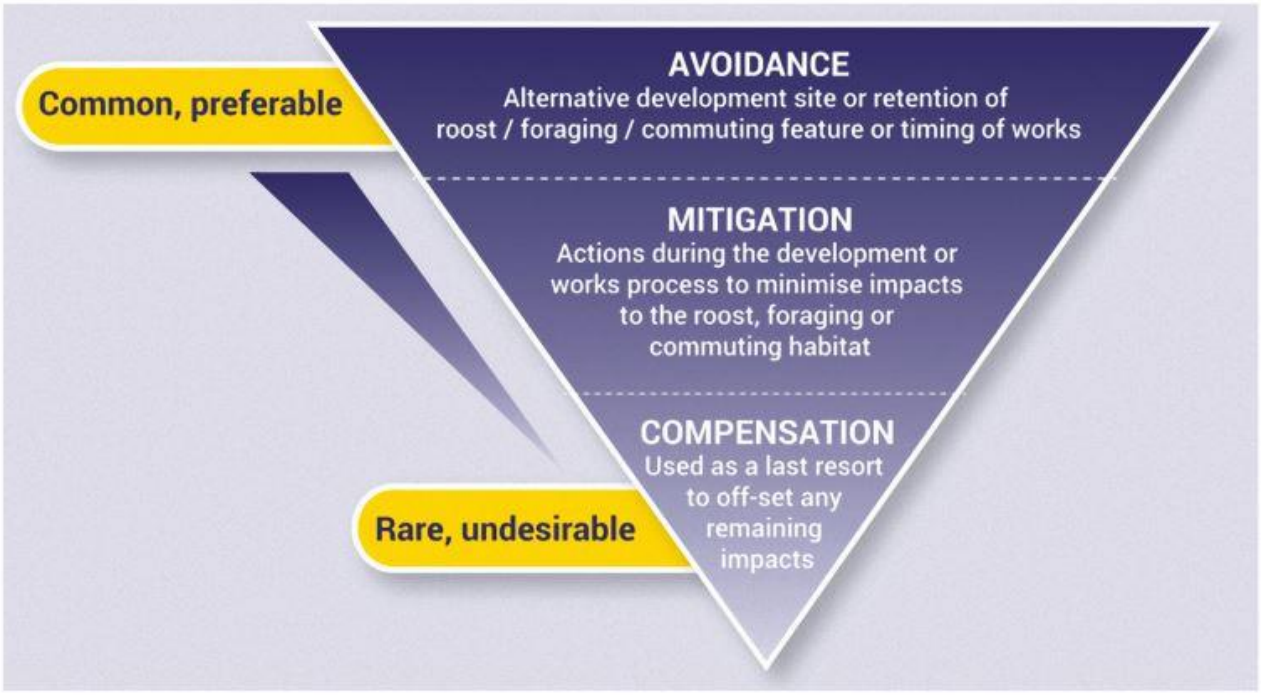

Figure 2. Mitigation hierarchy emphasising the importance of considering avoidance in the first instance (credit Bat Conservation Trust).

Figure 3a: Taken from BCT (2023) – Mitigation Hierarchy.

Key Message 3.13

"There are no lux level thresholds available for individual species to negate the need for site specific advice. Every site is different … The key in the first instance is to maintain or reduce existing light levels, and reduce blue content to protect the bat species present … Ideally light levels should always be designed to minimise potential environmental impacts and to maximise the potential of habitat and species enhancement work …"

1.3.3.2 Landscaping For Bats

Bats depend on the landscape for foraging, roosting and commuting. Different bat species will travel different distances, to and from their principal roosting sites, depending on their morphology, life stage and preferred foraging areas. Bats in Ireland are insect eating mammals and feed on an array of insects, whose populations are ultimately supported by vegetation. Areas of rich vegetation habitat tend to support higher abundances of insect populations and therefore a higher abundance of bats. In addition, many bat species rely on continuous linear habitats (e.g. treelines and hedgerows) to commute along. As a consequence landscaping as part of a proposed development project is an important element to the goal of retaining local bat populations.

The Bat Conservation Trust publication "Landscape and Urban Design for bats and biodiversity" (Gunnell *et al.,* 2012) is a resource for planning landscape design in our urban areas. This resource encourages measures to enhance existing bat foraging habitat, create water features such as ponds (drinking sites for bats and as a source of emerging insects), manage species rich grassland and planting of tall vegetation to ensure that exiting treelines and hedgerows are linked. It also recommends that use of landscaping as a means to creating dark zones or dark corridors for this mammal group to fly along in our lit urban areas. This is also support by the BCT Lighting Guidelines (BCT, 2018) where landscape design can be utilised to buffer potential light spillage from developments.

1.3.3.3 Seasonality of Bat Mitigation Measures

The NPWS Bat Mitigation Guidelines (Marnell *et al.* 2022) provides best practice guidance in relation to the timing of bat mitigation measures. It states that the most common and effective method of avoiding potential harm to a bat is to carry out the work at an appropriate time of the year. The following table provides a summary of timings.

Table 5 Optimum season for works in different types of roosts.

Bat usage of site	Optimum period for carrying out works (some variation between species)
Maternity	1st October – 1st May
Summer (not a proven maternity site)	1st September – 1st May
Hibernation	1st May – 1st October
Mating/swarming	1st November – 1st August

Figure 3b: Table 5 (p 50) Reproduced from Marnell *et al.* (2022).

Timing of bat mitigation measures is relevant to the proposed tree felling of Potential Bat Roosts (PBRs). Felling is recommended outside the principal maternity season and during mild weather conditions (to avoid cold weather that would encourage bats to hibernate). This coupled with dusk/dawn surveys and additional daytime inspections is best practice to ensure that tree felling is completed without causing harm to potentially roosting bats. The preferred tree felling months also avoids the bird nesting season.

2. Proposed Development Description

2.1 Site Location

The proposed development site is located along Port Road, Killarney, Co. Kerry.

Figure 4: Aerial photograph of proposed development site (Red line boundary).

3. Bat Survey Methodology

3.1 Night-time Bat Detector Surveys

3.1.1 Dusk Emergence Bat Survey

A Dusk Emergence Survey was completed of the known lesser horseshoe bat roost in the Tea House of Killarney National Park from 10 minutes before sunset to at least 80 minutes post sunset on 28th July 2023. One surveyor was located to the rear of the building to count bats during emergence (Surveyor 5). In addition, 3 surveyors (Locations 1, 3 & 5) and three static units (Locations 2, 4 & 6) were positioned in vicinity of the roost to determine the direction of commuting bats towards and along the River Deenagh. A fifth surveyor (Surveyor 1) was also located in vicinity of potential foraging and commuting habitats of the lesser horseshoe bat roost in adjacent woodland habitat.

The following equipment was used:

Surveyor 1 (Principal surveyor): Anabat Walkabout Full Spectrum Bat Detectors.

Surveyors 2 to 4: Anabat Scout Full Spectrum Bat Detectors (Locations 1, 3 & 5).

Surveyor 5: Counter.

Statics: Wildlife Acoustics Mini Bat Full Spectrum Static Unit (x 3 units, Locations 2, 4 & 6 with microphones directed towards the roost location).

Figure 5a: Survey locations during dusk emergence survey.

3.1.2 Filming

A Guide TrackIR Pro19 thermal imagery scope filming was also deployed to capture potential emerging bats from the lesser horseshoe bat roost. This was deployed to determine the commuting routes. This night vision aid equipment was used as an additional survey support system and due to set-up method, the information recorded was deemed suitable as standalone survey information. This was deployed from 10 minutes before sunset to 80 minutes post sunset on 28th July 2023.

3.1.3 Passive Static Bat Detector Survey

Passive Static Bat Surveys were completed on 2nd August to 3rd August 2023. Eight units were deployed along the River Deenagh / Port Road (See Figure 5b). Static 1 and Static 2 were located upstream of the gap in the existing tall vegetation along the River Deenagh (and therefore the boundary of the Port Road and Killarney National Park). Static 3 and Static 4 were located downstream of the gap in the existing tall vegetation along the River Deenagh (and therefore the boundary of the Port Road and Killarney National Park) while all other static units were located to detect potential commuting Lesser horseshoe bats emerging from the roost in the Tea House.

A Passive Static Bat Surveys involves leaving a static bat detector unit (with ultrasonic microphone) in a specific location and set to record for a specified period of time (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for analysis post surveying). The bat detector is effectively used as a bat activity data logger and the habitat type of where the bat detector is location is noted to allow interpretation of the results. Static surveillance results in a far greater sampling effort over a shorter period of time. Bat detectors with ultrasonic microphones are used as the ultrasonic calls produced by bats cannot be heard by human hearing.

The microphone of the unit was positioned horizontally to reduce potential damage from rain and the units were position so that the microphone as directed downstream in order to increase the potential to recorded individuals commuting north, during emergence, from the roost located in the Tea House.

Wildlife Acoustics Song Meter Mini Bat Platform Units use Real Time recording as a technique to record bat echolocation calls and using specific software, the recorded calls are identified. It is these sonograms (2-d sound pictures) that are digitally stored on the SD card (or micro SD cards depending on the model) and downloaded for analysis.

The recordings are analysed using Wildlife Acoustics Kaleidoscope Pro. The Auto-Id function is used for all sound files but manual verification was used to ensure the auto-id function is accurate. This is particularly important for less common bat species and cryptic bat species such as *Myotis* species. In addition, “Noise” and “Unidentified” sound files are also checked and identified, where possible, to species level. Each sequence of bat pulses are noted as a bat pass to indicate level of bat activity for each species recorded. This was either expressed as the number of bat passes per hour and per survey night.

Audio files are a maximum of 15 seconds long and each audio file is taken as a bat pass for each bat species recorded within the audio file. Each bat pass does not normally equate to the number of individuals of bats flying in vicinity of the recording device but is representative of bat activity levels, but this is dependent on the bat species recorded. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame (i.e. separate audio files within a small time frame) is one individual bat. On the other hand, Leisler’s bats tend to travel through an area quickly and therefore an individual sequence of echolocation calls or bat pass is more likely to be indicative of individual bats. In relation to Lesser

horseshoe bats, due to the fact that this species produces a narrow range and quiet echolocation call, any bat encounters recorded is likely to be attributed to an individual.

The following static units were deployed during this static bat detector survey:

Table 6: Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Unit Code	Bat Detector Type	Recording Function	Microphone
Mini Bat units	Wildlife Acoustics Mini Bat FS	Passive Full Spectrum	SMM-U2

Figure 5b: Location of static units during static surveillance.

4. Bat Survey Results

A bat survey is comprised of a number of different elements. The results of these different types of surveys are presented below in a step-wise fashion and summarised at the end of the section. It is important that the whole section is read in order to gain a full impression of the potential bat value of the survey area.

4.1 Night-time Bat Detector Surveys

4.1.1 Dusk Bat Survey

A total of 340 lesser horseshoe bats were recorded emerging from the roost during the dusk survey. 338 individuals were recorded commuting along the arrows presented in the figure below (in an approximate proportion of 30% along the yellow arrow and 70% along the orange arrow). Individuals were recorded commuting through the woodland vegetation by Surveyor 1 (represented by the Orange circles, Figure 6a).

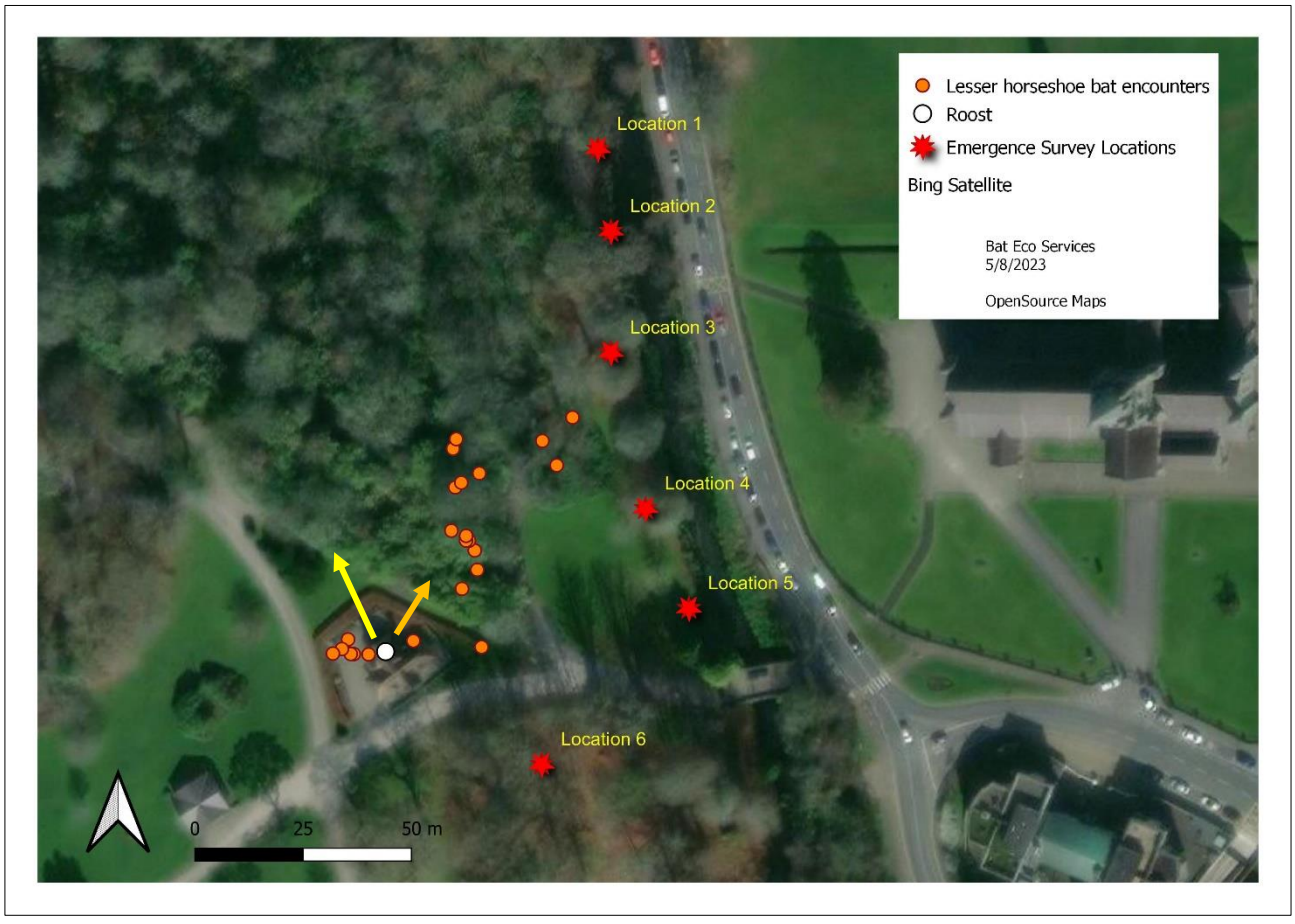

Figure 6a: Survey locations during dusk emergence survey.

In relation to the recordings of lesser horseshoe bats at locations, no lesser horseshoe bats were recorded on the static units located at Locations 2, 4 and 6. Lesser horseshoe bats were recorded by the surveyors at Location 1 (7 bat encounters at 22:32, 22:33, 22:34 and 22:34 hrs), Location 3 (1 bat encounter at 22:32 hrs) and Location 5 (1 bat encounter at 22:32 hrs).

4.1.2 Filming

A Guide TrackIR Pro19 thermal imagery scope filming confirmed that emerging bats commuted directly to vegetation located north and north-east of the Tea House. No bats were recorded commuting across the principal path in front of the Tea House to the adjacent woodland.

4.1.3 Passive Static Bat Detector Survey

The following table summarises the number of Lesser horseshoe bat encounters recorded on the static units deployed for one night of surveillance.

Table 4a: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Code	Location Description / Bat Habitat Type	Survey Period	Total number of bat encounters
Static 1	Along bank of River Deenagh	1 night 2nd to 3rd August 2023	45 bat encounters
Static 2	On tree along walking track adjacent to River Deenagh	1 night 2nd to 3rd August 2023	8 bat encounters
Static 3	Along bank of River Deenagh	1 night 2nd to 3rd August 2023	49 bat encounters
Static 4	On tree along walking track adjacent to River Deenagh	1 night 2nd to 3rd August 2023	7 bat encounters
Static 5	Along bank of River Deenagh	1 night 2nd to 3rd August 2023	24 bat encounters
Static 6	Treeline on top of bank of River Deenagh	1 night 2nd to 3rd August 2023	40 bat encounters
Static 7	Along bank of River Deenagh	1 night 2nd to 3rd August 2023	Unit failed to record
Static 8	Along bank of River Deenagh	1 night 2nd to 3rd August 2023	121 bat encounters

The recorded data was divided into hourly categories to represent the timing of the bat encounters. Due to the nature of Lesser horseshoe bat echolocation calls, it can be deemed that each bat encounter recorded represents an individual bat of this species. Emergence of this bat species tends to start approximately 30 minutes after sunset with the majority of individuals emerging within an hour thereafter. However to err on the side of caution, the number of bat encounters in the 21:00 hrs, 22:00 hr and 23:00 hrs slots were deemed to represent emerging bats while returning bats (i.e. bats returning to the roost prior to sunrise) were represented by bat encounters from the 03:00 hrs to 05:00 hrs slots. Any bats recorded in the 00:00 hrs, 01:00 hrs and 02:00 hrs slots were deemed to be foraging individuals.

Table 4b: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

Code	21:00 hrs	22:00 hrs	23:00 hrs	00:00 hrs	01:00 hrs	02:00 hrs	03:00 hrs	04:00 hrs	05:00 hrs
Static 1	1	22	6	6	0	3	2	5	0
Static 2	2	2	1	1	1	1	0	0	0
Static 3	2	21	5	8	1	2	2	3	0
Static 4	0	3	3	1	0	0	0	0	0
Static 5	0	1	4	2	4	5	2	5	1
Static 6	0	0	2	10	12	2	9	5	0
Static 7	No data	No data	No data	No data	No data	No data	No data	No data	No data
Static 8	1	17	32	21	27	5	14	1	4

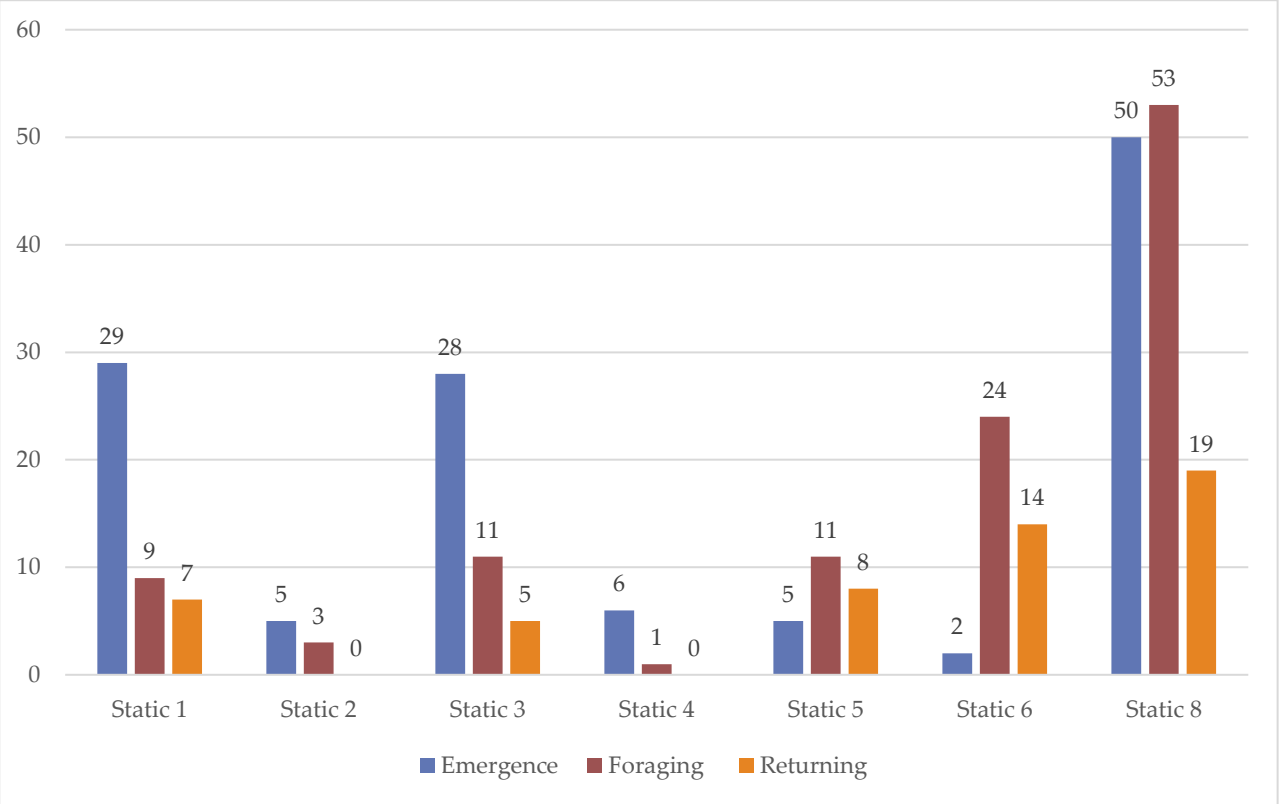

Figure 6b: No. of bat passes recorded for Lesser horseshoe bats during Emergence, Foraging and Returning periods on all statics units (Please note: Static 7 failed to record).

Static 1 and Static 3 were located on the bank of the River Deenagh upstream and downstream, respectively, of the gap in the tall vegetation across from the entrance to the proposed development on Port Road. A similar level of Lesser horseshoe bat activity was recorded on both static units during emergence with a potential of 29 individuals commuting along the River Deenagh in this area. This represents 8.5% of the total number of Lesser horseshoe bats recorded emerging from the Tea House roost on 28th July 2023.

The static units Static 2 and Static 4 were located either on the track or treeline adjacent to the River Deenagh (within the boundary of the Killarney National Park) and represent an additional 11 individuals commuting in vicinity of the gap in the tall vegetation across from the entrance to the proposed development on Port Road. Therefore the results indicate that on the 2nd August 2023, 40 Lesser horseshoe bats likely commuted in vicinity of the gap in the tall vegetation across from the

entrance to the proposed development on Port Road and this represents 11.8% of the total number of Lesser horseshoe bats recorded emerging from the Tea House roost on 28th July 2023.

The number of "Emergence" individuals recorded on Static 8, a static also located on the banks of the River Deenagh and closer to the location of the roost, recorded a likely 50 Lesser horseshoe bat individuals, which represents 14.7% of the total number of Lesser horseshoe bats recorded emerging from the Tea House roost on 23th July 2023, commuting along the river on the survey date (28th July 2023).

Therefore to account for the different levels of recorded bat passes for lesser horseshoe bats between the static locations, it is likely there are a number of commuting routes north of the roost in the Tea House. These are represented on the figure presented below.

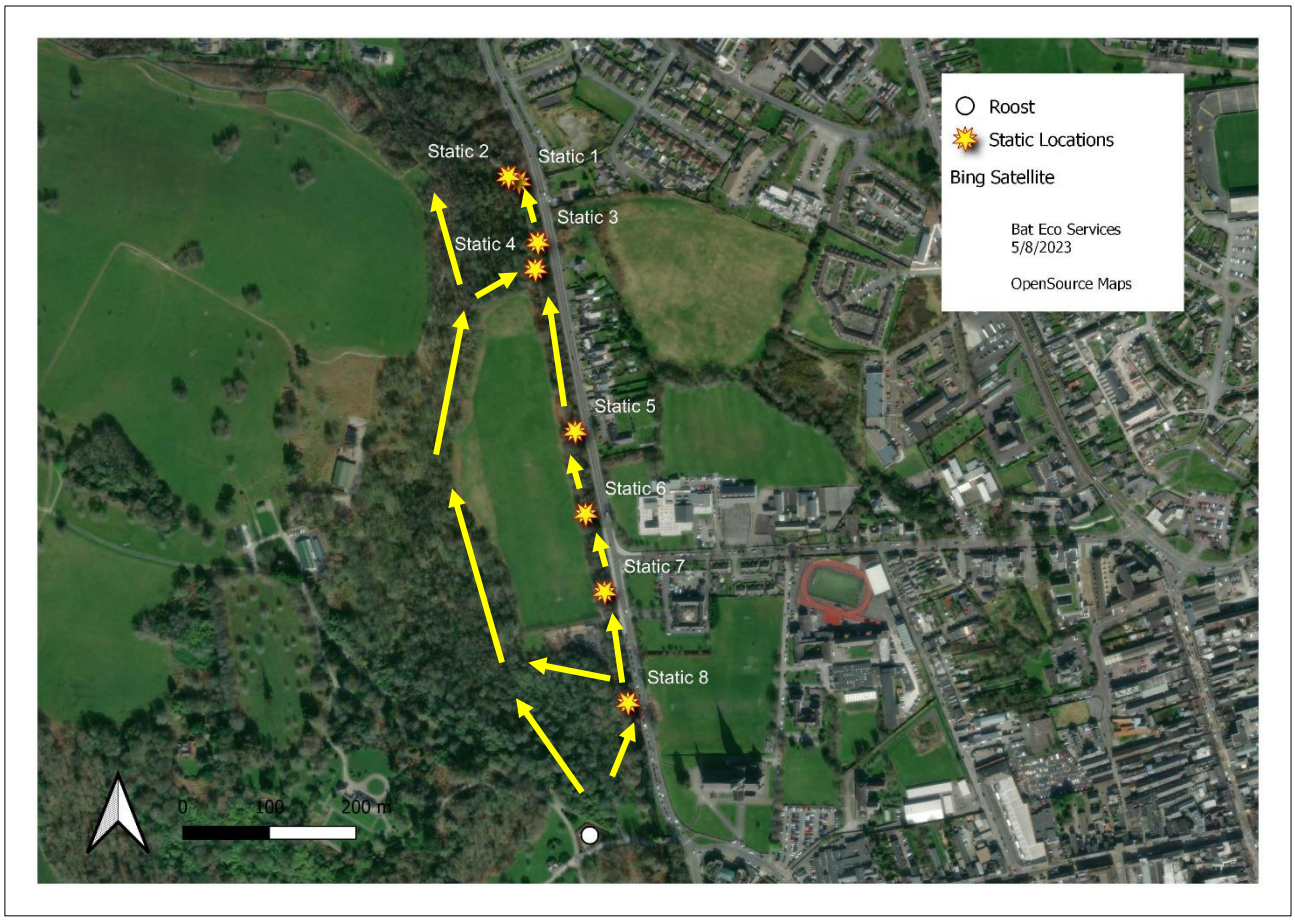

Figure 6c: Location of static units during static surveillance.

A lower level of lesser horseshoe bat activity was recorded during the "Foraging" period and the "Returning" period. In relation to "Foraging" period, this may indicate that the River Deenagh is primarily a commuting habitat for this species of bat. In relation to the "Returning" period, the microphones of the static units were deliberately positioned to "face" the direction of commuting lesser horseshoe bats during the "Emergence" period and therefore the direction of the microphones would be less suitable for recording commuting bats during the period prior to sunrise.

Other bat species recorded during the static surveillance included: Daubenton's bat, Natterer's bat, whiskered bat, common pipistrelle, soprano pipistrelle and Leisler's bat. A breakdown of the results for these bat species is presented in the appendices.

4.1.4 Environmental Designations

Within a 15km buffer of the proposed development site the following Special Area of Conservation (SACs) are presented:

- Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment SAC (Site Code 000365)
    - Lesser horseshoe bat is listed as a qualifying interest for this SAC.

The conservation objectives, in relation to lesser horseshoe bat, as presented in the list publications is provided as a screenshot below.

NPWS (2017) Conservation Objectives: Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht

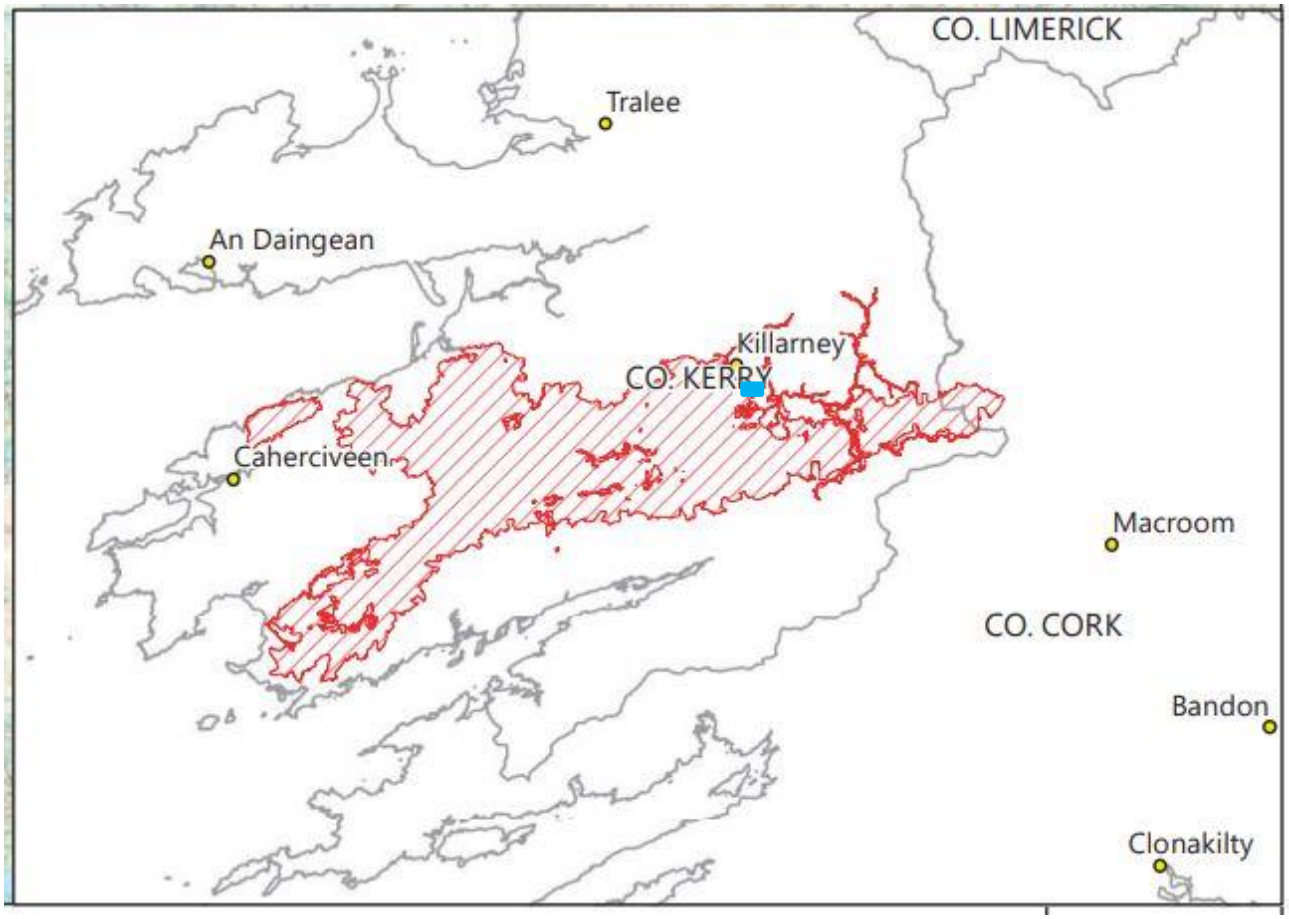

Figure 7a: Location of Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC 000365 (Source: www.npws.ie). Approximate location of proposed development site represented as Blue Rectangle.

Figure 10c (below) is Map 10 extracted from NPWS document cited above and referred to in the table (Figure 10b). This indicates that there are three important lesser horseshoe bats roosts located south of the proposed development site. Bat Code 296 (summer roost with a minimum number of 315 individuals) is located within the grounds of Killarney National Park along the Port Road and therefore it is likely that individuals from this colony commute along the River Deenagh, woodland of the national park and connecting habitats in the landscape (Note: This roost is also used as a hibernation site). The 2.5km value is listed as the potential distance around a known maternity roost

for this species that is deemed important to ensure connectivity from the maternity roost to foraging habitats.

Conservation Objectives for : Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC [000365]

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

To maintain the favourable conservation condition of Lesser Horseshoe Bat in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population per roost	Number	Minimum number of 182 bats in winter for Roost ID 623; minimum number of 127 in winter and 358 in summer for Roost ID 505; minimum number of 176 in winter and 315 in summer for Roost ID 296; minimum number of 218 in summer for Roost ID 615. See map 10	Figures of 100 bats for summer roosts and 50 bats for winter roosts were set as the minimum qualifying standards (MQS) when SACs were being selected for lesser horseshoe bat (*Rhinolophus hipposideros*). NPWS conduct annual counts at each qualifying roost. Qualified means from the 2010-2016 data have been calculated whereby the year with the highest maximum count and the year with the lowest maximum count over that period were removed, and the mean of the remaining years was calculated. This mean is set as the target figure for the roost except where the figure falls below the MQS, then the MQS (100 or 50 as appropriate) is used as the target. Some structures may host qualifying winter roosts AND qualifying summer roosts, in which case separate targets have been set for each season using the summer and winter count data
Winter roosts	Condition	No decline	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC has been selected for lesser horseshoe bats because of the presence of a number of internationally important winter roosts. Damage or disturbance to a roost or to the habitat immediately surrounding a roost will lead to a decline in its condition (Mitchell-Jones et al., 2007)
Summer roosts	Condition	No decline	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC has been selected for lesser horseshoe bats because of the presence of a number of internationally important summer roosts. Damage or disturbance to a roost or to the habitat immediately surrounding a roost will lead to a decline in its condition (Kelleher and Marnell, 2006)
Number of auxillary roosts	Number and condition	No decline	Lesser horseshoe bat populations will use a variety of roosts during the year besides the main summer maternity and winter hibernation roosts. Such additional roosts within the SAC may be important as night roosts, satellite roosts, etc. In addition, in response to weather conditions for example, bats may use different seasonal roosts from year to year; this is particularly noticeable in winter. Several other winter and summer roosts that support lesser horseshoe bats, but at numbers below the MQS figures, are known from this SAC. A database of all known lesser horseshoe roosts is available on the National Biodiversity Data Centre website. NB further unrecorded roosts may also be present within this SAC
Extent of potential foraging habitat	Hectares	No significant decline	Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008). See map 10 which shows a 2.5km zone around the above named roosts and identifies potential foraging grounds
Linear features	Kilometres	No significant loss, within 2.5km of qualifying roosts. See map 10	This species follows commuting routes from its roost to its foraging grounds. Lesser horseshoe bats will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species, most importantly within 2.5km around each roost (Schofield, 2008)

Figure 7b: Table extracted from NPWS Conservation Objectives report.

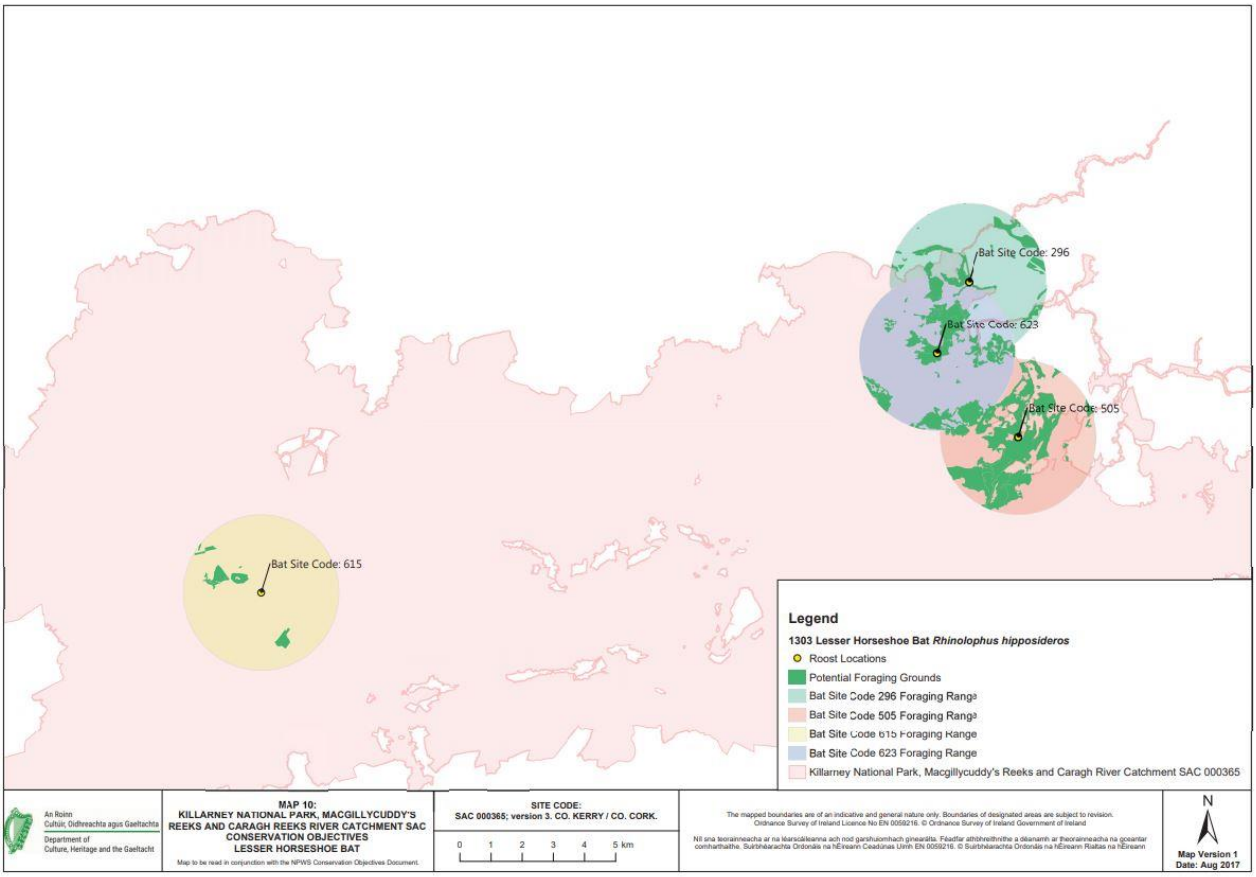

Figure 7c: SAC Site Code 00365 with 2.5km buffers around important lesser horseshoe bat roost sites as listed in Qualifying Interest table for this species (SAC data source: www.npws.ie).

Lesser horseshoe bat roosts are counted by NPWS and VWT staff as part of the Lesser Horseshoe Bat Roost Monitoring (managed by Bat Conservation Ireland under the Irish Bat Monitoring Programme). This involves annual winter and summer counts. In 2020 the maximum count at any one site was 580 bats at a cottage, Killarney, Co. Kerry (Site Code 505) (Aughney *et al.,* 2021), which is located further south of Bat Site Code 296.

The trend for the lesser horseshoe bats in the summer roosts, similar to winter, has been one of increases over the course of the monitoring scheme, albeit at a much more moderate pace in recent years. Since the start of the survey (1992) the annual growth rate has been 2.3% per annum in summer while the more recent short term (six year 2015-2020) trend is at 2.7% increase per annum (Aughney *et al.,* 2021).

In an earlier monitoring report (Aughney *at al.,* 2020), Bat Conservation Ireland presented a map of all of the lesser horseshoe sites surveyed between 2008-2017 under the roost monitoring scheme. This map was collated to represent the extensive checking of historical sites known to NPWS. As shown in Figure 10d, the sites known in the Killarney area were all reported to be occupied by lesser horseshoe bats.

The publication Aughney *at al.,* 2018 undertook analysis of population trends of individual roost sites. The three principal summer roost sites in the Killarney area have some small changes in the monitoring period 2013-2017, with two roosts increasing and one roost declining. It is considered that the local lesser horseshoe population is, overall, stable.

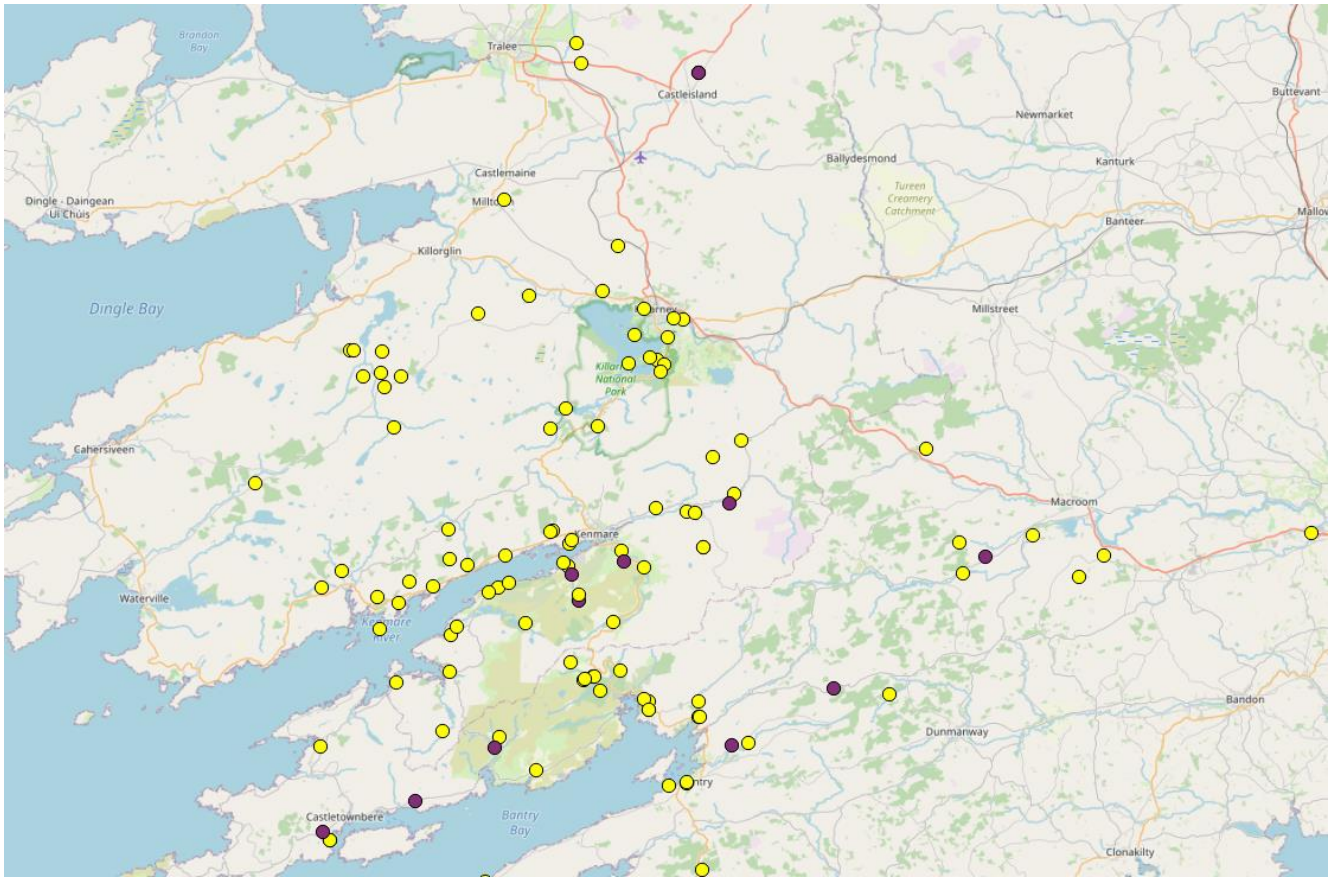

Figure 7d - Extracted from Aughney *et al.,* 2020 – "Figure 6.3: Sites surveyed in Kerry and Cork from 2008-2017 and where bats were present are highlighted in yellow. Additional sites surveyed 2018-2019 and where bats were present are highlighted in purple…".

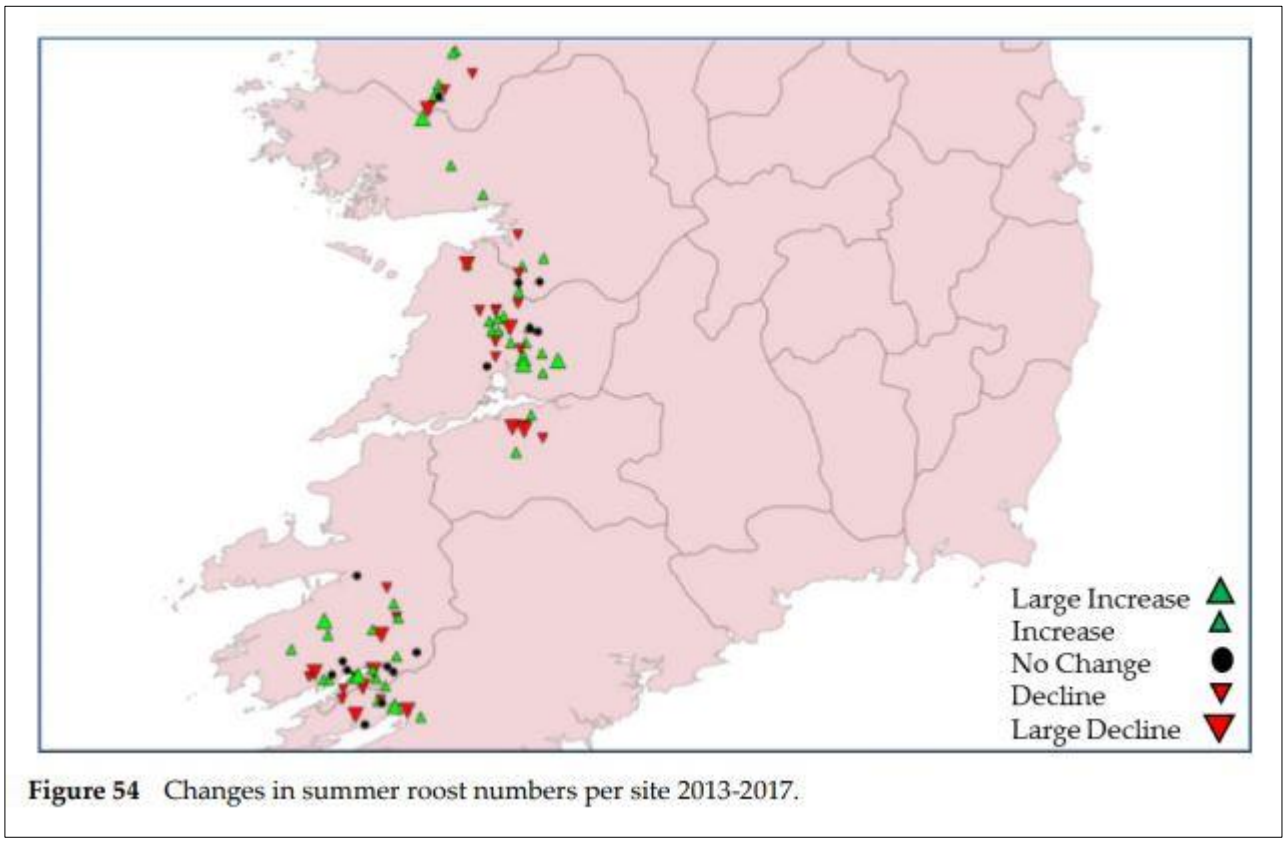

Figure 7e - Extracted from Aughney *et al.,* 2018 – "Figure 54: Changes in summer roost numbers per site 2013-2017".

4.2 Survey Effort, Constraints & Survey Assessment

The following table details any Survey Constraints encountered and a summary of Scientific Assessment completed.

Table 5: Survey Effort, Constraints & Survey Assessment Results.

Category	Discussion
Timing of surveys	All surveys were undertaken in the preferred summer survey period and completed according to Collins (2016).
Survey Type	Bat Survey Duties Completed (Indicated by red shading) Tree PBR Survey ◯ Daytime Building Inspection ◯ Static Detector Survey ■ Daytime Bridge Inspection ◯ Dusk Bat Survey ■ Dawn Bat Survey ◯ Walking Transect ◯ Driving Transect ◯ Trapping/Mist Netting ◯ IR Camcorder filming ◯ Endoscope Inspection ◯ Other Thermal imagery filming ■
Weather conditions	Favourable weather conditions during dusk survey and the static surveillance period.
Survey Constraints	None
Survey effort	Dusk survey (5 surveyors – 10 hrs), Night Vision Aids (2 hrs), static surveillance (8 units - 56 hours) = TOTAL 68 hrs
Extent of survey area	Roost and River Deenagh along Port Road/Killarney National Park
Equipment	One static failed to record. All other equipment in good working order.

The extent of the surveys undertaken has achieved to determine:

- Emergence count of known Lesser horseshoe bat roost located in Killarney National Park;
- Potential commuting routes from this roost;
- Extent and pattern of usage by Lesser horseshoe bats along River Deenagh.

The survey design was guided by Collins (2016) and it was primarily designed to gather a large volume of information on lesser horseshoe bat movement over a short period of time.

It is therefore deemed that the surveys completed are appropriate in order to complete the aims of the bat survey.

5. Bat Ecological Evaluation

The lesser horseshoe bat, an Annex II bat species, was the primary focus of the supplementary bat surveys undertaken by Bat Eco Services and the surveys were undertaken in view of the potential lighting impacts only.

These supplementary bat surveys documented that the River Deenagh is an important commuting route for individuals of the lesser horseshoe bat maternity colony roosting in the basement of the Tea House. While these surveys were only brief, they did indicated that a potential 14.7% of the Tea House colony commuted along the River Deenagh directly after emergence. In addition, 11.8% of the Tea House colony continued commuted along the River Deenagh in vicinity of the proposed development area. As a consequence, this high level of lesser horseshoe bat usage it is seemed that the River Deenagh is an important commuting habitat for the local lesser horseshoe bat population.

The lesser horseshoe bat is an Annex II bat species.

Lesser horseshoe bat

- Lesser horseshoe bat is an Annex II bat species under the EU Habitats Directive. The status of this bat species is listed as Least Concern. The national lesser horseshoe bat population is considered to be stable with a steady annual increase (Aughney *et al.,* 2021).
- The modelled Core Area for Lesser horseshoe bats is a relatively restricted area that covers six western seaboard counties Ireland (5,993km^2) but with two distinct areas highlighted: one in Kerry/west Cork and the second in Clare/Galway. The Irish Landscape Model indicated that the lesser horseshoe bat habitat preference is for areas with broadleaf woodland and riparian habitats (Roche *et al.,* 2014).

While the local lesser horseshoe bat population in Killarney National Park is favourable, the overall trend for the country is less favourable. Article 17 reporting (NPWS, 2019) for this species of bat concluded the following:

- Range = Inadequate
- Population = Favourable
- Habitat for species = Inadequate
- Overall Assessment of Conservation Status = Inadequate
- Overall trend in Conservation Status = Deteriorating

As a consequence, it is important to ensure that the Killarney National Park population is protected and conserved.

6. Assessment of Potential Impact

The lesser horseshoe bat, an Annex II bat species, was the primary focus of the supplementary bat surveys undertaken by Bat Eco Services. These supplementary bat surveys documented that the River Deenagh is an important commuting route for individuals of the lesser horseshoe bat maternity colony roosting in the basement of the Tea House. While the surveys were only brief, they did indicated that a potential 14.7% of the Tea House colony commuted along the River Deenagh directly after emergence. In addition, 11.8% of the Tea House colony continued commuted along the River Deenagh in vicinity of the proposed development area.

In relation to proposed lighting and exiting lighting along the Port Road, the following are the primary concerns for local lesser horseshoe bat populations:

- Light spill from the proposed development site.
- Light glare from vehicles exiting/entering the proposed development site (i.e. at the junction of the proposed development site on the Port Road).
- Light spill from existing lighting of the Port Road.

As a consequence, this high level of lesser horseshoe bat usage indicates that proposed lighting of the immediate road area, of the proposed development area and potential “glare” from turning vehicles will likely impact on the river linear as a linear bat habitat.

This impact is considered to be **Moderate Negative** and will be **Permanent** in relation to local lesser horseshoe bat populations commuting along the River Deenagh. Therefore, bat mitigation measures are required to reduce this impact.

6.1 Bat Mitigation Measures

The bat mitigation measures described below take into consideration Marnell *et al.* (2022) as well as best practice guidelines from Collins (2016) and BCT (2023). The measures described are those considered to be practical and effective based on past experience of the principal bat specialist, for the proposed development site. Measures are also reflective to published scientific research, where available and applicable to Irish bat populations. As stated by Marnell *et. Al.* (2022) “Any mitigation intended to ensure that there is no impact or minimal impact on the bats must be clearly described in detail, giving examples of how it worked in other places”. Please see Section 1.2.3 for more information.

6.1.1 Lighting Design

Where lighting is deemed necessary, the following will be undertaken:

- All luminaires will lack UV elements when manufactured. Metal halide, compact fluorescent sources should not be used.
- LED luminaires will be used due to their sharp-cut-off, lower intensity, good colour rendition and dimming capability,
- A warm white light source (2700 Kelvin or lower) will be adopted to reduce blue light component of luminaires. This is particularly important for the Local Authority street lighting directly adjacent to the River Deenagh and any street lighting associated with the proposed development. While standard street lighting tends to be 3,000 to 4,000 Kelvins, it is important to note that such Kelvin values are standards adopted by Local Authorities but that these can be and should be changed to accommodate biodiversity needs. Given the circumstances of this particular project and the concerns of lighting impact on an Annex II species, all efforts

are required to reduce the potential impact by all parties concerned and therefore a minimum of 2700 Kelvins will be adapted by any proposed street lighting proposed within the survey area (both for upgrades and newly proposed lighting). At the recent Bat Conservation Ireland bat conference (March 2023), Sabre Lighting provided a demonstration on the colour of lighting of the different Kelvin values. A 2700 Kelvin luminaire appears as a warm yellow due to the reduction in the stark blue light associated with higher Kelvin values (e.g. 4000 Kelvins). The "warmer" the light, the less of an impact on nocturnal wildlife. The progression of LED technology means that the majority of luminaires are available at 2700 Kelvins and lower. Therefore, it is recommended that such luminaires are standard for "biodiversity areas" and as LED technology develops, 2200 Kelvins may become more commonly available in future years.

- Light sources will feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats. Consideration of using red lighting, particularly for road street lighting directly adjacent to the River Deenagh, should be investigated (i.e. Local Authority street lighting). However, if red light is considered too "different" of a light source, >550nm should be the minimum standard set for this project.

DEFINITION: Red Light refers to the light sources in the red spectrum and mainly consist of long wavelength light above 600nm with an RA value of 60 (for good colour recognition). This wavelength of light is considered to the have the least impact on bats.

- Internal luminaires, in relation to buildings within the proposed development area, can be recessed (as opposed to using a pendant fitting) where installed in proximity to windows to reduce glare and light spill.
- Waymarking inground markers (low output with cowls or similar to minimised upward light spill) to delineate path edges, if required, for pedestrian zones within the proposed development area will be used.
- Column heights will be carefully considered to minimise light spill and glare visibility. This should be balanced with the potential for increased numbers of columns and upward light reflectance as with bollards.
- Only luminaires with a negligible or zero Upward Light Ration, and with good optical control, will be used.
- Luminaires will be mounted horizontally, with no light output above 90^{o} and/or no upward tilt.
- Where appropriate, external security light should be set on motion sensors and set to as short a possible a timer as the risk assessment will allow (e.g. 1-2 minute timer).
- Use of a Central Management System (CMS) with additional web-enables devices to light on demand. If possible, it should be determined if the Local Authority street lighting immediately adjacent to the River Deenagh and particular luminaires of concern, can be managed in a manner to reduce the amount of lighting required as the night progresses (i.e. reduction in lighting for specific hours of the night). This Part-Night lighting may require further survey work to determine if dimming is of value to local lesser horseshoe bat population.
- Only if all other options have been explored, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed.

The lighting design for the proposed development site will incorporate the BCT (2023) guidelines. In addition, the lighting design will ensure that lighting within the proposed development area will be contained within the site and no light spill will occur as shown on the light spill/contour map presented below (Please see MHL Lighting Report for more details).

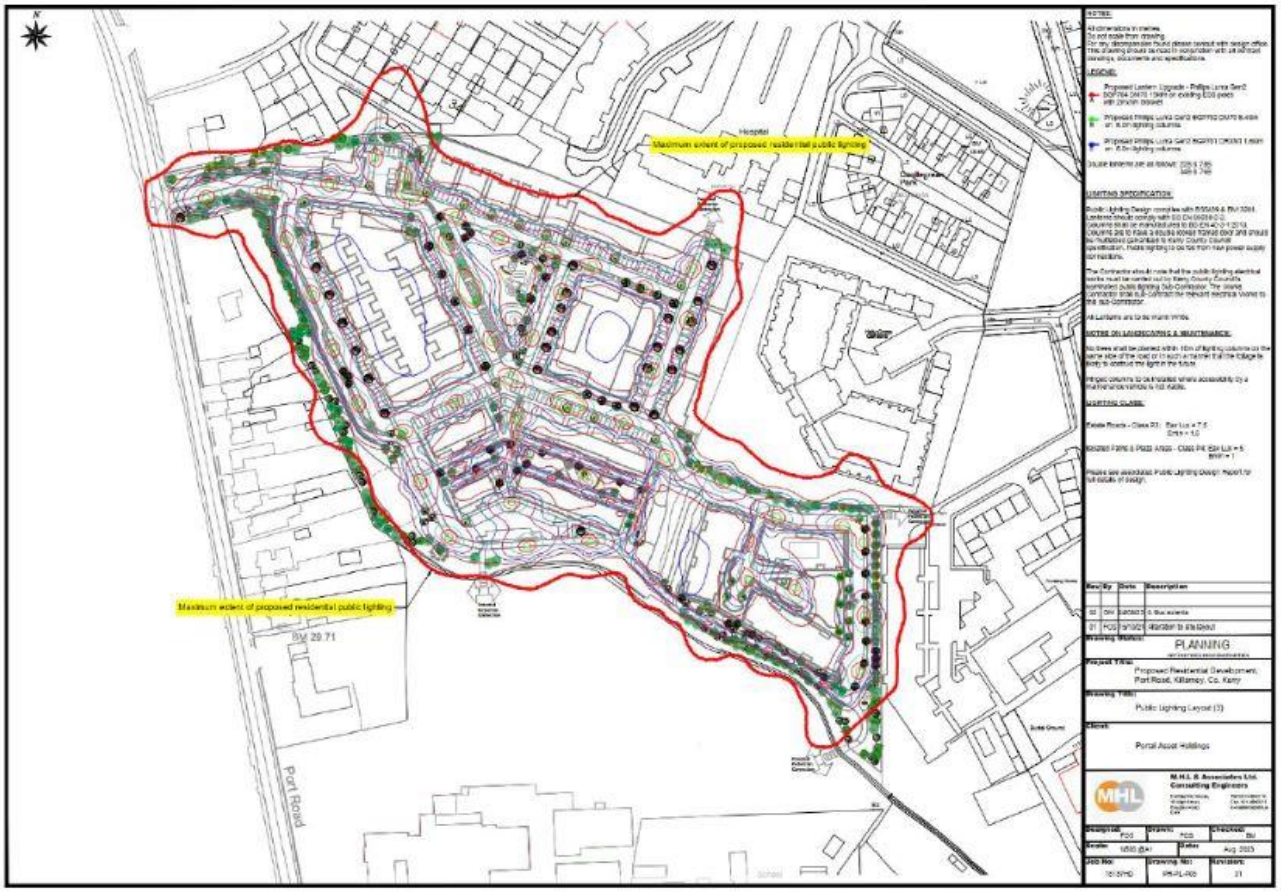

Figure 8a: Proposed Internal Development Lighting Isolux extents (0.1lux) (Source: Figure 7.2, MHL Lighting Report).

In relation to existing lighting along the Port Road, changes have been agreed to reduce light spill into the national park. The agreed solution with Kerry Co. Co is to move the lighting standards to the western side of the road adjacent to the park boundary wall on the public footpath. The new light standards will also adopt the required specifications detailed above for bats in order to eliminate any impacts (Please see MHL Lighting Report for more details).

6.1.2 Landscape Buffer

One of the primary concerns expressed about lighting resulting from the proposed development is the glare from turning vehicles exiting and entering the proposed development site. The vegetation on the Port Road-side of the River Deenagh in vicinity of the developments exit point considered to be dense enough to provide a buffer from this lighting. However there are there are some gaps in the vegetation to the right of the proposed new junction and in a northly direction on both sides of the river. Therefore, the following will be undertaken (and is presented in the figure below):

- 40m of a double line of hedging will be planted to reduce glare from vehicles exiting the proposed development site and entering the national park.
- New planting will be planted along the river bank within any gaps along the Port Road / River Deenagh. Discussions were undertaken with NPWS and a double hedge has been agreed to be planted along the park-side of the walkway along the River Deenagh.
- Mature trees and shrubs, similar to existing vegetation, will be planted to provide a buffer of vegetation to at least 2-3m height above the existing wall boundary.

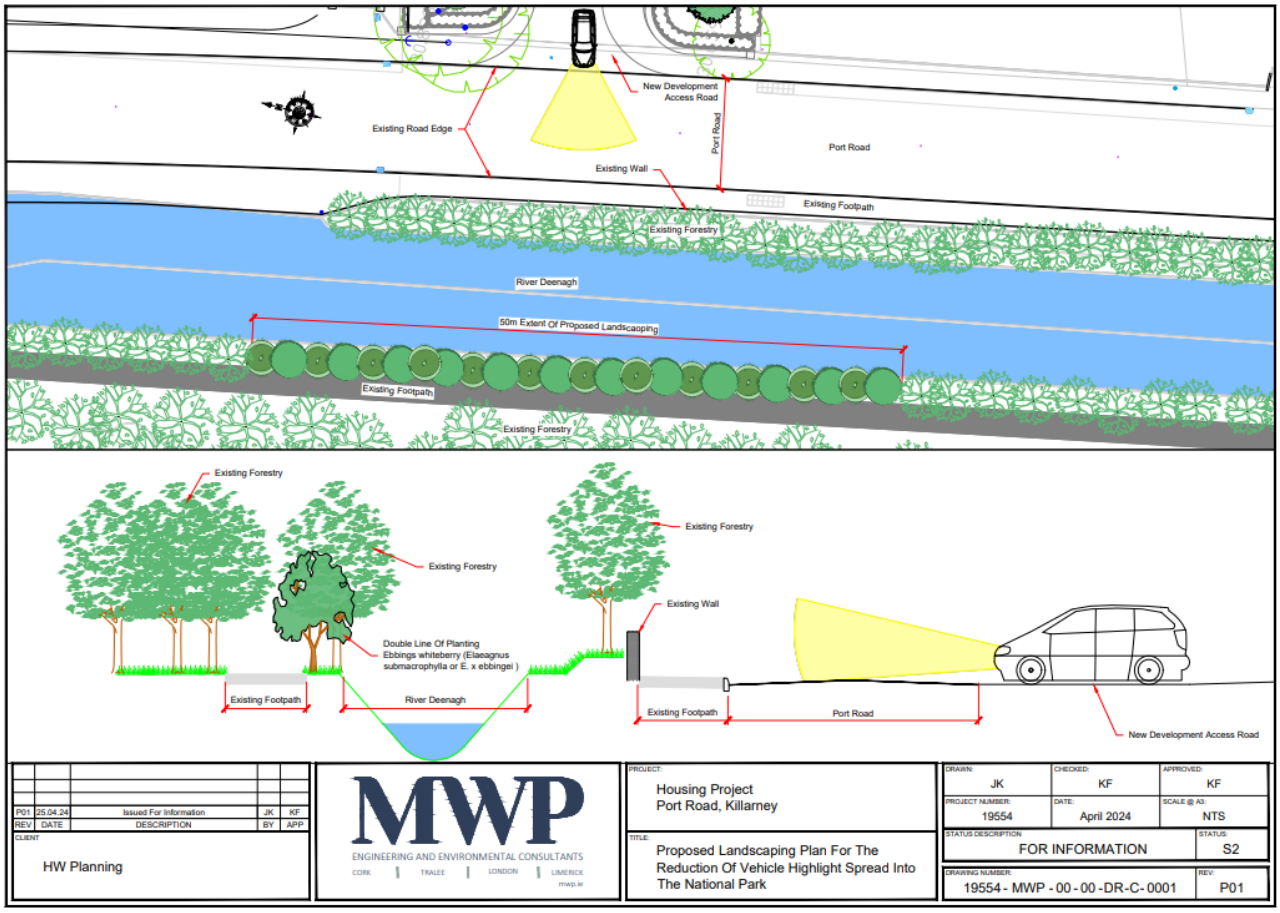

Figure 8b: Proposed landscaping to reduce vehicle glare from the proposed development site into Killarney National Park (Source: MWP).

6.1.3 Landscaping

Planting dense vegetation zones can assist to "buffer" potential light spillage. In addition to 6.1.2, the following is recommended:

Proposed Development Site – the landscape plan for the proposed development site will ensure that the boundary of the site along the port road is planted with a native hedgerow and interspersed trees to achieve a height to reduce light spillage from street lighting within the proposed development site.

6.1.4 Monitoring

In Ireland, we are often depending research and guidelines from outside the country e.g. BCT (2023) guidelines. However, this project provides an ideal opportunity to demonstrate the positive impact the mitigation measures in relation to reducing the potential impact of lighting on lesser horseshoe bats. The static surveillance data provides baseline data and the survey can be replicated post works to compare the levels of lesser horseshoe bat activity. Therefore it is recommended that this project is used as a Case Study to inform future works and that a suitable monitoring project is designed by an integrated team of an bat ecologist and lighting engineer with input from NPWS and Kerry Co. Co.

7. Survey Conclusions

The lesser horseshoe bat, an Annex II bat species, was the primary focus of the supplementary bat surveys undertaken by Bat Eco Services. These supplementary bat surveys documented that the River Deenagh is an important commuting route for individuals of the lesser horseshoe bat maternity colony roosting in the basement of the Tea House.

As a consequence, this high level of lesser horseshoe bat usage indicates that proposed lighting of the immediate road area, of the proposed development area and potential “glare” from turning vehicles will likely impact on the river linear as a linear bat habitat.

This impact is considered to be **Moderate Negative** and will be **Permanent** in relation to local lesser horseshoe bat populations commuting along the River Deenagh. Therefore, bat mitigation measures are required to reduce this impact.

There are three main mitigation measures proposed are:

- The lighting design for the proposed development site which has been designed using BCT (2023) specifications to contain lighting within the site.
- At the new site junction on the Port Road, landscaping (i.e. new planting) along the River Deenagh will prevent vehicle glare entering the national park.
- Existing lighting/luminaires along the Port Road will be moved to the western side so as to reduce lighting spill. New luminaires will also meet the BCT (2023) specifications.

It is considered that the strict implementation of these measures will ensure that the proposed development will not result in any significant adverse effects on the local lesser horseshoe bat population in Killarney National Park.

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9. Appendices

9.1 Appendix 1 Other Bat Species Recorded during Static Surveillance

Code	Daubenton's bat	Whiskered bat	Natterer's bat	Myotis species	Soprano pipistrelle	Common pipistrelle	Leisler's bat
Static 1	116	158	5	0	9	26	0
Static 2	8	11	1	8	223	309	23
Static 3	121	89	3	0	13	23	0
Static 4	12	14	2	0	60	56	2
Static 5	21	90	0	0	55	69	2
Static 6	227	27	0	0	108	56	1
Static 7	No recordings	No recordings	No recordings	No recordings	No recordings	No recordings	No recordings
Static 8	111	42	0	2	912	180	1

Appendix 3 – Lighting Report (MHL, 2024)

For: Portal Asset Holdings Ltd.
Port Road, Killarney

PROPOSED RESIDENTIAL DEVELOPMENT

Public Lighting Design Assessment

May 2024

MHL & Associates Ltd.
Consulting Engineers

Document Control Sheet

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Project Title:	Proposed Residential Development at Port Road, Killarney, Co. Kerry
Document Title:	Public Lighting Design Assessment
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1 NON-TECHNICAL SUMMARY

In response to the proposed Large-Scale Residential Development in Killarney, Co. Kerry, MHL & Associates Ltd. on behalf of Portal Asset Holdings Ltd. has conducted a comprehensive assessment and design of public lighting for this site. This assessment describes the existing and proposed lighting designs, lighting pollution, and mitigation measures while ensuring lighting standards are conformed to. In this non-technical summary, we'll outline our findings and mitigation measures for the proposed public lighting infrastructure. Best practice design and mitigation measures have been employed to ensure the sensitive ecological receptors (Bat) / habitats have been accounted for in the site's proposals.

As part of our assessment, MHL has collaborated closely with the project ecologist to examine the potential lighting impacts. The assessment has considered and incorporated the recommendations of the 'Bat Eco Services. The design focused on two primary areas. Firstly, lighting within the development site to contain light and prevent general spillage, particularly at the new junction where it meets Port Road. Secondly, attention was given to the existing public lighting along Port Road, which has historically caused light spillage into the national park, particularly at vulnerable zones along the boundary of the Park. Final lighting specification to be agreed between the applicant/appointed contractor and the Kerry County Council with input from National Parks and Wildlife Service (NPWS), as required.

The three primary mitigation measures proposed for reducing light spill and the impacts of artificial lighting for this application, as noted in the planning applications Bat Report are:

- Lighting Design with BCT Specifications: Designing the lighting for the proposed development site according to BCT (2023) specifications helps ensure that the light is contained within the site boundaries, reducing spillage into neighbouring areas and minimizing light pollution. By using fixtures and design practices that comply with these specifications, the development can achieve its lighting goals while mitigating potential negative impacts on the surrounding environment.
- Landscaping along River Deenagh: Implementing landscaping, such as new planting along the River Deenagh at the new site junction on the Port Road, serves as a natural barrier to prevent vehicle glare from entering the national park. Vegetation helps to shield and diffuse light, reducing its intensity and minimizing its impact on sensitive ecosystems and wildlife habitats. This approach not only mitigates light spill but also enhances the visual aesthetics of the area.
- Relocation of existing lighting and use of BCT-compliant Luminaires: Moving existing lighting/luminaires along the Port Road to the western side and ensuring that new luminaires meet BCT (2023) specifications are effective measures for reducing lighting spill. By relocating existing fixtures away from sensitive areas and using fixtures that are designed to minimize light spill, the overall impact of artificial lighting can be significantly reduced. This approach improves lighting efficiency and safety while minimizing potential negative effects on the environment and nearby communities.

1.1 Development Site

For this lighting assessment, the adopted design integrates all essential measures within the housing scheme, effectively restricting light dispersion within the site as illustrated by the light spill/penetration assessments noted in this document. Moreover, the spatial separation, topography, and existing treeline encircling the development site guarantee that there are no concerns stemming from that specific area or location, as containment remains intact. The design of the project, informed by the ecological inputs from the project team, prioritizes public lighting within the development estate that minimizes the impact of artificial light through measures such as selecting lantern heads with suitable optics, incorporating lighting hoods/shields, mounting luminaires horizontally with zero degrees vertical tilt, using warm white spectrum (2700k) lanterns, opting for flat glass lanterns, employing LEDs with sharp cut-offs and dimming capability, and options for dimming and part-night lighting based on diurnal, seasonal, and human activity factors.

1.2 Port Road

Port Road existing lighting design was reviewed and evaluated against with new LED luminaires proposed. The revised design notes improved lighting quality, coverage, energy usage and overall road and pedestrian safety along the route above the modelled existing "do-nothing scenario". Compliance is demonstrated through the lux contour plan of the proposed public lighting for the roadway. This plan not only verifies adherence to the specified limits but also provides insights the light spread and control through use of the selected lantern head optic and lighting classification. The lighting plan encompasses the expected horizontal illuminance at ground level across all areas of the site, presenting lux contours. Coupled with this is the reduction of light spill in comparison to the existing older lantern heads on site, noting a net gain in comparison to the existing scenario.

The proposed development lighting plan notes a demonstrable improvement on light spill into the park (benefits of both relocation and through the use sensitive 2700K Led lanterns with zero up light (Uo). The proposed lighting columns are to be situated to the back of the western footpath along Port Road with an additional column installed directly opposite the development entrance, as noted in the supporting lighting design layouts / sections.

1.2.1 Port Road Junction

At the junction onto Port Road, existing public light standards emit light across the road towards the national park, particularly concerning is the fixture on the right (north) side and another further north. Discussions with NPWS highlighted concerns about cars leaving the housing site at night and the potential for light spillage. To address this, a solution was agreed upon between MWP and NPWS: planting a 40-meter-long double line of semi-mature species along the pathway edge to serve as an additional barrier against light spillage. Please refer to the "Proposed Landscaping Plan for the reduction of vehicle highlight spread into the national park" produced" by MWP.

1.3 Domestic Light Sources from the development

Although it falls outside the scope of the public lighting design, to mitigate potential light trespass from development unit windows, measures have been employed at optimizing site configuration to minimize domestic spill lighting, implementing screening through soft landscaping and physical barriers.

Internal luminaires can be recessed (as opposed to using a pendant fitting) where installed in proximity to windows to reduce glare and light spill. Low transmission glazing treatments to achieve further reduced illuminance targets from internal domestic sources at specified locations are also proposed and are be agreed between the applicant and Kerry County Council at preconstruction stage. The measures proposed can be incorporated by way of condition in a grant of planning.

By implementing these mitigation measures, the project can effectively address concerns related to light spill and contribute to the preservation of natural habitats and the reduction of light pollution in the surrounding area.

Notwithstanding that it has been demonstrated that lighting design will ensure that lighting within the proposed development will be contained within the site and no light spill will occur, the potential to reduce lighting glare from elevated windows / those nearest sensitive ecology receptors can also be offset through the use of recessed internal luminaires near windows and / or use of glazing treatments on west and south facing windows, where necessary, to restrict any lighting trespass. The BCT guidelines advise that where needed, low transmission glass may be a suitable option in achieving reduced illuminance targets. It may not be necessary having regard to height and position of windows, as well as intervening built form or landscape screening. A range of glazing specification options exists in respect of lower light transmission of glass, and where deemed necessary, a final specification can be agreed with the project ecologist.

2 INTRODUCTION

M.H.L. & Associates Ltd. Consulting Engineers have been engaged by Portal Asset Holdings Ltd. to produce a Public Lighting Design Assessment to supplement an LRD planning application for a Large-scale Residential Development at Coollegrean, Port Road, Killarney, Co. Kerry. Portal Asset Holdings Ltd is seeking planning permission for the construction of a new housing development at the site.

Figure 2.1: Main Residential Development Site

Portal Asset Holdings Ltd. intend to apply for planning permission for a Large-Scale Residential Development (LRD) at Port Road and St Margaret's Road, Coollegrean, Inch, Knockreer, Ardnamweely, Derreen (townlands), Killarney, Co. Kerry.

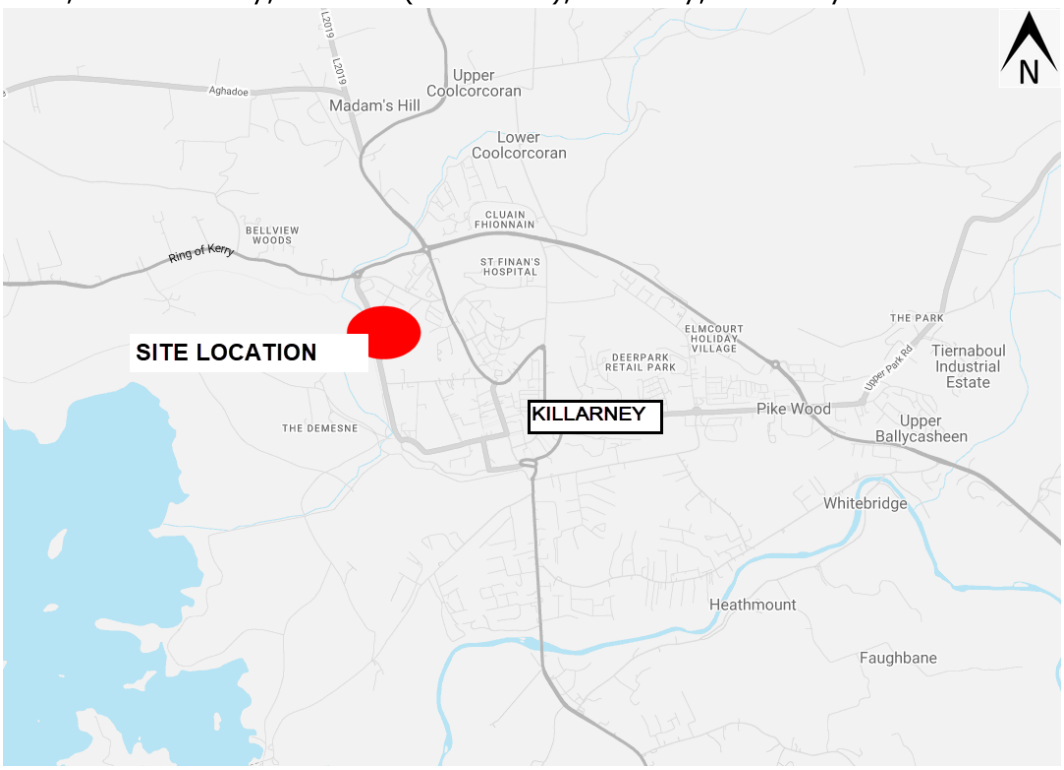

Figure 2.2 Site Location – wider context.

2.1 Report Structure

This report has been prepared to assess the lighting levels within the vicinity of the development site and develop a sensitive lighting design to support the applicant's planning application. The report has been prepared by MHL to the best of our knowledge using the information provided by Kerry County Council and the client. The report assesses the potential effects of obtrusive light that could arise from outdoor artificial lighting at the proposed development.

The principal objective is to identify the effects of the new lighting plan on identified sensitive receptors and propose suitable mitigation measures. Obtrusive light or light pollution is any light that strays to areas other than where it is intended and can include light intrusion (spill light) into neighbouring properties, upward light (which can create sky glow) and visual source intensity (glare). Light pollution can create negative effects on ecological receptors in the area, particularly concerning bat roosts and foraging corridors.

This lighting impact assessment considers the scenario of installing new proposed artificial lighting, to assess the significance of the potential effects compared to existing baseline scenarios.

3 ASSESSMENT METHODOLOGY

3.1 Environmental Zone Classification

All standards consulted are nationally recognised documents, (some internationally also) which deal with all design issues associated with external lighting.

CIE Standards, the CIBSE and the Society of Light & Lighting guidance documents, all apply a common Environmental Zoning system, which is summarised in the table below.

Table 1 – Environmental Zones

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

Figure 3.1 Environmental Zone (ILP)

3.2 Obtrusive Light

- Obtrusive light (or sometimes referred to as light pollution) refers to any light emitted in a direction in which it is not required or wanted and as such is detrimental to other users.
- Light intrusion refers to the spilling of light beyond the boundary of the area to be lit. This includes the intrusion of light into bedroom windows.
- Skyglow refers to the brightening of the sky above towns cause by direct or reflected upward light.
- Glare refers to the uncomfortable brightness of a light source when viewed against a dark background. The figure below illustrates the different types of obtrusive light.

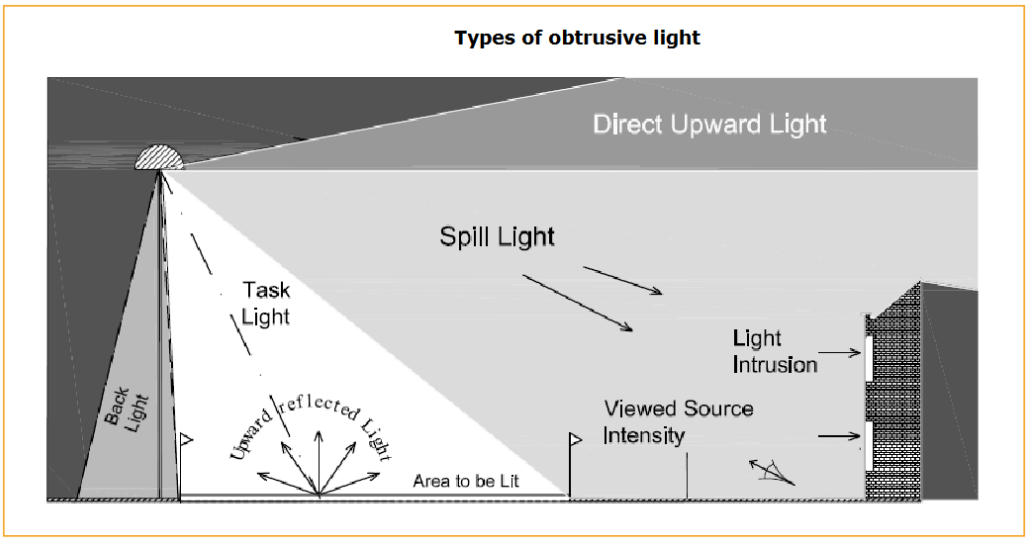

Figure 3.2 Types of Obtrusive light (ILP)

3.3 Potential Effects

Poorly designed public lighting can contribute the following obtrusive light components:

- Light spill into windows: this is typical of wall-mounted luminaires with high tilt angles.
- Upward light causing sky glow: this is typical of up-lighting.
- Glare: due to high light source intensity from floodlights
- Intrusive light affecting ecology: caused by excessive height and tilt.

Poorly designed lighting consists of the installation of a limited number of luminaires that are being used to light a wide area. Due to this, the lighting is normally installed with tilt angles that are too great, because there is a need to spread the light as far as possible, lighting the intended area, as well as surfaces where the lighting was not intended.

Many of the potential effects of artificial lighting can be effectively mitigated by a suitable lighting strategy, good design and choice of suitable lighting equipment. It is proposed that the lighting impact is to be limited by using accepted methods of lighting control, limiting illuminance, and controlling light spill. Lighting shall be selected to provide safety and security without polluting the surrounding environment.

4 BASELINE CONDITIONS

4.1 Site Overview

The site for the proposed development is accessed from an existing road network, that is illuminated with lighting columns that are owned and maintained by the Local Authority.

Information in this report will assess the impact of the introduction of artificial lighting that consists of 6m high lighting columns within the applicant's site and 8m columns along Port Road, where noted.

4.2 Existing Site Topography

The existing site is a greenfield site, located directly east of the nearby local Port Road, as shown in the figure below. The site is grading north to south, with falls from the northern boundary towards its south and eastern boundary towards the nearby Folly Stream. From a lighting perspective, the area highlighted in red is where existing ground level is highest relevant to the adjoining site ground levels. This area would be of particular focus regarding trespass lighting from proposed housing/ relative FFLs.

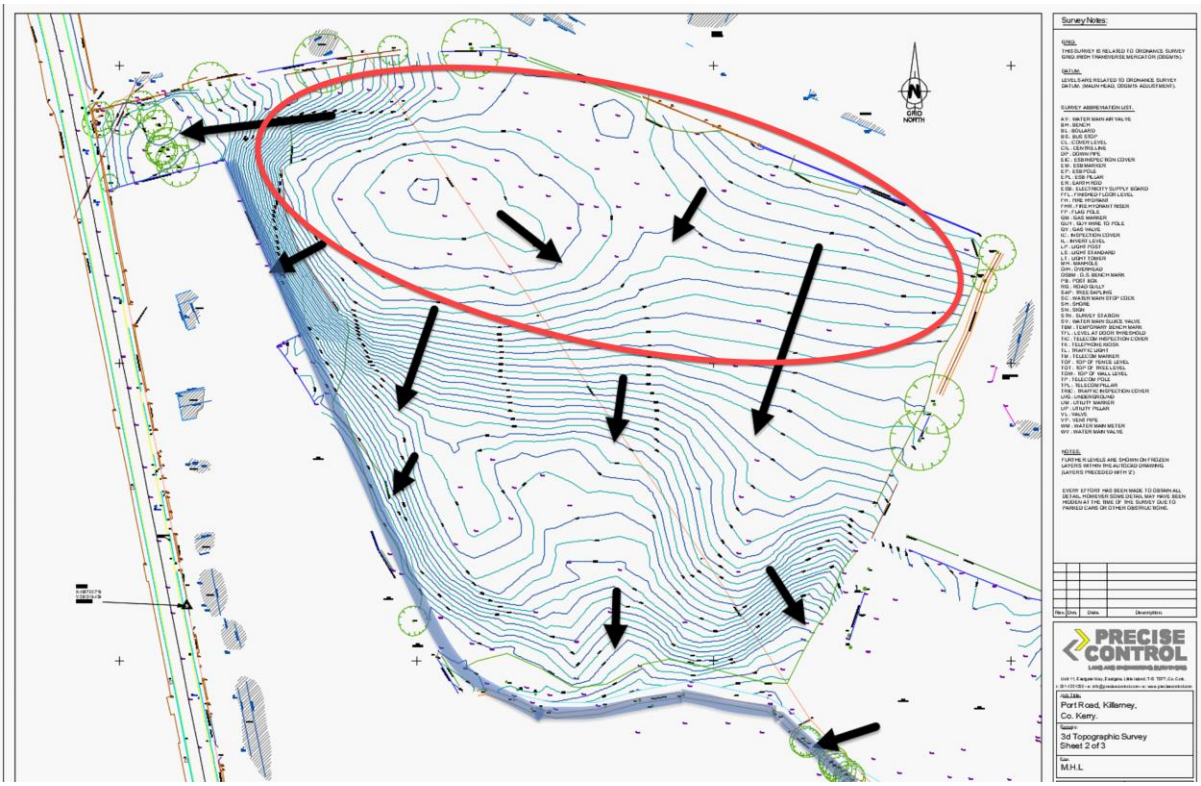

Figure 4.1 Existing Topographical Layout

Please refer to the topographical survey noted in the Appendix, carried out by Precise Control Surveyors.

4.3 Existing Access

An existing vehicular access is located to the northwest of the applicant's site, connecting onto the R877 Port Road as noted in the following figures.

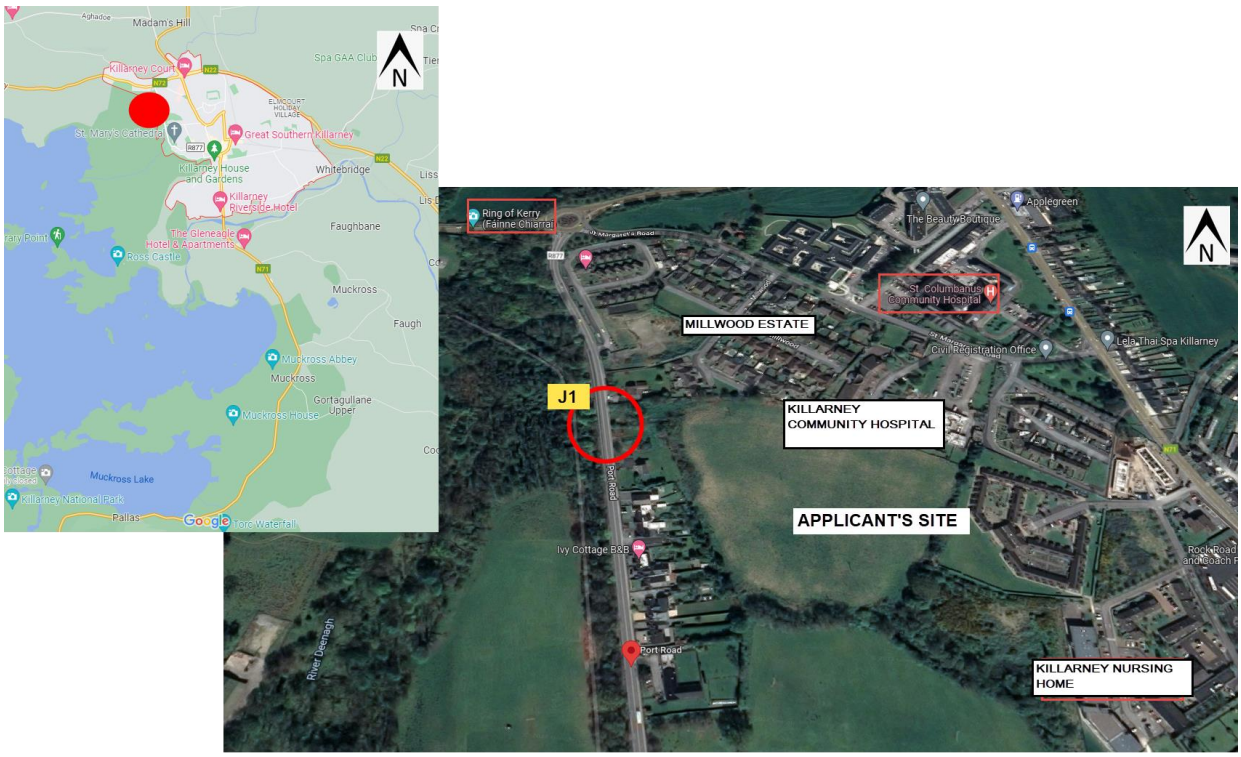

Figure 4.2 Site access.

4.4 Existing Port Road Carriageway

The existing Port Road is a wide single carriageway (c. 8-9.5m in width) with footways of varied widths both sides of its section along its length.

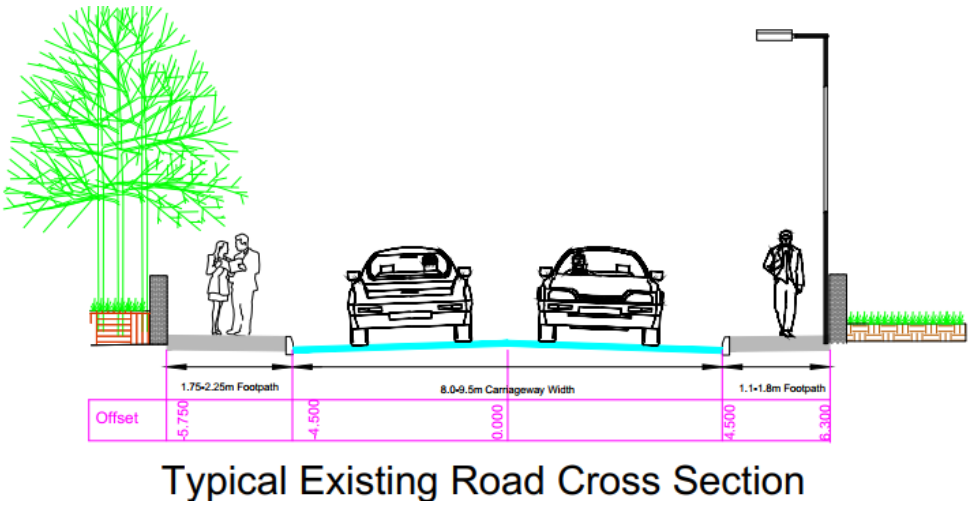

Figure 4.3 Existing Carriageway X Section

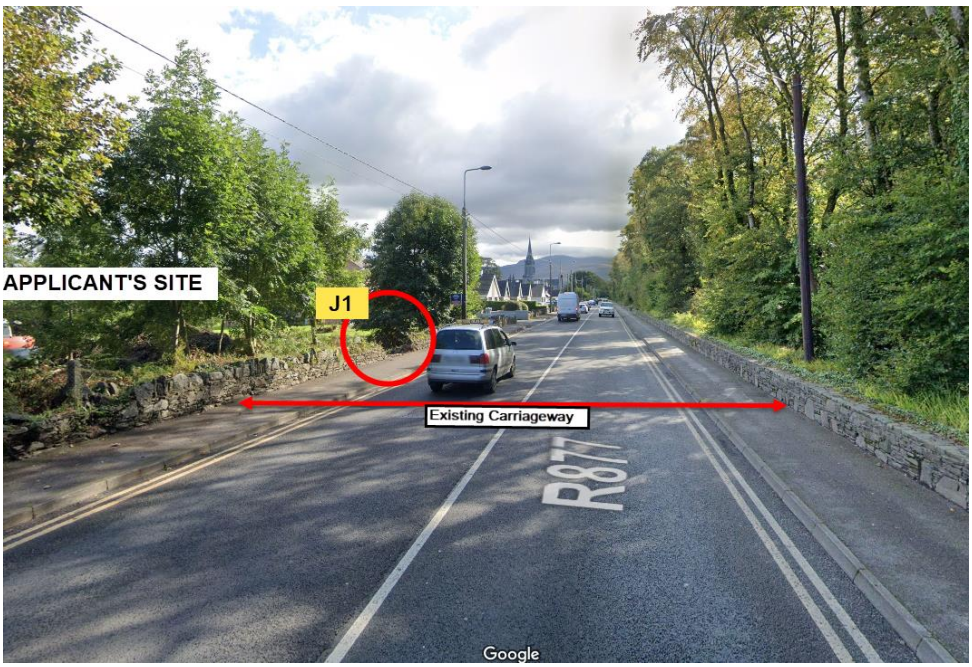

Figure 4.4 Existing Carriageway

Historically the most common types of lamps installed in residential areas and on traffic. routes were high pressure sodium lights (SON), which replaced Low Pressure Sodium (SOX), and to a lesser degree Metal Halide (MH). From site surveys it was determined that existing Son streetlights are located for the entire extent of Port Road, along its eastern road edge. These older types of luminaire/ streetlights have higher wattages and higher photopic lumens than the newer LED variants.

5 DEVELOPMENT PROPOSALS

5.1 Proposed Development

Portal Asset Holdings Ltd. intend to apply for planning permission for a Large-Scale Residential Development (LRD) at Port Road and St Margaret's Road, Coollegrean, Inch, Knockreer, Ardnamweely, Derreen (townlands), Killarney, Co. Kerry.

The proposed development will consist of 224 no. units comprising 76 no. two storey houses (8 no. 2 bed units, 38 no. 3 bed units and 30 no 4 bed units), 52 no. duplexes over 3 no. storeys (14 no. 1 bed units, 26 no. 2 bed units and 12 no. 3 bed units) and 96 no. apartments in 3 no. 4 no. storey buildings (16 no. 1 bed units and 80 no. 2 bed units), and a 2 no. storey creche (334 sq. m). Ancillary site works include public and communal open spaces, hard and soft landscaping, the relocation/undergrounding of ESB powerlines, wastewater infrastructure including foul pumping station, surface water attenuation, water utility services, public lighting, bin stores, bicycle stores, ESB substation, and all associated site development works.

Vehicular access to the development will be via a new entrance from Port Road. The proposed development includes upgrade works to Port Road, a pedestrian connection to Millwood Estate, and improvements to the stormwater network on St. Margaret's Road, as part of enabling infrastructure for the project.
The proposed development will provide for a new vehicular access and pedestrian entrances onto Port Road, upgrades to Port Road comprising reduction in carriageway widths, provision of shared pedestrian/cycle path and uncontrolled pedestrian crossing, and a pedestrian connection to Millwood Estate.

It is proposed to upgrade the stormwater network on St. Margaret's Road (approximately 140 metres north of the main development site) to support the development. Ancillary infrastructure development works will include relocation/undergrounding of ESB powerlines, wastewater infrastructure including foul pumping station, surface water storage/infiltration, water utility services, public lighting, bin stores, bicycle stores, ESB substation, and all associated site development works.

Figure 5.1 Site Layout

See drawing Proposed Site Layout accompanying the application produced by Deady Gahan Architects Co Ltd for the layout of the development.

5.2 Proposed Development Access

The proposed entrance is located at the northwest section of the site, connecting onto Port Road within a 60kph speed zone. The design of the development entrance has been a particular focus of the design team, with lighting provided to ensure light spill in the location is kept to a minimum whilst ensuring the lighting standard specified is appropriated to the level of traffic passing on the adjoining roadway.

5.3 Shared Surface on Port Road

The site's proximity to both existing schools and the Killarney National Park, noted in the figure below means that it is a prime location to provide sustainable transport facilities. As part of this scheme and following consultation with both KCC and TII, it is proposed to install a 3.0m wide shared surface along Port Road. This 3.0m shared surface will replace the existing 1.1m footpath on the eastern side of Port Road.

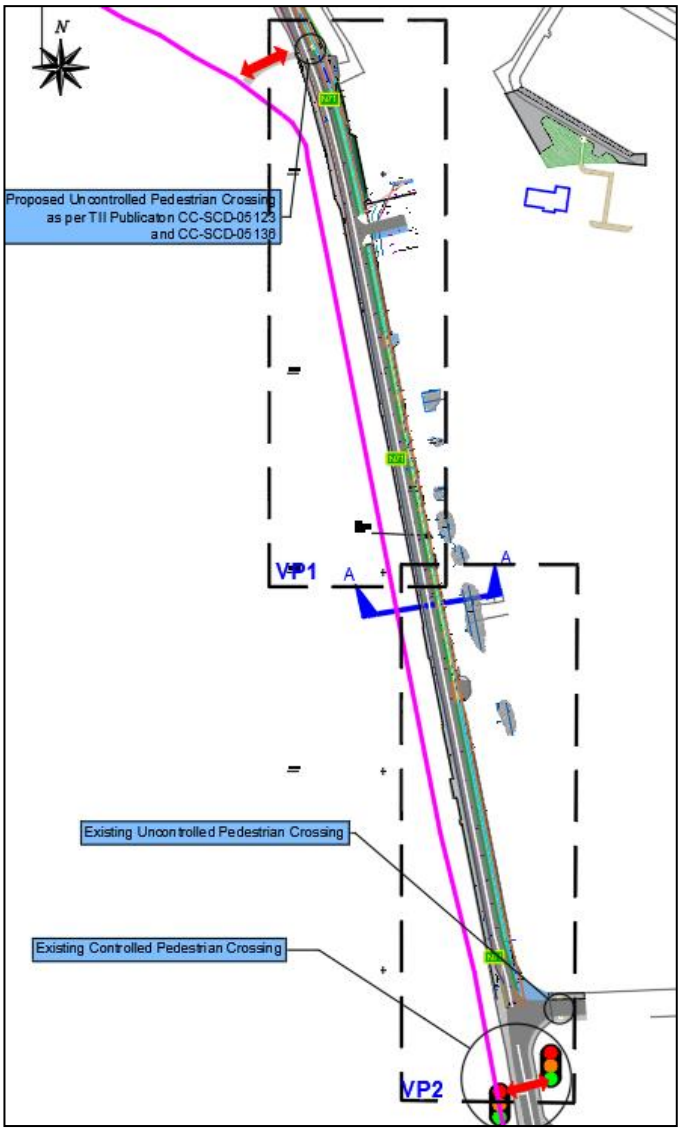

Figure 5.2 Proposed Shared Surface along Port Road

To the north of the development entrance, it is proposed that the shared surface will terminate at a new uncontrolled pedestrian crossing to the Fossa Cycleway. To the south of the development entrance the shared surface will extend as far as the junction of Port Road and New Road. This facility will provide pedestrian and cyclist linkage between Killarney Town and the Fossa Cycleway/National Park, providing excellent connectivity to the wider cycle network throughout the town and environs. The new lighting plan takes account of these proposals.

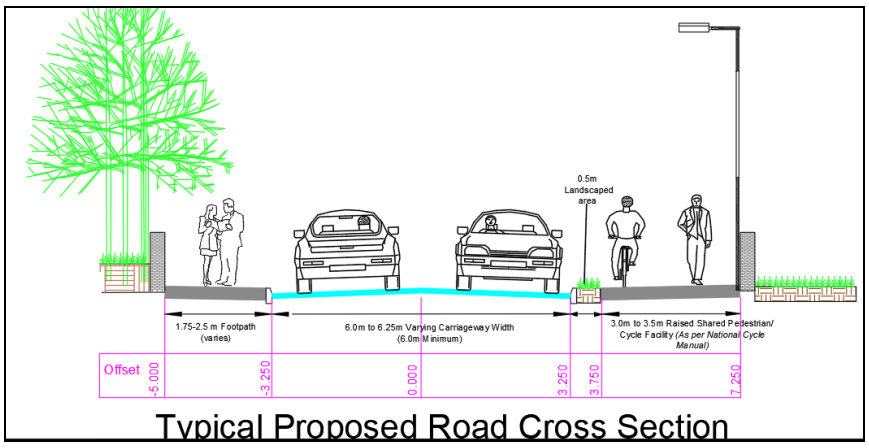

Figure 5.3 Proposed Shared Surface Cross Section

Please refer to N72 Port Road Shared Surface Proposal for the site in Planning Drawing Pack accompanying this report.

6 LIGHTING ASSESSMENT

6.1 Lighting Brief

The lighting assessment aim is to ensure that lighting is fit for its purpose and to ensure safety and security for vehicles and pedestrians during the hours of darkness, whilst minimising the potential for obtrusive light.

MWP provided an ecology report which identifies sensitive areas adjacent to the proposed development particularly the national park near Port Road.

It is this woodland section that has been identified as a sensitive receptor.

Lighting performance details outlined in this section of the document are to be considered in conjunction with the submitted lighting design layouts.

6.2 Lighting Calculations and Modelling

An external lighting calculation has been prepared by MHL & Associates Ltd for the proposed development along Port Road. The site was modelled using industry-standard software Lighting Reality. Lighting Reality is a software package which utilises the manufacturer's luminaire photometric data files to simulate the lighting output of lighting units.

It is to be noted that the lighting calculation report has been produced with a luminaire maintenance factor of 1.0 as specified in the ILP publication, Public Lighting Guide 04 – Guidance on undertaking an Environmental Assessment Report. It defines a maintenance factor of 1.0 as being the worst-case scenario as all the outdoor lighting will be performing at peak intensity.

Light spill calculations are based on the luminaires at full output, with a maintenance factor of 1.0, as this will represent the worst-case scenario. The light spill model does not consider physical obstructions and provides light spill details for the initial light output, therefore disregarding the maintenance factor used for ensuring the lighting design performs as required at the end of its life. Considering this, the light spill diagram provides an exaggerated and absolute worst-case scenario with regards to the light spill at ground level, assuming no light limiting features are present.

The calculation model (illustrated by illuminance levels and Isolux contour lines on the layout drawing) does not include any proposed or existing planting/hedgerows/ trees on site, or in the surrounding area.

6.3 Sensitive Receptors

There is an existing woodland facing the proposed development entrance which has been identified in the ecology report as an area which has foraging bats.

7 OUTDOOR LIGHTING REQUIREMENTS

7.1 Lighting Classification

The design is a residential estate comprising of housing units and apartments. All internal estate roads have been designed to lighting Class P3. Isolated footpaths and Plaza Areas have been designed to lighting Class P4. As part of this application, it is proposed to replace the existing public lighting heads along Port Road for the length of the proposed shared surface works along Port Road.

7.2 Lighting plan

Lighting plans must provide a 'worst case scenario' plot, whereby light from proposed sources, should be modelled at a 100% illumination state, all external lights on and at operational dimming levels. This will be the key for examination of whether proposals meet prescribed lux maxima by zone. This will also allows an assessment of the likely impact of soft and hard landscaping attenuation. This 100% lighting state will be necessary in order to allow for any unforeseen future loss of soft landscaping or alterations to the external layout of the site which may remove screening features.

8 DEVELOPMENT SITE LIGHTING

The proposed public lighting for the new development has been designed using Lighting Reality Public Lighting Reality. This lighting design software provides lighting compliant designs to EN13201:2015. The design is a residential estate comprising of housing units and apartments.

All internal estate roads have been designed to lighting Class P3.
Isolated footpaths and Plaza Areas have been designed to lighting Class P4.
All internal lighting is to Philips Luma luminaires on 6.0m columns. Isolated footpath columns are to be hinged type.

It has been demonstrated that the lighting design within the main residential development site will not result in light spill outside the boundary of the site, rather the design specification ensures it will be contained.

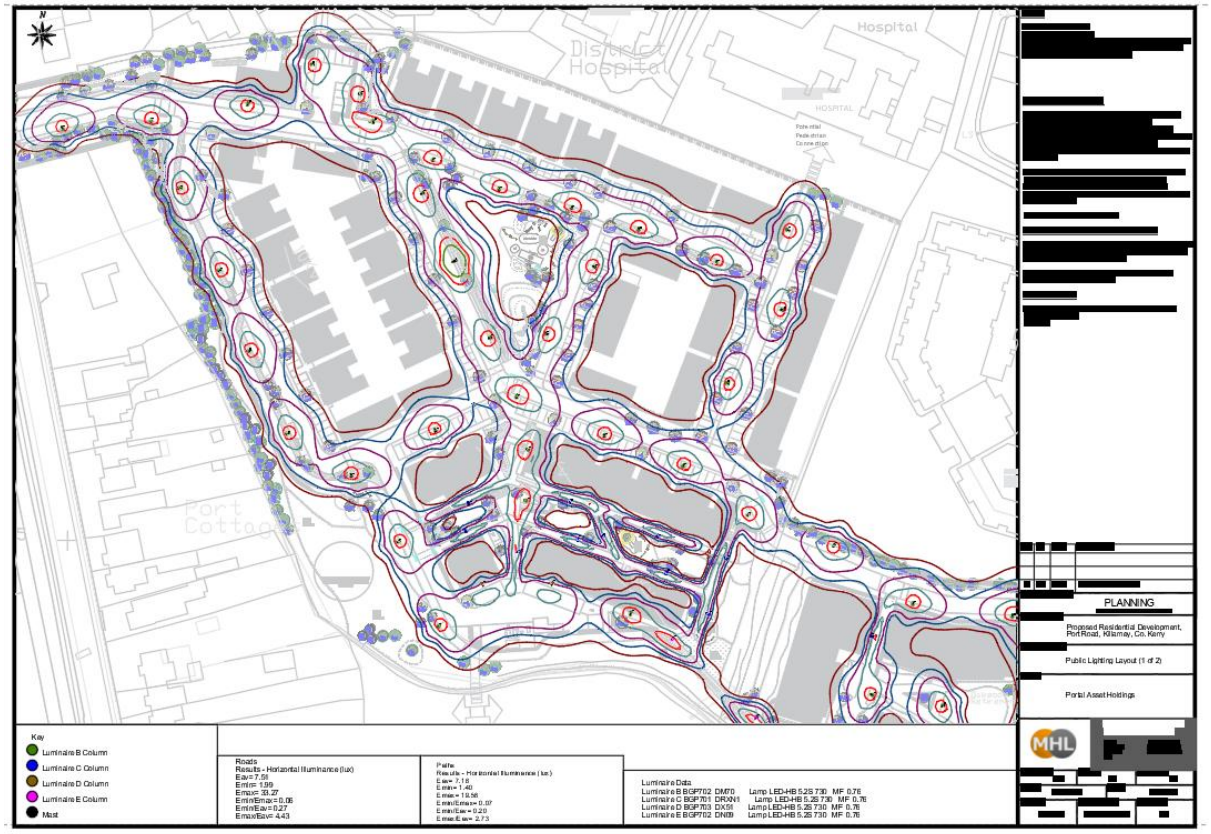

Figure 8.1 Proposed Public Lighting Design

Please refer to Proposed Services- Public Lighting layouts for the site in Planning Drawing Pack accompanying this report.

Lighting Specification:

- Lanterns should comply with IS EN 60598-2-3
- Columns are to have a double locked framed door and should be multisided galvanised to Kerry County Council specification.

- Columns shall be manufactured to BS 5649.
- Public lighting to be fed from new power supply connections.
- Minimum lux level on public roads, paths, and playgrounds within the housing estate to be 1.5 lux.
- The S/P ratio can be applied to the internal estate lux levels depending on lantern type.
- The proposed internal estate public lights are to be dimmable from 12.00 midnight to 06.00 as per dimming class 2A in housing estates.

8.1 Notes on Landscaping:

No trees to be located within 1.5 times the height of the lighting columns.
i.e. Not within 10m of all estate lighting including pathways and playground areas.

8.2 Notes on Ecology:

All ecological constraints as raised in the Ecology Report as produced by Malachy Walsh & Partners have been accounted for by optimising the revised design to cater for the protection of wildlife (EC Habitats Directive and the Wildlife Act), ensuring the impact of artificial light is mitigated against and controlled.

The approach to lighting has been directly informed by the recommendations of the project ecologists, including bat specialist.

Light spillage is to be kept to a minimum by:

- Lighting with suitably chosen lantern heads where optics selected stop indirect lighting.
- Inclusion of lighting hoods/shields to direct light only where it is needed.
- Luminaires design to be mounted on the horizontal with zero degrees vertical tilt, reducing spill light and preventing backlighting.
- All luminaires to lack UV elements.
- The proposed lighting design has been designed using warm white spectrum (2700k) lanterns to reduce the blue light component.
- Lanterns to be flat glass type to limit the amount of upward light and spill light onto the surrounding area.
- The LEDs proposed have sharp cut offs, lower intensity, good colour rendition and dimming capability.
- An option for dimming and part-night lighting, controlled diurnally, seasonally, and according to human activity can be employed

Design Drawings:

Drawings have been compiled showing the lantern types, column locations and lux contours for 1.5, 3.0, 5.0, 10, 15 and 20, as appropriate. The drawings are scaled at 1:500 @ A1.

9 PUBLIC LIGHTING DESIGN REVIEW- PORT ROAD

This report assesses the development lighting proposed within the applicant's site and the arrangement proposed along the Port Road. The review compares the new design for Port Road to the existing historic SON lanterns that are currently installed.

On review of new traffic counts undertaken in 2023, the AADT for Port Road has been approximated at 11,000 veh/day with the lighting class designed to M4/ C4.
As part of this application, it is proposed to replace the existing public lighting heads along Port Road for the length of the proposed shared surface works along Port Road, please refer to the accompanying lighting design report for Port Road.

9.1 Proposed Public Lighting within applicant's site.

The proposed public lighting for the new development has been designed using Lighting Reality Public Lighting Reality. This lighting design software provides lighting compliant designs to EN13201:2015. As part of this application, it is proposed to replace the existing public lighting heads on Port Road for the length of the shared surface works proposed, improving lighting quality, coverage, energy usage and overall road and pedestrian safety along the route.

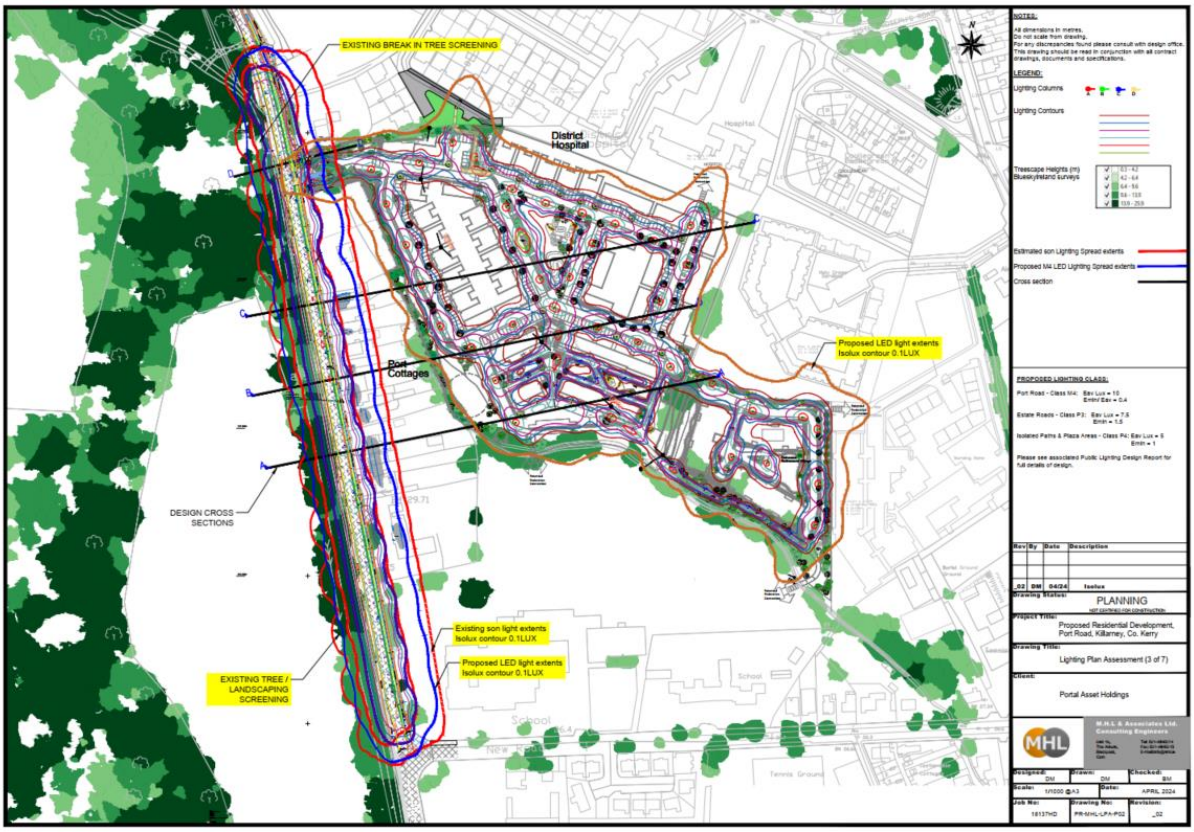

Figure 9.1 Proposed Internal Development Lighting Isolux extents (0.1lux)

As noted in the figure above, the modelled Isolux extents (0.1lx) is confined to the site, as noted by the orange line. This provides clarity regarding the extent spill lighting from the development.

9.2 Public Lighting along Port Road

Existing lighting records were provided by Kerry County Council noting location and wattage level. An option of replacing the existing lighting by installing lighting columns to the opposite side of the Port Road carriageway was also reviewed. These have been tabulated and are noted below.

The contour lux extents have been designed to curtail the lighting envelope within the immediate roadway surrounds, to reduce/limit backscatter and lighting spread where not required. As can be seen in the lux contour lighting layouts, the proposed lighting envelope is well defined and curtailed along the Port Road and is an improvement over the existing SON design in terms of spread lighting.

The lighting design results are detailed for the following options assessed:

- Existing Nearside (8m column height, 1.5m outreach)
- Proposed Farside (western boundary of Port Road) (8m column height, 1.5m outreach)

9.2.1 Existing Public Lighting along Port Road (estimated existing along Port Road)

Luminaire D Data

Supplier	_Historic Lanterns
Type	SGS203 PC P1
Lamp(s)	SON-TPP150W
LampFlux(klm)/Colour	17.50 -/
File Name	SGS203 1xSON-TPP150W PC P1.ldt
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	382.0, 24.0, 6.0
No. in Project	12

Figure 9.2: Existing Public Road Lighting Lantern

Eav	18.20
Emin	2.50
Emax	52.06
Emin/Emax	0.05
Emin/Eav	0.14

Figure 9.3: Estimated existing Public Road Lighting Class results**

(Existing Column positions do not provide Uo of 0.4 due to variable column locations)**

9.3 Proposed Options

9.3.1 Proposed Option: Public Lighting along Port Road (Farside)

Luminaire A Data

Supplier	Philips
Type	BGP292 DW50
Lamp(s)	LED-HB 5.2S 730
Lamp Flux (klm)	10.50
File Name	LumiStreet Gen2 Mini_BGP292_DW50_10500_40LED_5.2S_CLO_L90_730.ies
Maintenance Factor	0.84
Imax70,80,90(cd/klm)	609.4, 39.0, 0.0
No. in Project	12

Figure 9.4: Proposed Public Road Lighting Lantern

Results

Eav	10.00
Emin	5.01
Emax	15.41
Emin/Emax	0.32
Emin/Eav	0.50

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Figure 9.5: Proposed Public Road Lighting Class results.

9.3.2 Overall comparison

From a lighting design perspective, the proposed upgrade to LED lighting for either the footpath side or opposite side of the road are comparable from a lighting standard perspective, meeting the requirement of M4/C4 classification.

	Lighting Model Results		
Option	Eav	Emax	Emin/Eav
Existing	18.2	52.06	
Proposed LED (Class M3)	15.22	23.62	0.46
Proposed LED(Class M4)	10.00	15.41	0.50

Figure 9.6: Public Road Lighting Class option results.

Upgrading the design to a LED lighting variant would be of benefit by reducing the Emax. Historic lantern's maximum lighting level Emax is over twice that of the LED equivalent for the same lighting class standard / design uniformity. Further benefit is the option of locating lighting to the opposite site of the road as this would allow for cowling of lanterns to reduce backscatter into the park, reducing the lighting spread/ envelope even further.

The following figure notes the extents of the lux lighting envelopes for the assessed lanterns, comparing existing estimated SON lighting with comparable modern LED variants of a similar LUX output. As is evident in the figure, the lighting extents of the new LED provides an improvement to that of older SON. The lighting extents for the nearside LED upgrade(blueline) falls closely within the extents of the SON (redline). This

shows that the upgrade to LED lighting will be comparable if not a general improvement above that which is in situ.

Coupled with these improvements, it should be noted that the current treeline that runs along the boundary with Port Road also screens the park of intrusive light spread. The impact to these trees and associated habitats would require comment from the ecologist. but from a lighting perspective the light spread would be maintained/reduced to that present and the Emax would be significantly reduced.

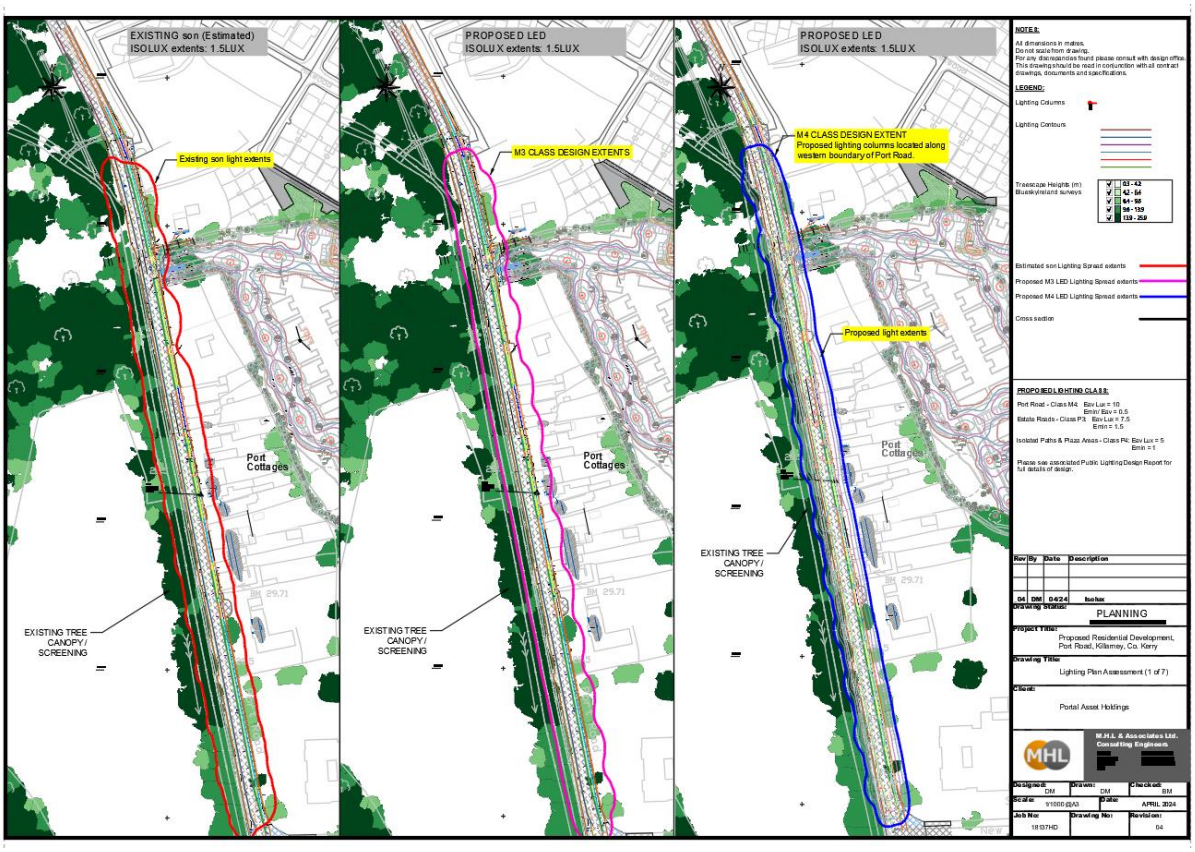

Figure 9.7: Existing and Proposed Public Road Lighting extents/ treescape.

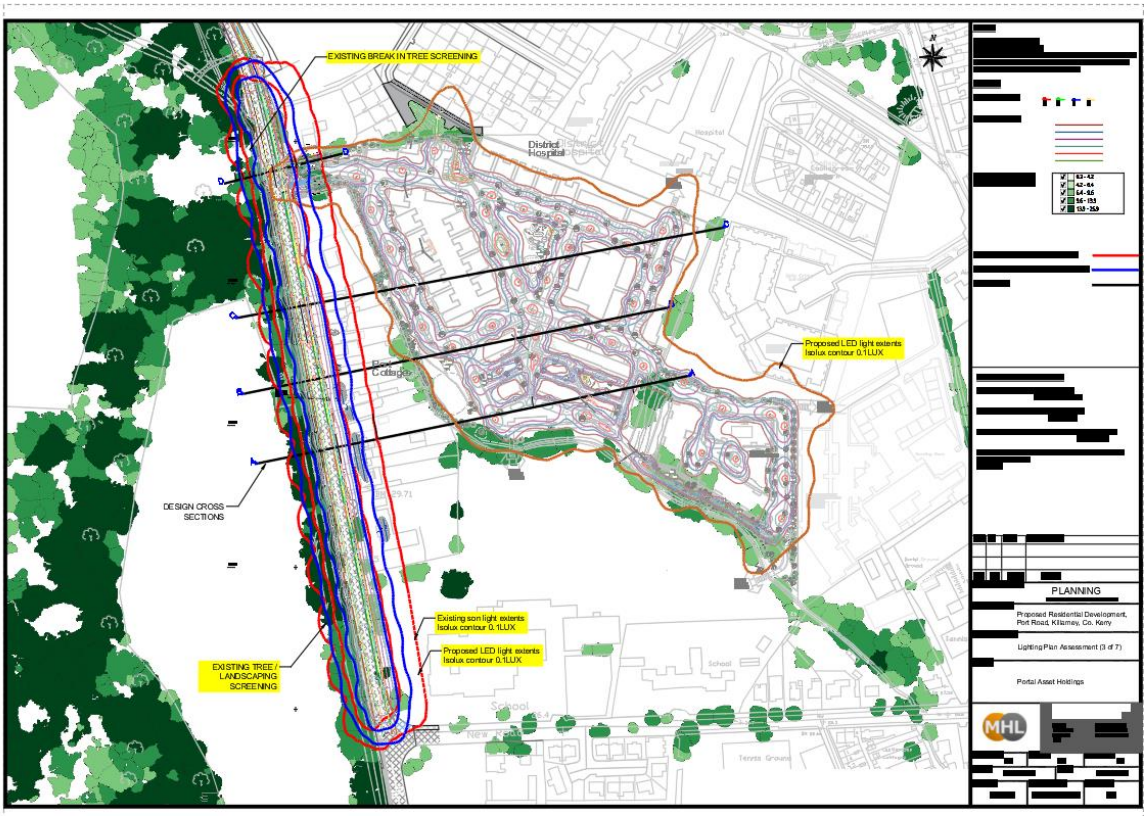

Figure 9.8: Cross Section locations.

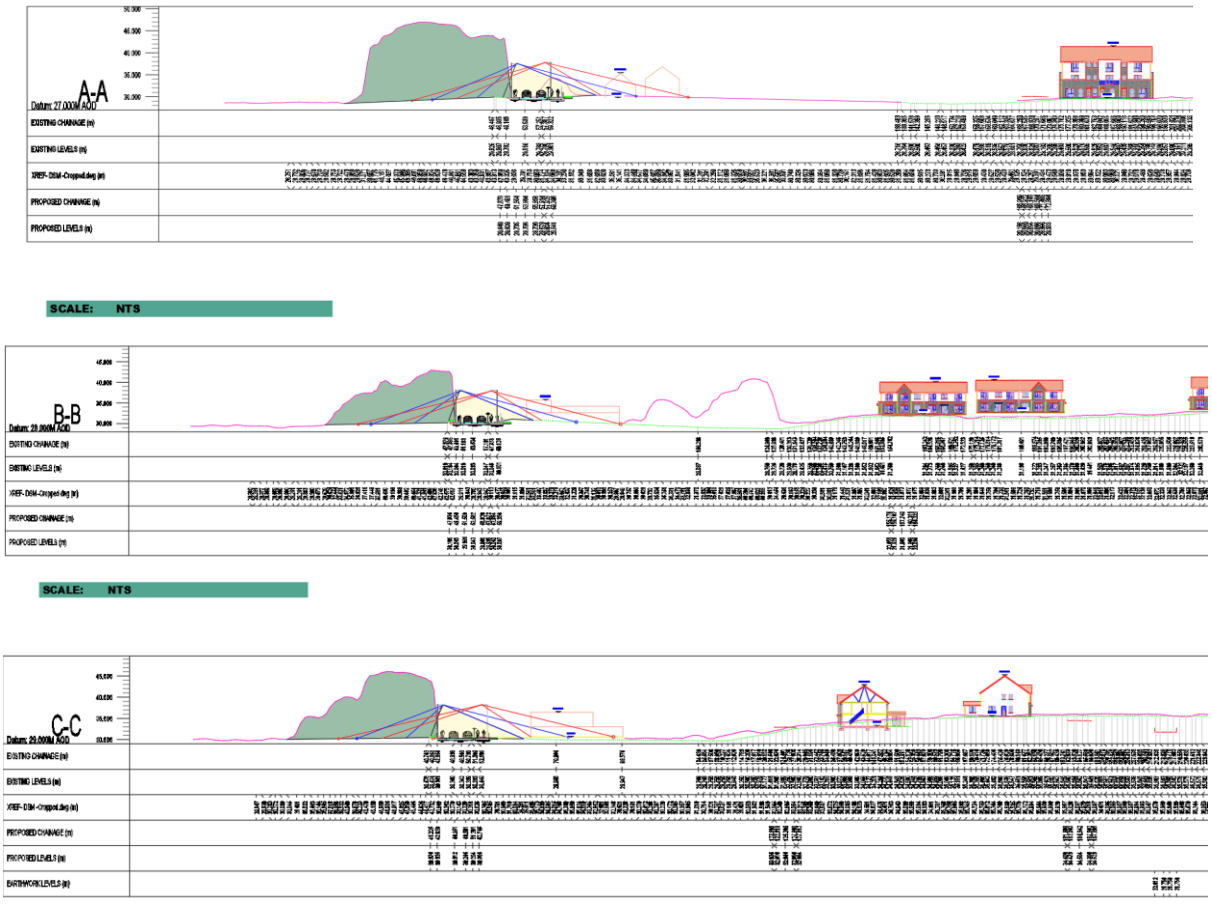

Figure 9.9: Cross Section details- light profile.

9.4 Port Road lighting:

The light spread from the propsed lighting columns/ luminaires are contained with the immediate area of Port Road as noted.

9.5 Residential Lighting:

Ground Levels proposed within the site show how light spread from the estate would be mitigated against due to the existing surrounding topography and heights of the nearby treeline. External security lighting to be set on motion-sensors and short (1min) timers.Taller buildings are located to the farthest location on site, sufficiently set back from key habitats to limit light spill. Street lights internally within the development are located so that the rear shields and optics selected stop back light thereby directing light into the task area where needed.

10 NOTES ON ECOLOGY:

All ecological constraints as raised in the Ecology Report as produced by Malachy Walsh & Partners have been accounted for by optimising the revised design to cater for the protection of wildlife (EC Habitats Directive and the Wildlife Act), ensuring the impact of artificial light is limited to acceptable levels.

Tree survey data of the area was obtained from BlueSky Ireland to determine the screening extents of the existing treeline / hedge line along Port Road. It can be seen from the figure below and the submitted drawing pack that the treescape is quite substantial, with average heights more than 14m and average depth into the park of 16m. This existing screening coupled with targeted light optics/ cowling ensures mitigation of light spread into the park to what is noted.

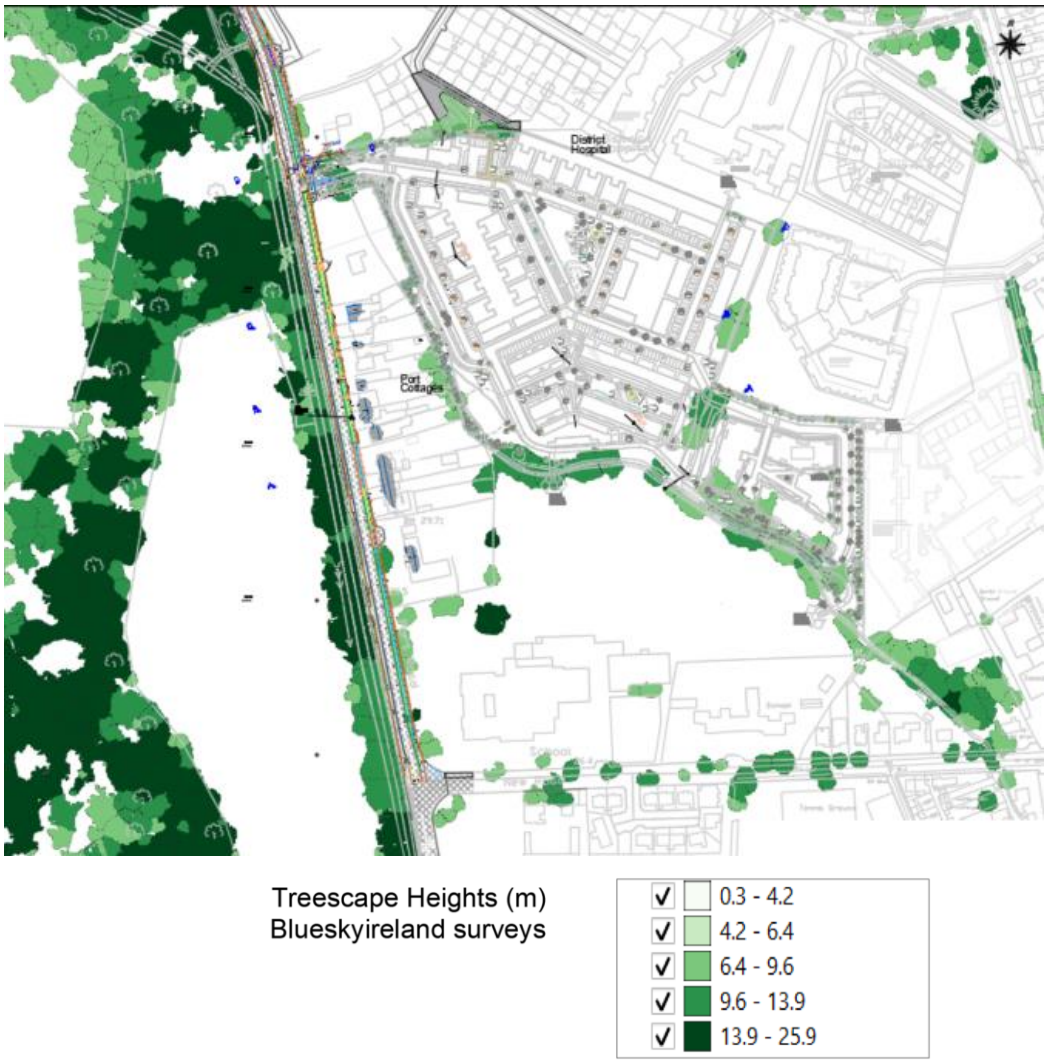

Figure 10.1: Boundary Treescape extents along Port Road.

A region of particular focus is the partial break in the treeline coverage noted below. This break in vegetation is due to an existing accessway to the park.

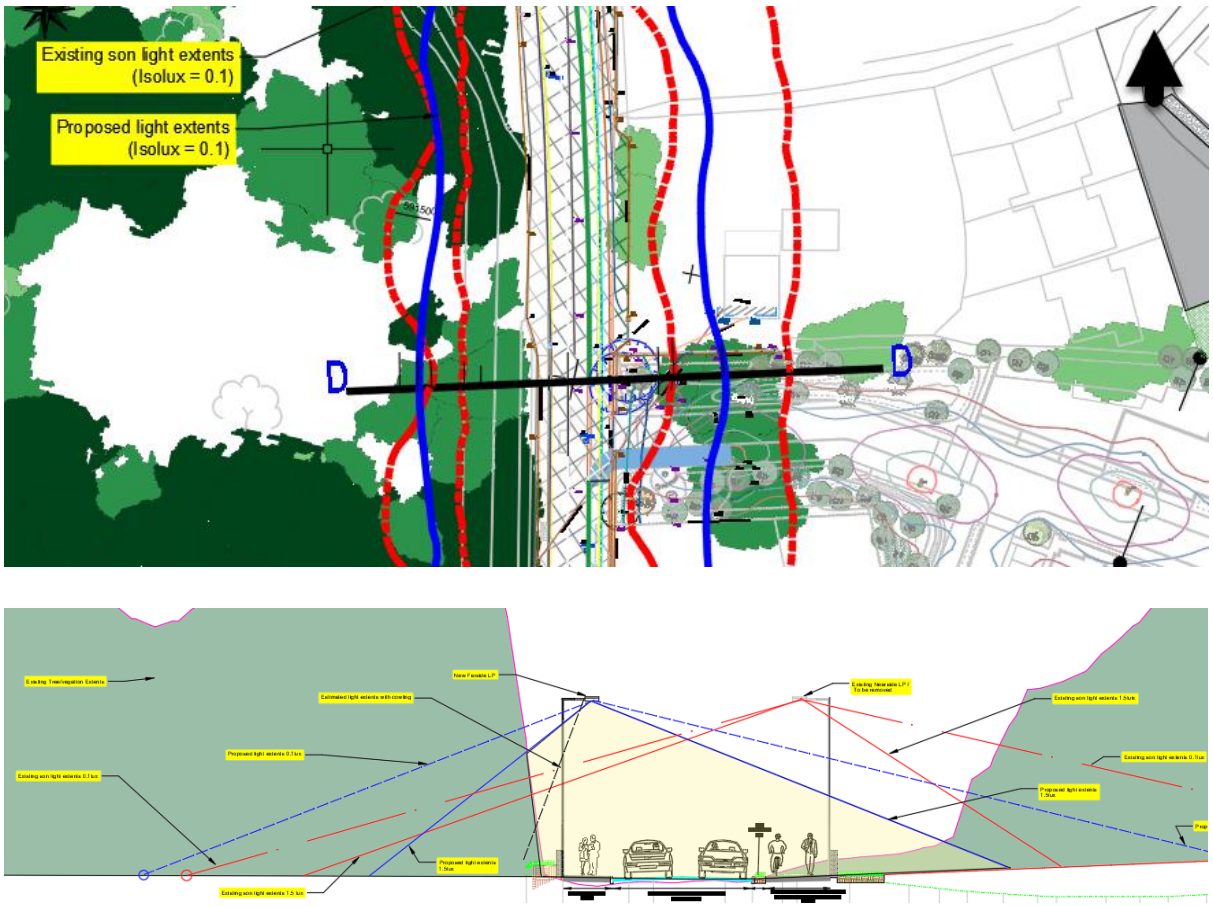

Figure 10.2: Section DD- Cross section – light spread.

Proposed mitigation at this location:

- Position columns to the farside of the road(western side)
- Cowl installation
- Zero tilt optics/ recessed optics
- Luminaire type as proposed

As can be seen in the contour lux lighting extents and Section DD, the light spread will be limted by the mitigation proposals noted above. The proposed lighting spread is lower than the estimated SON extents (existng spread indicated by the red dashed line). The mitigation measures,light optic type / position chosen will allow for a buffer to separate park habitats from the regional road lighting.

Engagement between the project ecologists and NPWS identified concerns in respect of existing public lighting on Port Road, which has been assessed. It has been confirmed that the existing 'do-nothing' scenario results in theoretical light spill into the Park (discounting landscaping). It has been demonstrated that the relocation of the lighting columns to the opposite side of the road as part of the planned upgrade works will result in a direct improvement in respect of this. In addition to this, the upgrade works allow for the use of a sensitive lantern in accordance with (reference bat guidelines) thereby reducing any potential for impact.

11 RECOMMENDATIONS FOR AVOIDANCE AND MITIGATION OF EFFECTS

As part of this exercise, it is suggested that land extending inland from the water's edge of Port Road is divided into discrete zones according to their intended land use. These zones can then be used to determine the boundaries of different surface illuminance limits to be imposed at the outset of scheme design. Each zone would accord with one of the Environmental Lighting Zones as outlined by the Institute of Lighting Professionals Guidance Note GN01:2011 where E1 is an 'intrinsically dark area' and E4 is an urban zone with high district brightness.

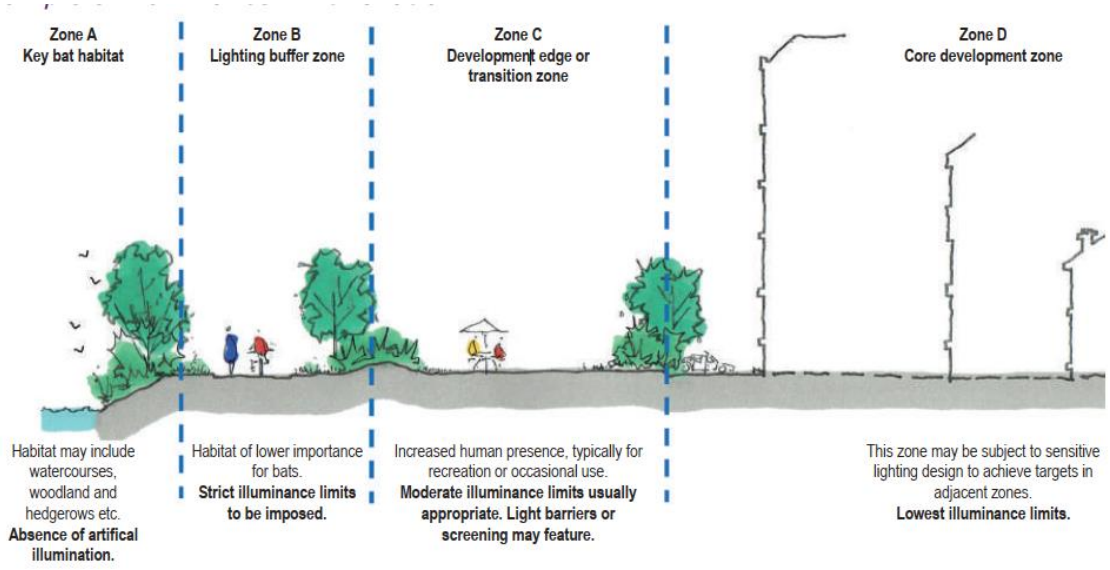

Figure 11.1: Zonation. (ILP)

The aim of assessing the Port Road area with Lighting Zones is to maintain a continuous dark corridor along the riverbank suitable for bats to use for navigation year-round and thereby preserve the value of the river as a key component of the SAC. An absence of lighting (considering the potential for sources of illumination from both banks) is the priority in Zones A and B. Applying Zonation with offset distances and different treatment options assist in reducing the impacts of proposed lighting.

Key habitats suitable for bats immediately adjacent to the site which may be impacted must also be taken into consideration.

- Lux contour plans include an output with no Maintenance Factor applied, i.e. full ('Day 1') lighting efficiency and this should be clearly stated.
- 'Warm white' LED luminaires with colour temperatures of 2700K or less is be used wherever possible due to their reduced UV spectrum component. The presence of glare acting upon Zones A and B is considered, with direct line of sight between a relatively intense light source (or group of light sources) to the flight corridors within Zones A and B is to be avoided through the luminaire type, location, angle/direction or use of blinds and cowls.

Figure 11.2: Port Road- Proposed Zonation

Light spillage is to be kept to a minimum by:

- Lighting with suitably chosen lantern heads where optics selected stop indirect lighting.
- Inclusion of lighting hoods/shields to direct light only where it is needed.
- Luminaires design to be mounted on the horizontal with zero degrees vertical tilt, reducing spill light and preventing backlighting.
- All luminaires to lack UV elements.
- The proposed lighting design has been designed using warm white spectrum (2700k) lanterns to reduce the blue light component, with peak wavelengths greater than 550nm. Lower colour temperature lanterns can be employed 2200k, subject to KCC approval. Lantern manufacturer confirmed assessment Isolux extents for 2200k, 3000k and 4000k lanterns are equivalent to one another.
- Lanterns to be flat glass type to limit the amount of upward light and spill light onto the surrounding area.
- The LEDs proposed have sharp cut offs, lower intensity, good colour rendition and dimming capability.
- Luminaires to be mounted on the horizontal, i.e., no upward tilt. Only luminaires with an upward light ratio of 0% and with good optical control be used – See ILP Guidance for the Reduction of Obtrusive Light.

Figure 11.3: Street View Port Road

Please refer to the project ecologist for further commentary on ecological aspects of the project.

11.1 Design Conformity

Conformity to these limits is demonstrated via a lux contour plan of the proposed development prepared by a qualified lighting engineer. To demonstrate that these limits have been met, including information on the contribution and glare from more distant, intense sources, the following should be noted:

- The lighting plan includes the anticipated horizontal illuminance at ground level within all areas of the site, with actual lux figures or contours displayed.
- Upwards lighting is not be permitted in zones A-C.
- Light trespass from windows to be mitigated against, with the design focused on development units location, FFL, building height, specification, orientation with respect to the national park.
-

11.2 Domestic Lighting

This report focuses on the public lighting design aspect of the scheme but notes mitigation measures to account for domestic lighting spill light.Mitigating light spill involves several steps aimed at reducing the amount of light that spills beyond the intended area of illumination. Measures to reduce the impact of light trespass from private properties, can include:

- Sensitive site configuration: Ensuring FFL and unit type are located optimally to reduce domestic spill lighting.

- Screening: screened through soft landscaping and the installation of walls, fences and bunding.
- Glazing treatments: low transmission glazing treatments are suitable option in achieving reduced illuminance targets.
- Fixture Selection: Lighting fixtures with proper shielding and optics to minimize light spillage. Full cutoff fixtures are particularly effective in directing light downward and reducing spillage.
- Optimal Placement: Fixtures installed at appropriate heights and angles to ensure that light is directed where it's needed without unnecessary spillage into neighboring properties or the night sky.
- Lighting Design: Design plan takes into account the specific requirements of the space and minimizes overlighting through the use a combination of lighting techniques such as task lighting, accent lighting, and ambient lighting to achieve desired illumination levels with minimal spill.
- Timers and Sensors: Utilize timers, motion sensors, or photocells to control when lights are on, ensuring they are only activated when necessary and reducing the duration of unnecessary light spillage.
- Dimming and Control Systems: Implement dimming and lighting control systems that allow for precise adjustment of light levels based on time of day, occupancy, or ambient light conditions.
- Vegetation and Landscaping: Landscaping features such as trees, shrubs, and hedges help shield and diffuse light, reducing the visibility of light spill from adjacent properties.
- Community Engagement: Engage with the community to raise awareness about the importance of reducing light spill and encourage participation in mitigation efforts through responsible lighting practices.

The upper storey windows of housing units and apartments will be subject to appropriate glazing treatments on west and south facing windows to restrict and reduce light trespass. Specification is to be agreed with the appointed Lesser horseshoe bat specialist, the applicant and KCC.

By implementing these mitigation measures, it's possible to significantly reduce light spill from domestic properties and its associated impacts on the environment, wildlife, and human health while still providing adequate illumination for safety and security.

12 CONCLUSION

12.1 Design Commentary

This lighting assessment outlines the lighting design criteria for the proposed development, to ensure that the lighting is fit for purpose whilst maintaining sensitivity towards the environment. This is achieved through compliance with relevant lighting industry standards and ecological guidance.

Compliance with this lighting strategy will allow a safe and sensitive level of light for the movement of pedestrians/drivers at night, whilst reducing the potential for obtrusive light and limiting this to a negligible level.

In addition to mitigating the potential effects of lighting on residential amenities, ecologically sensitive receptors have been considered using warm white light sources with lower blue light content and through minimising boundary light spill as far as reasonably practicable. The sensitive receptors as shown in the supporting ecological assessment identify the existing woodland which shall remain when the proposed development has been completed.

The proposed development is planned to be built off Port Road in the vicinity of substantial woodland and a river, both of which needed to be considered during the lighting design. Isolux lines of 0.1 lux have been shown on the lighting layouts in the Appendix. These values are all taken with a maintenance factor of 1.0 as a conservative worst-case approach, whereas in normal operation, the maintenance value would be reduced to 0.80. Using a reduced maintenance factor provides typical 'realistic' light levels which uses lumen depreciation, driver degradation and lens grime.

Final lighting specification to be agreed between the applicant/appointed contractor, bat specialist and the Kerry County Council with input from National Parks and Wildlife Service (NPWS) as required.

In summary it is our considered opinion that the proposed lighting installation will not have a significant negative impact on the immediate environment concerning lighting pollution or energy usage, that the lighting upgrade to LED on Port Road is an improvement over the current scenario and that all sensible steps, through consultation with the project ecologist and bat conservationist, have been taken within the design stage of this lighting scheme to keep the impact to the environment to a minimum.

13 REFERENCE

- BS5489-1: Code of practice for the design of road lighting- Part 1: Lighting roads and public amenity areas
- EN13201:2015 Road Lighting
- Lighting Reality software
- Google Aerial Photography
- Recommendations for site development works for housing areas. Dept. of Environment
- DMURS: Design Manual for Urban Roads and Streets
- Kerry County Council Development Plan 2022-2028
- Code of Practice for Avoiding Danger from Overhead Electricity Lines, May 2019, ESB Networks.
- Avoidance of Electrical Hazards When Working Near Overhead Electric Lines, ESB Networks
- GN08/23 Guidance Note. Bats and Artificial Lighting at Night. ILP
- GN08/18 Bats and artificial lighting in the UK. ILP.

Conditions

MHL & Associates Ltd accept no responsibility or liability for:

- The consequence of this documentation being used for any purpose or project other than that for which it was commissioned.
- The issue of this document to any third party with whom approval for use has not been agreed.
- Ahead of construction stage, lighting manufacturer/contractor to confirm lux optics before installation.

14 APPENDIX

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15 A. GLOSSARY OF TECHNICAL TERMS

ID		
1	Cowl	Physical light spill control accessory.
2	Diffuse	Term describing dispersed light distribution referring to the scattering of light.
3	Efficacy	A measure of light output against energy consumption measured in lumens per watt.
4	Glare	The sensation produced by luminances within the visual field that are sufficiently greater than the luminance to which the eyes are adapted, which causes annoyance, discomfort, or loss in visual performance and visibility.
5	Hood	Physical light spill control accessory.
6	Illuminance	Illuminance is the quantity of light, or luminous flux, falling on a unit area of a surface. It is sometimes designated by the symbol E. The unit is the lux (lx). Luminance refers to the light given off from a source while illuminance refers to the amount of light hitting a surface.
7	Lamp	Light source.
8	Light cone	The angle at which the beam falls off to 50% of peak intensity.
9	Light pollution	The spillage of light into areas where it is not required. Also known as obtrusive light.
10	Light spill	The light that falls outside the light cone.
11	Light trespass (nuisance)	Light that impacts on a surface outside of the area designed to be lit by a lighting installation. The correct legal term is nuisance.
12	Louvres	Physical light spill control accessory.
13	Lumen	The unit of light power emitted from a light source
14	Luminaire	Lighting enclosure, lantern, or unit designed to distribute light from a lamp or lamps.
15	Luminance	The physical measurement of the stimulus that produces the sensation of brightness measured by the luminous intensity reflected in a given direction. The unit is the candela per square metre (cd/m2). Luminance refers to the light given off from a source while illuminance refers to the amount of light hitting a surface.
16	Lux	This is 'illuminance' or the quantity of light (luminous flux), falling on a unit area of a surface in the environment. It is sometimes designated by the symbol E.
17	Maintenance Factor	A correction applied to a lighting calculation to allow for the build-up of dirt on a luminaire and the deprecation of the lumen output of a lamp over time. 1=100% output, 0.9=90% etc.
18	Optic	The components of a luminaire such as reflectors, refractors, and protectors which make up the directional light control section.
19	Photocell	A unit which senses light to control luminaires.
20	Reflector	A device used to reflect light in a given direction.
21	Shield	A device used to redirect the light output from a lamp when the light passes through it. It is usually made from prismatic glass or plastic.
22	Sky Glow	Physical light spill control accessory.
23	Symmetric beams	The brightening of the night sky caused by artificial lighting. Lamp mounted in the centre of the reflector.
24	Voltage	The difference in electrical potential between two points of an electrical circuit.
25	Watt (W)	The unit for measuring electrical power.
26	Upward light Output Ratio ULOR	The proportion of direct light transmitted from the luminaire above 90° in the vertical plane

16 B. SITE TOPOGRAPHICAL SURVEY

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Please refer to planning pack layout for further details.


39.90
30.90
30.60
30.30
30.00
36.30
36.60
36.90
37.20
37.50
37.80
37.20
36.90
36.60
36.30
36.00
35.70
35.40
35.10
34.80
34.50
34.20
33.90
33.60
33.30
33.00
32.70
32.40
32.10
31.80
31.50
31.20
30.90
30.60
30.30
30.00
29.70
29.40
29.10
28.80
28.50
28.20
27.90
27.60
27.30
27.00
26.70
26.40
25.80
34.80
35.10
33.90
32.40
30.30
29.70
28.50
27.60

17 C. LIGHTING DESIGN CALCULATIONS

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DATE: 23 February 2023

DESIGNER: MHL & Associates Ltd.

PROJECT No: 18137HD

PROJECT NAME: Proposed Residential Development, Port Road Killarney

Lighting Classification

Grid 2: Port Road -

Existing estimated

Outdoor Lighting Report

PREPARED BY:

Design Software from:
Lighting Reality Ltd
Park Business Centre
Wood Lane
Erdington
Birmingham
B24 9QR
United Kingdom
e-mail: sales@lightingreality.com
website: www.lightingreality.com

Layout Report

General Data

Dimensions in Metres Angles in Degrees

Calculation Grids

ID	Grid Name	X	Y	X' Length	Y' Length	X' Spacing	Y' Spacing
1	Grid 1	495720.81	591042.78	81.15	546.37	1.48	2.19

Luminaires

Luminaire D Data

Supplier	_Historic Lanterns
Type	SGS203 PC P1
Lamp(s)	SON-TPP150W
LampFlux(klm)/Colour	17.50 -/
File Name	SGS203 1xSON-TPP150W PC P1.ldt
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	382.0, 24.0, 6.0
No. in Project	12

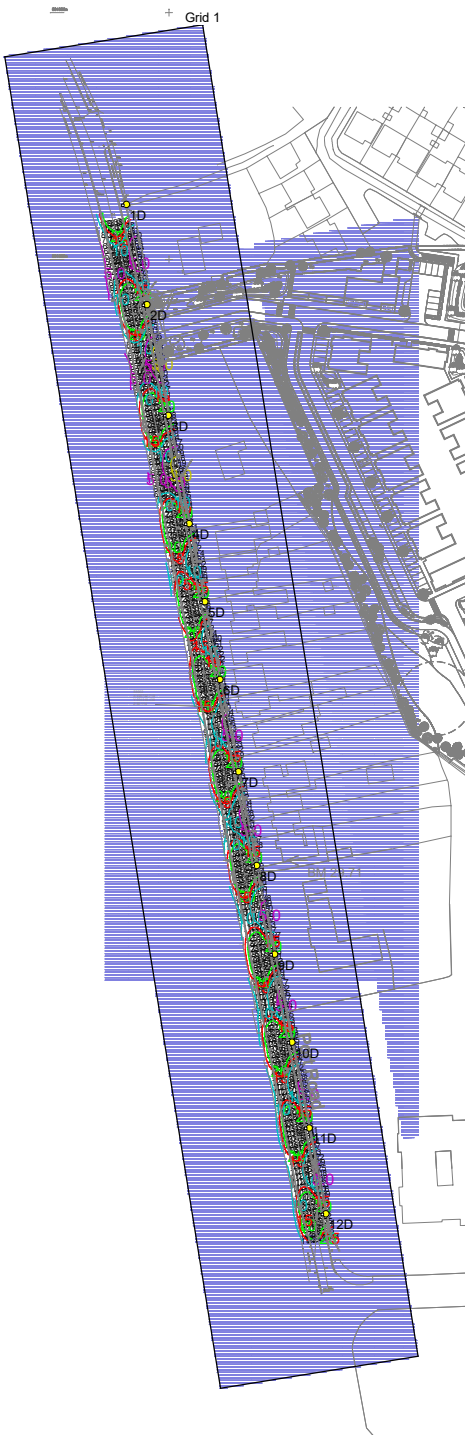
Layout

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
1	D	495682.72	591522.34	8.00	196.00	0.00	0.00	1.50			
2	D	495691.07	591481.75	8.00	191.00	0.00	0.00	1.50			
3	D	495699.74	591436.92	8.00	186.00	0.00	0.00	1.50			
4	D	495708.21	591393.12	8.00	190.00	0.00	0.00	1.50			
5	D	495714.49	591361.35	8.00	190.00	0.00	0.00	1.50			
6	D	495720.62	591329.95	8.00	190.00	0.00	0.00	1.50			
7	D	495728.07	591292.49	8.00	189.00	0.00	0.00	1.50			
8	D	495735.57	591254.56	8.00	189.00	0.00	0.00	1.50			
9	D	495742.79	591218.65	8.00	189.00	0.00	0.00	1.50			
10	D	495749.80	591182.93	8.00	191.00	0.00	0.00	1.50			
11	D	495756.80	591148.26	8.00	189.00	0.00	0.00	1.50			
12	D	495763.53	591113.51	8.00	191.00	0.00	0.00	1.50			

8514203548

Horizontal Illuminance (lux)

Grid 1



Results

Eav	18.20
Emin	2.50
Emax	52.06
Emin/Emax	0.05
Emin/Eav	0.14

8514203548

DATE:	**24 April 2024**
DESIGNER:	**MHL & Associates Ltd.**
PROJECT No:	**18137HD**
PROJECT NAME:	**Proposed Residential Development, Port Road Killarney**

Lighting Classification

Grid 2: Port Road - M4 /C4
Proposed

Installation farside of existing column locations

Outdoor Lighting Report

PREPARED BY:

MHL & Associates Ltd.
Unit 1B,
The Atrium,
Blackpool,
Cork

Layout Report

General Data

Dimensions in Metres Angles in Degrees

Calculation Grids

ID	Grid Name	X	Y	X' Length	Y' Length	X' Spacing	Y' Spacing
1	Grid 1	495720.81	591042.78	81.15	546.37	1.48	2.19

Luminaires

Luminaire A Data

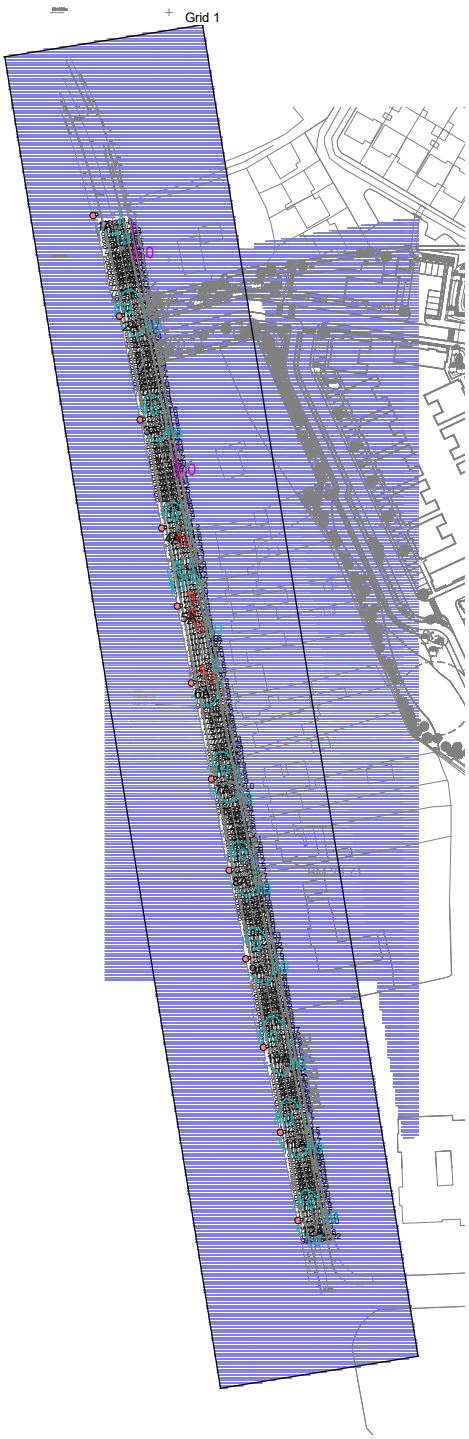
Supplier	Philips
Type	BGP292 DW50
Lamp(s)	LED-HB 5.2S 730
Lamp Flux (klm)	10.50
File Name	LumiStreet Gen2 Mini_BGP292_DW50_10500_40LED_5.2S_CLO_L90_730.ies
Maintenance Factor	0.84
Imax70,80,90(cd/klm)	609.4, 39.0, 0.0
No. in Project	12

Layout

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
1	A	495669.29	591517.82	8.00	18.00	0.00	0.00	1.50			
2	A	495679.93	591477.11	8.00	13.00	0.00	0.00	1.50			
3	A	495688.36	591435.05	8.00	9.00	0.00	0.00	1.50			
4	A	495697.02	591391.22	8.00	11.00	0.00	0.00	1.50			
5	A	495703.38	591359.58	8.00	9.00	0.00	0.00	1.50			
6	A	495709.05	591328.49	8.00	10.00	0.00	0.00	1.50			
7	A	495717.18	591289.61	8.00	11.00	0.00	0.00	1.50			
8	A	495724.36	591252.62	8.00	11.00	0.00	0.00	1.50			
9	A	495731.13	591216.69	8.00	13.00	0.00	0.00	1.50			
10	A	495738.30	591180.89	8.00	13.00	0.00	0.00	1.50			
11	A	495745.16	591146.36	8.00	13.00	0.00	0.00	1.50			
12	A	495752.20	591110.72	8.00	11.00	0.00	0.00	1.50			

Horizontal Illuminance (lux)

Grid 1



Results

Eav	10.00
Emin	5.01
Emax	15.41
Emin/Emax	0.32
Emin/Eav	0.50

9196336537

18 D. LIGHTING DESIGN LAYOUTS

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19 E. PRODUCT SPECIFICATIONS

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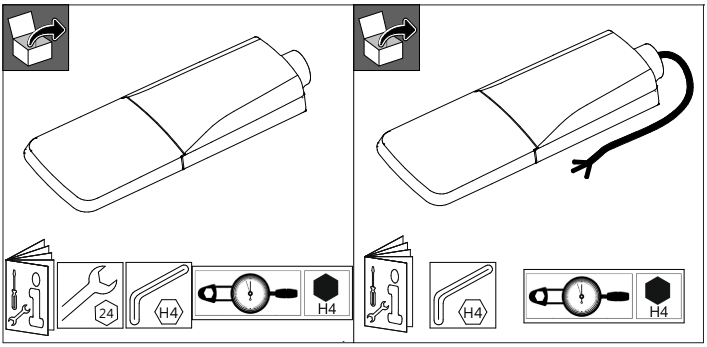
PHILIPS

UniStreet gen2
LumiStreet gen2
LumiStreet Pro gen2

BGP28X/29X/39X



R&TTE 868MHZ <5mW | outdoor | 220V 240V | 50Hz 60Hz | IP66 | IK08 IK09 | Max. 50°C Min. -40°C | 4-18m

LED COLOUR	420*	518*	610*	722*	727*	730	740	757	830*
Light Source Energy Efficiency Class	D	D	E	E	E	D	D	D	E

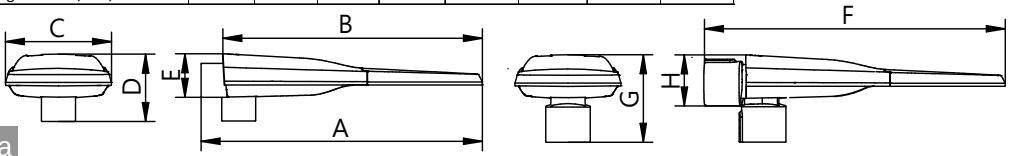
*except BGP280; BGP290; BGP390

LUMINAIRE	LEDs	LED count	DRIVER	MCB 16A	Inrush current	m²	SCx (m²)	P(W)	P(W) (-/+10%)	kg +/-5%
BGP280	LED10 ÷ LED35	16 LF	22W FP 0,7A	48	12A/270µs	0.024	0.0158	3 ÷ 41	4,5 ÷ 47	4
			22W LP/BP 0,7A		11,5A/220µs					4
BGP290 BGP390	LED40 ÷ LED60	24 LF	40W FP 1A	30	18A/280µs			16 ÷ 38	20 ÷ 42	4
			40W LP 1A	32	18,7A/195µs			16 ÷ 38	20 ÷ 42	4
			40W BP 1A	32	19A/210µs			16 ÷ 38	20 ÷ 42	4
BGP281	LED6 ÷ LED35	6 - 10 LO	22W FP 0,7A	29	15A/295µs	0.053	0.0235	4 ÷ 21	5,1 ÷ 23	4.6
BGP291	LED27 ÷ LED64	20 LO	40W FP 0,7A	26	21A/225µs			19 ÷ 39	21 ÷ 43,5	4.6
BGP391	LED49 ÷ LED94	20 LO	75W FP 1,0A	10	43A/260µs			38 ÷ 59	42 ÷ 63	4.6
BGP282	LED14 ÷ LED22	10 LO	22W FP 0,7A	29	15A/295µs	0.063	0.0251	7 ÷ 17	9,2 ÷ 19,8	5.4
BGP292	LED25 ÷ LED59	20 LO	40W FP 0,7A	26	21A/225µs			13 ÷ 40	15,6 ÷ 44,5	5.4
BGP392	LED51 ÷ LED139	30 - 40 LO	110W FP 0,7A	10	47A/250µs			32 ÷ 82	36 ÷ 87	5.4
	LED109 ÷ LED180	40 LO	110W FP 1,0A	10	47A/250µs			82÷ 112	87÷ 116	5.4
BGP283 BGP293	LED45 ÷ LED64	40 LO	75W FP 0,7A	10	46A/260µs	0.073	0.0246	23 ÷ 48	26 ÷ 52	6.8
BGP393	LED70 ÷ LED260	60 - 80 LO	150W FP 0,7A	8	53A/300µs			36 ÷ 151	40 ÷ 156	6.8
BGP284 BGP294 BGP394	LED109 ÷ LED420	120 -180 LO	150W FP 0,7A	8	53A/300µs	0.083	0.0256	68 ÷ 235	77 ÷ 245	10.5
BGP280 BGP290	LED10 ÷ LED35	16 LF	22W SR 0,7A	23	18A/320µs	0.024	0.0158	3 ÷ 41	4,5 ÷ 47	4
BGP390	LED40 ÷ LED60	24 LF	40W SR 1A	21	21A/300µs			16 ÷ 41	20 ÷ 127	4
BGP281	LED6 ÷ LED35	6 - 10 LO	22W SR 0,7A	23	18A/320µs	0.053	0.0235	4 ÷ 21	5,1 ÷ 24	4.6
BGP291	LED27 ÷ LED64	20 LO	40W SR 0,7A	21	21A/300µs			19 ÷ 39	21 ÷ 43,5	4.6
BGP391	LED49 ÷ LED94	20 LO	75W SR 1,0A	33	4A/270µs			38 ÷ 59	42 ÷ 63	4.6
BGP282	LED14 ÷ LED22	10 LO	22W SR 0,7A	23	18A/320µs	0.063	0.0251	7 ÷ 17	9,2 ÷ 19,8	5.4
BGP292	LED25 ÷ LED59	20 LO	40W SR 0,7A	21	21A/300µs			13 ÷ 40	15,6 ÷ 44,5	5.4
	LED51 ÷ LED130	30 - 40 LO	110W SR 0,7A	23	4A/270µs			32 ÷ 75	36 ÷ 80	5.4
BGP392	LED99 ÷ LED180	40 LO	110W SR 1,0A	23	4A/270µs			78÷ 112	74 ÷ 255	5.4
BGP283 BGP293	LED45 ÷ LED64	40 LO	75W SR 0,7A	10	9,6A/130µs	0.073	0.0246	23 ÷ 48	26 ÷ 52	6.8
BGP393	LED70 ÷ LED260	60 - 80 LO	150W SR 0,7A	6	63A/360µs			36 ÷ 151	41 ÷ 158	6.8
BGP284 BGP294 BGP394	LED109 ÷ LED420	120 -180 LO	150W SR 0,7A	6	65A/330µs	0.083	0.0256	68 ÷ 235	77 ÷ 245	10.5

LF - LEDGine Flex; LO - LEDGine-O; SR - System Ready driver; FP - Full Prog driver; LP - LITE Prog driver; BP - Basic Prog driver

Printed in Poland
Data subject to change without notice
Keep for future reference: www.philips.com/lighting

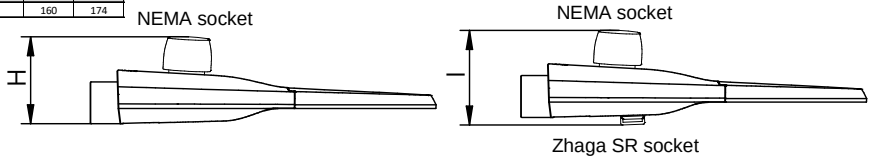
Dimensions in [mm]								
Luminaire	A	B	C	D	E	F	G	H
Nano BGP280/290/390	425	379	232	144	92	469	188	108
Micro BGP281/291/391	520	472	234	150	95	564	195	110
Mini BGP282/292/392	620	573	234	150	95	664	195	110
Medium BGP283/293/393	626	579	340	150	95	670	195	110
Large BGP284/294/394	865	819	340	150	100	910	195	120



1a

Dimensions in [mm] with 48/60 spigot		
Luminaire	H	I
Nano BGP280/290/390	155	163
Micro BGP281/291/391	155	169
Mini BGP282/292/293	155	169
Medium BGP283/293/393	156	170
Large BGP284/294/394	160	174

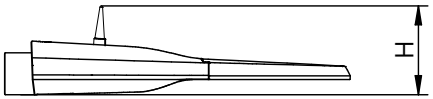
Interact OLC NEMA



1b

Dimensions in [mm] with 48/60 spigot	
Luminaire	H
Micro BGP281/291	157
Mini BGP282/292	157
Medium BGP283/293	158
Large BGP284/294	163

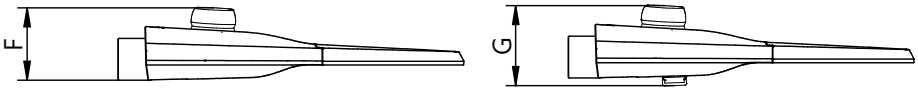
RF Antenna



1c

Dimensions in [mm] with 48/60 spigot		
Luminaire	F	G
Nano BGP280/290/390	123	137
Micro BGP281/291/391	128	142
Mini BGP282/292/293	128	142
Medium BGP283/293/393	129	143
Large BGP284/294/394	134	148

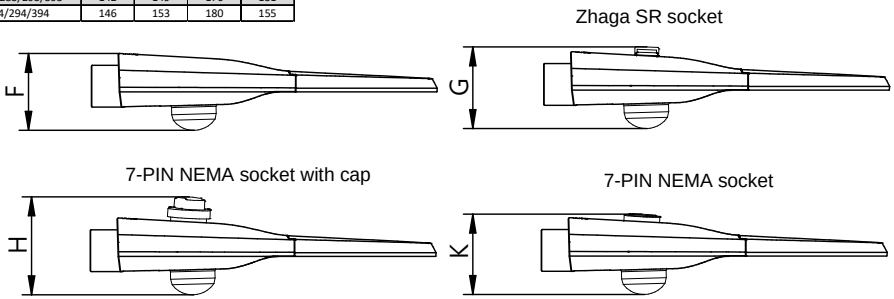
Interact OLC Zhaga SR



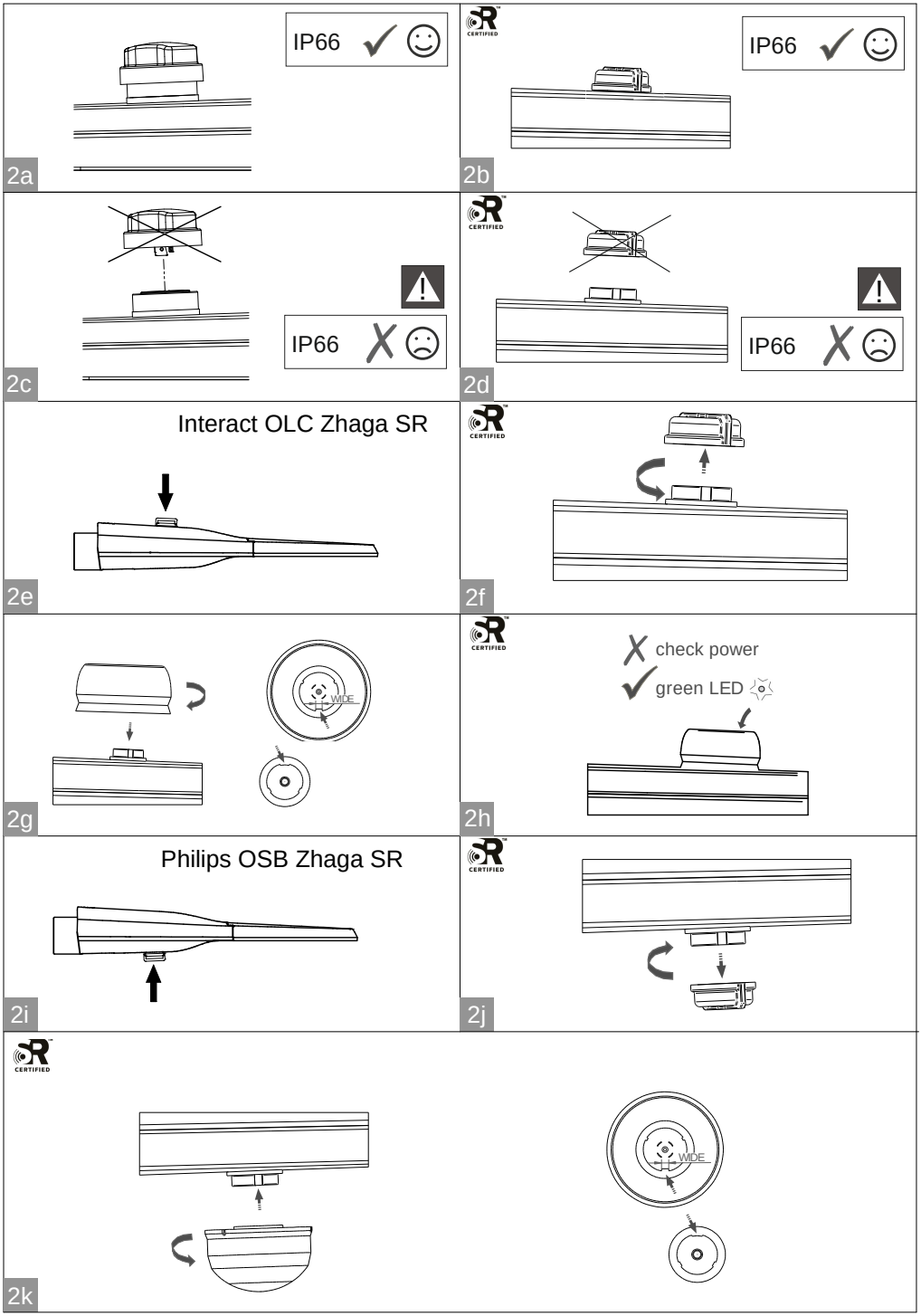
1d

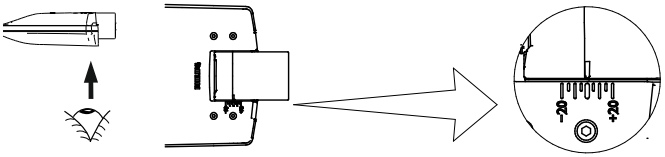
Dimensions in [mm] with 48/60 spigot				
Luminaire	F	G	H	K
Nano BGP280/290/390	140	148	175	150
Micro BGP281/291/391	141	148	175	150
Mini BGP282/292/293	141	148	175	150
Medium BGP283/293/393	142	149	176	151
Large BGP284/294/394	146	153	180	155

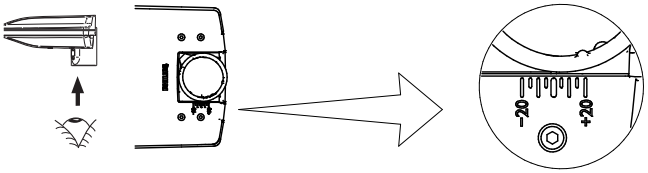
Philips OSB Zhaga SR



1e


IP66
2a
IP66
2b
IP66
2c
IP66
2d
Interact OLC Zhaga SR
2e
2f
WIDE
2g
check power
green LED
2h
Philips OSB Zhaga SR
2i
2j
WIDE
2k



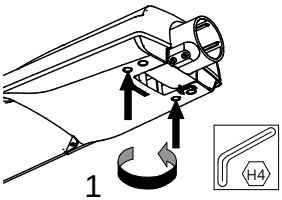


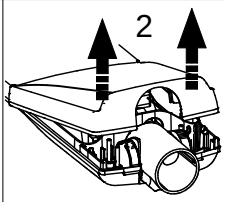
3

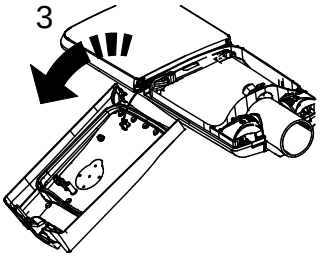
Version without cable

GB - Disconnect before servicing
FR - Mettre hors tension avant intervention
DE - Offnen nur spannungsfrei
NL - Stroom afsluiten voor onderhoud
LT - Pirms apkopes atvienojiet no elektrības
EE - Katkesta elektri toide enne valgusti hooldust/remonti
PT - Desconecte antes de fazer a manutenção
DK - Frakobl, før service
NO - Koble fra før service
FI - Irrota pistoke ennen huoltoa
CZ - Před servisem se odpojte
TR - Servis yapmadan önce bağlantıyı kesin
HR - Prije servisiranja isključite
GR - Αποσυνδέστε πριν από τη συντήρηση
BG - Изключете преди сервиз
RS - Отключите перед обслуживанием
LV - Pirms apkopes atvienojiet to
IT - Togliere tensione prima di fare manutencione
SP - Desconectar antes de manipular
SE - Bryt strömmen före lampbyte
SK - Odpojiť pred údržbou
SI - Pred servisiranjem izključite svetilko
HU - Karbantartás előtt húzza ki a csatlakozót
PL - Odłącz przed serwisowaniem
RO - Deconectați-vă înainte de întreținere

BGP28x/29x







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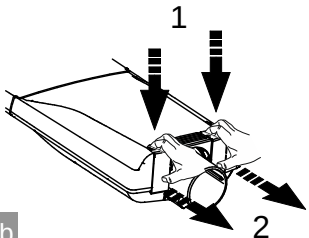
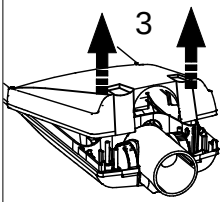
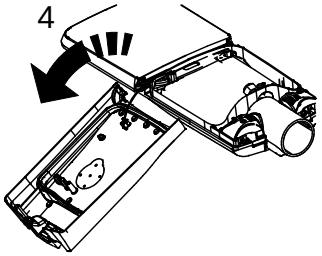
BGP39x







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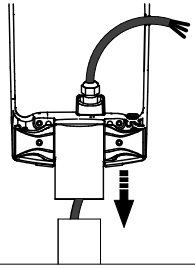
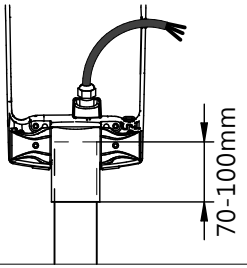


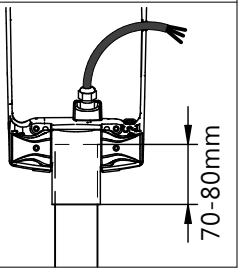
5a

Ø32/48
Ø48/60
Ø32/60



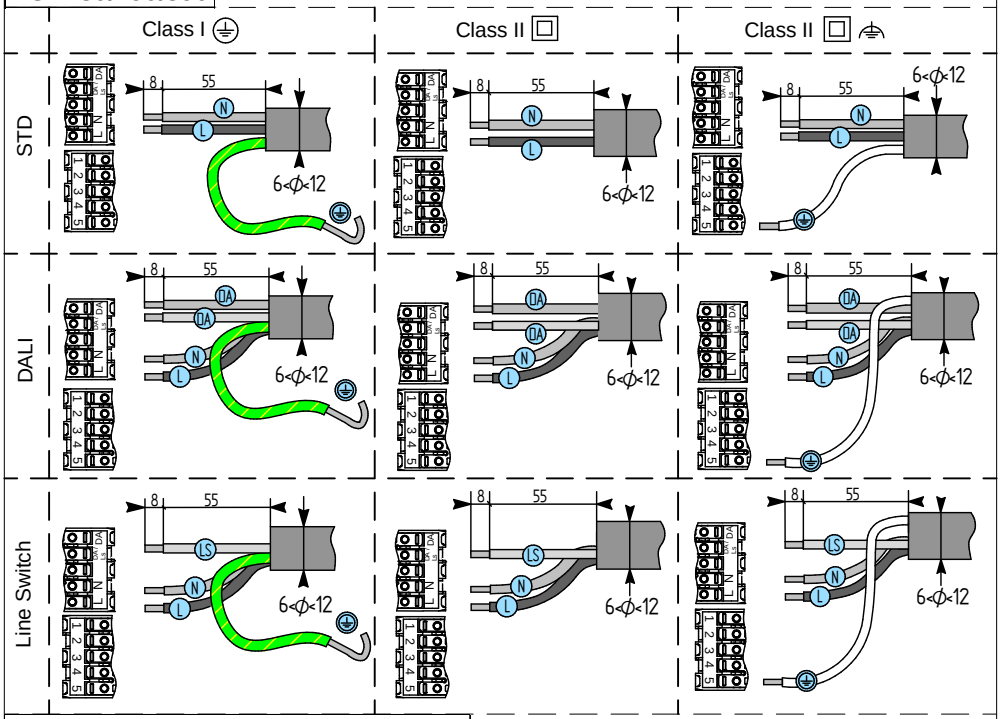
5b

Ø76
Ø32/76
Ø48/76

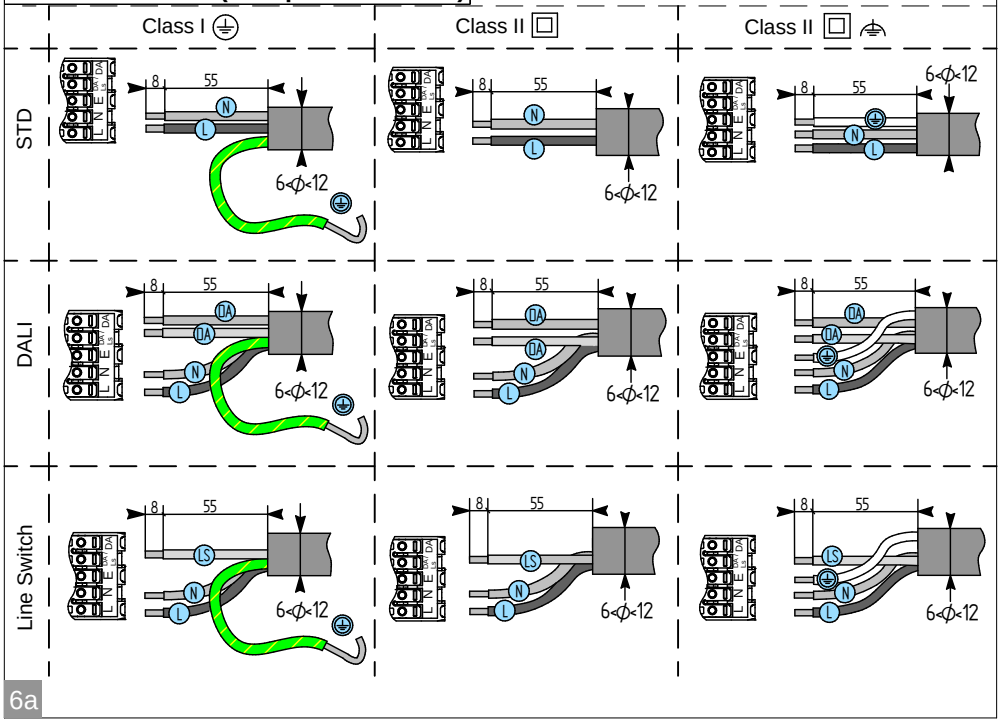


5c

BGP280/290/390

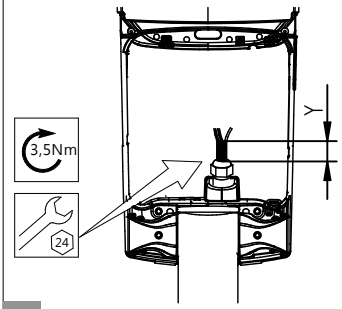


BGP28X/29X/39X (except 280/290/390)



6a

Luminaire	Y
BGP280/290/390	20 mm
BGP281/291/391	40 mm
BGP282/292/392	40 mm
BGP283/293/393	40 mm
BGP284/294/394	40 mm



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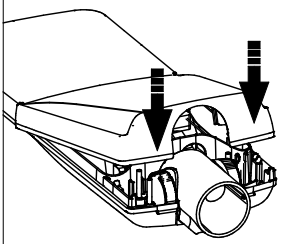

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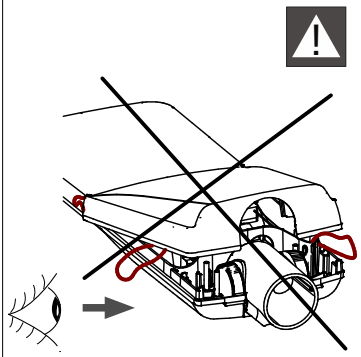
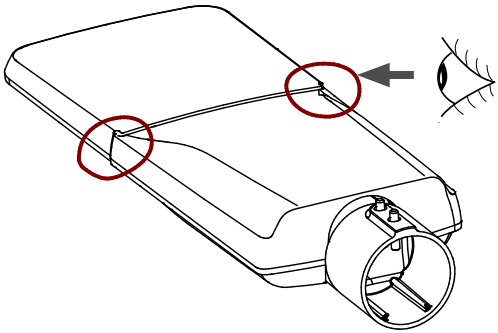


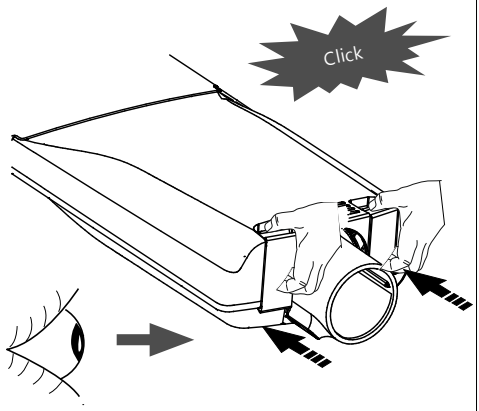
7b

BGP28x/29x/39x



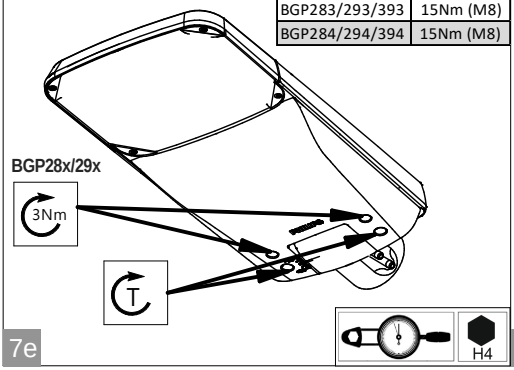
7c

BGP39x

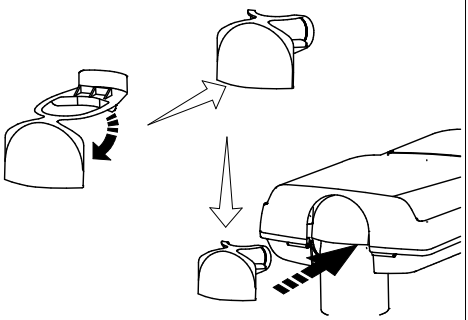


7d

Luminaire	T
BGP280/290/390	10Nm (M8)
BGP281/291/391	15Nm (M8)
BGP282/292/392	15Nm (M8)
BGP283/293/393	15Nm (M8)
BGP284/294/394	15Nm (M8)



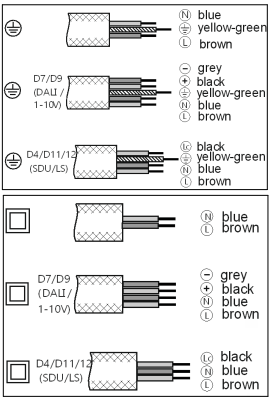
7e



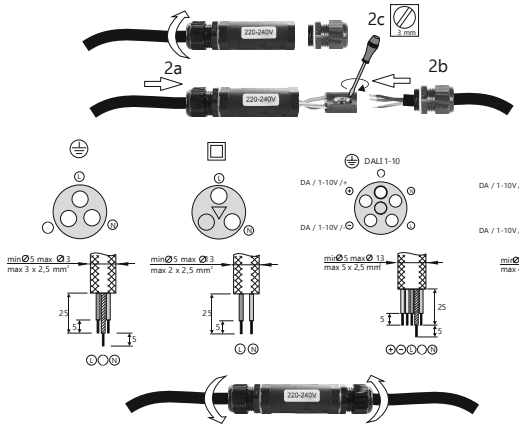
910925866469 -
A LUMISTREET POLE
CAP RAL7035 (5 PCS)

8

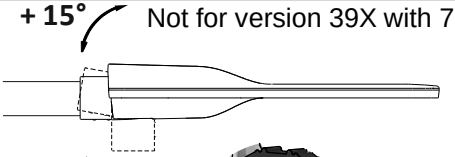
For version with cable



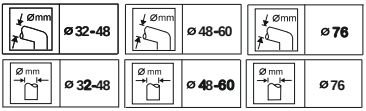
For specific cable connector



9



Not for version 39X with 76 SE



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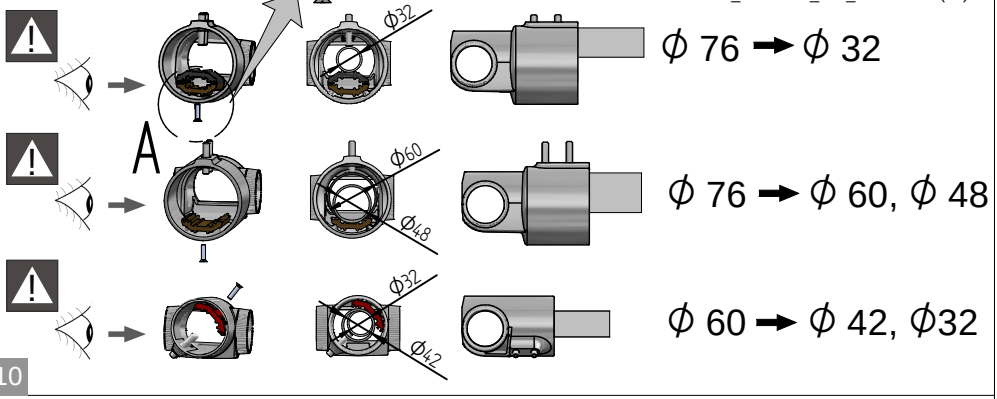
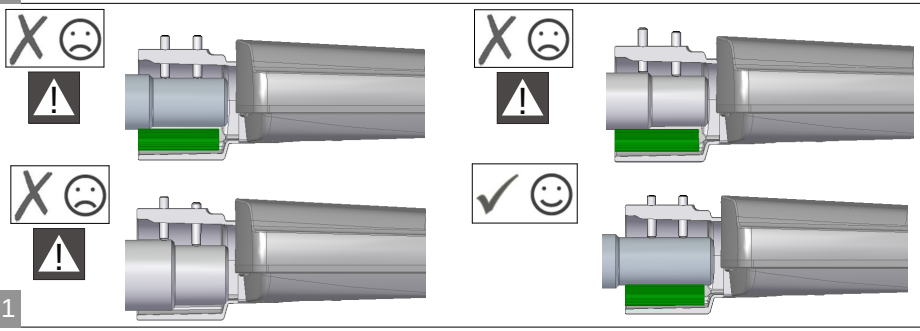
992200113063 AGP203/4/13/14 AGP307 SPIGOT ASSY 48-60
992200113064 AGP203/204AGP307AGP281/284 SPIGOT ASSY76
910925864608 ZGP203 SP INSERT_DIGI_UNI_LUMISTR 1(50pcs)
910925867694 ZGP281SP INSERT_CLEARW_UNI_LUMISTR 2(20)

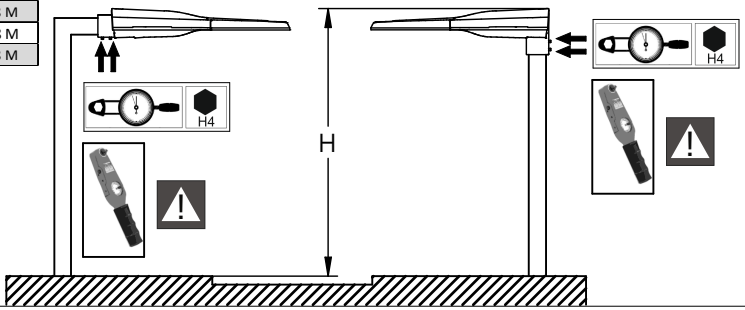


10

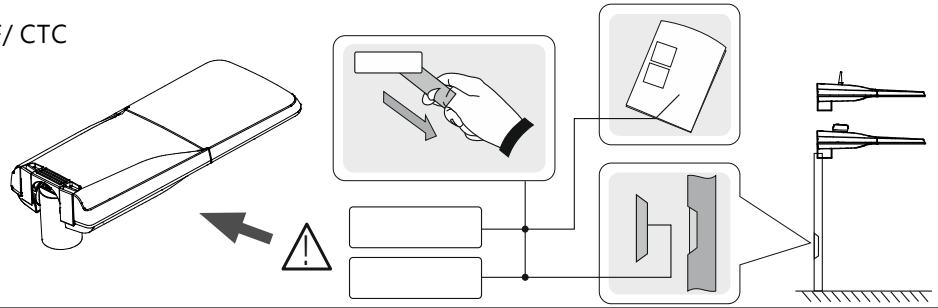


11

Luminaire	Spigot/pole	H
BGP280/290/390	10Nm (M8)	8 M
BGP281/291/391	15Nm (M8)	18 M
BGP282/292/392	15Nm (M8)	18 M
BGP283/293/393	15Nm (M8)	18 M
BGP284/294/394	15Nm (M8)	18 M

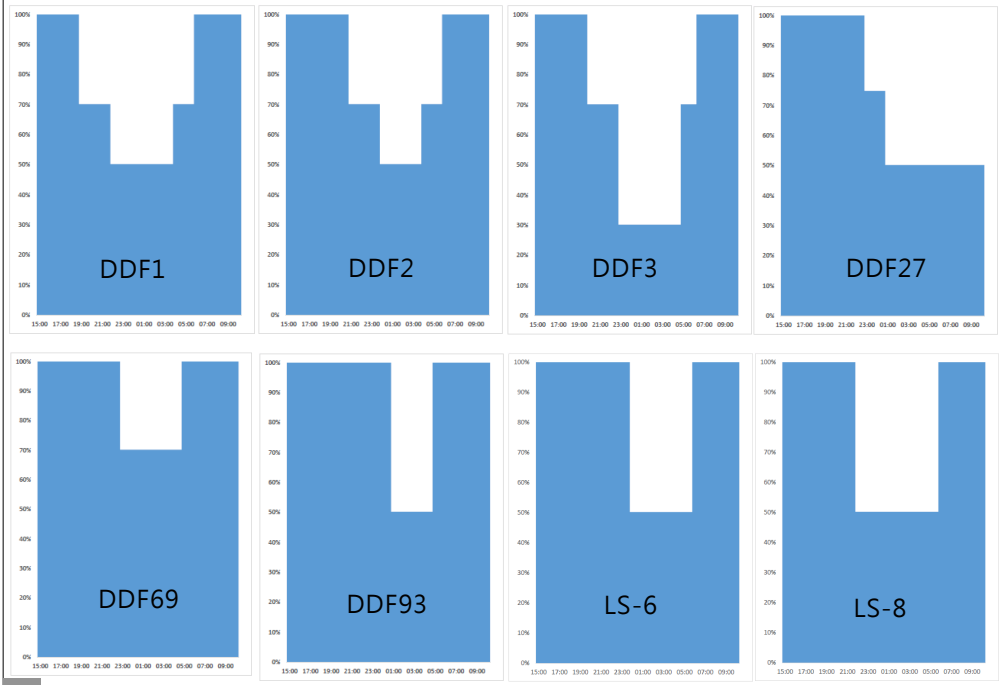


RF/ CTC



12

DDFx - DynaDimmer
LS-x - LumiStep



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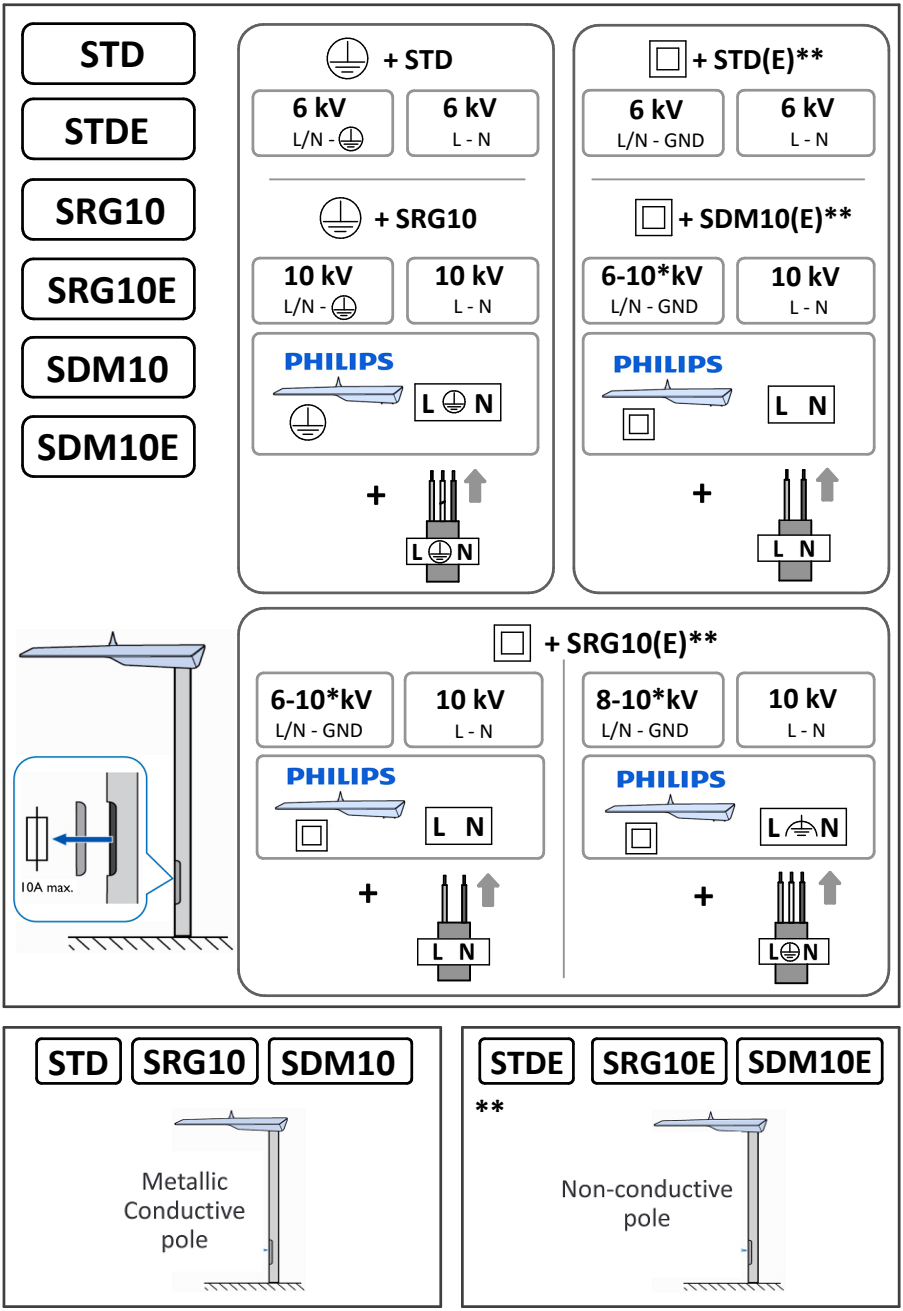

*10kV for L/N - GND non-conductive connection
**E - ESD protection - bleeder resistor

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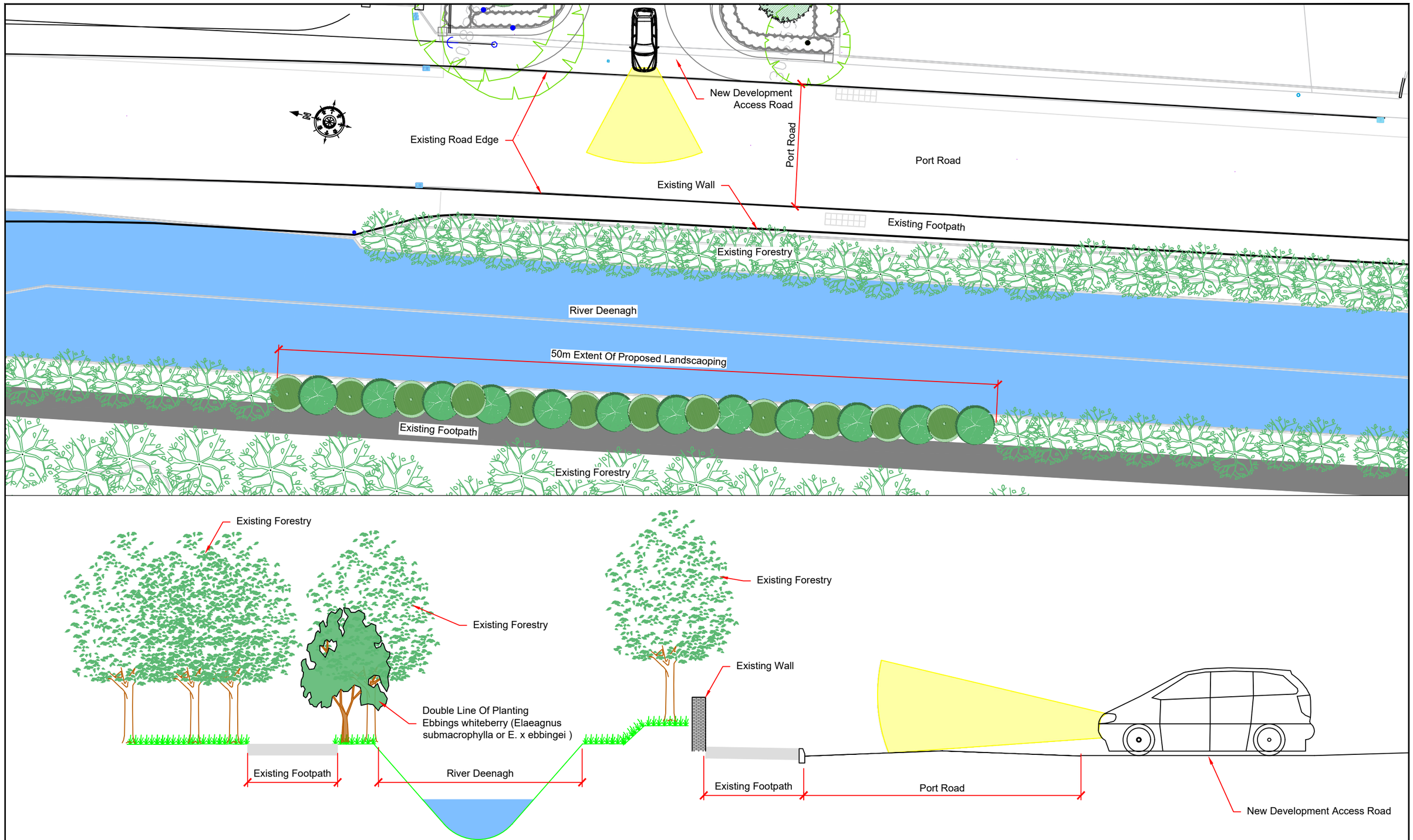
Appendix 4 – Landscape plan for reduction of vehicle glare opposite PD site entrance



REV	DATE	DESCRIPTION	BY	APP
P01	25.04.24	Issued For Information	JK	KF

CLIENT

HW Planning

MWP

ENGINEERING AND ENVIRONMENTAL CONSULTANTS

CORK | TRALEE | LONDON | LIMERICK

mwp.ie

PROJECT:

Housing Project
Port Road, Killarney

TITLE:

Proposed Landscaping Plan For The Reduction Of Vehicle Highlight Spread Into The National Park

DRAWN:	CHECKED:	APPROVED:
JK	KF	KF
PROJECT NUMBER:	DATE:	SCALE @ A3:
19554	April 2024	NTS

STATUS DESCRIPTION	STATUS:
FOR INFORMATION	S2

DRAWING NUMBER:	REV:
19554 - MWP - 00 - 00 - DR - C - 0001	P01

Appendix 5 – NPWS Letter

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

3rd May 2024.

Planning Department
Kerry County Council
Rathass
Tralee
Co Kerry

Re: Proposed Port Road LRD Housing Development, Port Road, Killarney, Co Kerry

Dear Sir/Madam,

We are aware that the above-mentioned LRD Housing project will be lodged with Kerry County Council in the coming week and accordingly we wish to confirm the following:

- MWP had engaged with NWPS in relation to the proposed project and mitigation that could be applied for Lesser Horseshoe Bat (LHB).

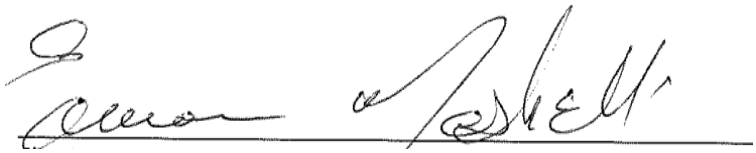
- It was agreed that a 40mt stretch of planting would be placed within the national park opposite the new housing junction on Port Road. The species of plant and extent of planting is shown on the attached drawing by MWP. The planting would be a double row of semi mature Ebbings whiteberry (Elaeagnus submacrophylla or E. x ebbingei).

- NPWS consent to those works taking place, and the applicant will fund the proposed planting scheme.

- The above to be formalised by way of a specific applied planning condition.

Sincerely,

Eamonn Meskell



Divisional Manager Killarney National Park