

Ecological Impact Assessment

Amenity Development, Glenfarne, Co. Leitrim



Document Details

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Appendix 1: Proposed Boardwalk Design Drawings

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1 Introduction

1.1 Project Background

Oran Ecology has been commissioned to undertake an Ecological Impact Assessment (EclIA) of a proposed amenity development at Glenfarne Wood, Glenfarne, Co. Leitrim. This report has been prepared on behalf of Coillte Teoranta.

1.2 Project Aims

The aims of this EclIA are;

- To establish baseline ecological data of the proposed development site;
- To determine the ecological value of the identified features;
- To assess the impact of the proposed project on ecologically valuable features (biodiversity);
- To assess the cumulative impacts of the proposed project in combination with other plans and projects;
- To apply mitigation measures to avoid, reduce, remedy or compensate impacts;
- To identify any residual impacts post mitigation.

This report was prepared in accordance with the following guidance documents:

- Guidelines for Assessment of Ecological Impacts of National Road Schemes Rev 2 (NRA, 2009)
- Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (NRA, 2009)
- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2018).
- Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (Environmental Protection Agency (EPA), 2003).
- Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002).
- Draft Revised guidelines on the information to be contained in Environmental Impact Statements (EPA, 2017).

1.3 Legislative Context

The following legislation is relevant to the proposed project;

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended); hereafter the 'Habitats Directive'
- Directive 2009/147/EEC; hereafter the 'Birds Directive'.
- Wildlife Acts 1976-2017. The Wildlife Acts are the principal pieces of legislation at national level for the protection of wildlife and for the control of activities that may harm wildlife. All bird species, 22 other animal species or groups of species and 86 species of flora are protected under these pieces of legislation. Under the Wildlife Amendment Act (2000), NHAs are legally protected from damage from the date they are formally proposed for designation.
- European Communities (EC) (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011 (as amended); hereafter the 'Birds and Habitats Regulations'. This legislation transposes the

Habitats and Birds Directives into Irish law. It also contains regulations (49 and 50) that deal with invasive species (those included within the Third Schedule).

- Flora (Protection) Order, 2015. This lists species of plant protected under Section 21 of the Wildlife Act, 1976-2017.
- Planning and Development (Amendment) Act 2010 (as amended). This legislation is the basis for Irish planning law. Development plans as required by this legislation often include objectives for the conservation of natural heritage and for the conservation of European Sites.

1.4 Statement of Competency

This report and general ecological walkover survey were carried out by ecologist James Owens (B.Sc., M.Sc.) who has relevant academic qualifications and is a competent expert in his field. James has seven years' experience as an ecologist and has prepared impact assessments for numerous projects including residential developments, flood relief schemes, commercial developments and renewable energy developments.

2 Project Description

2.1 Site Location

The proposed development site is located in Glenfarne Wood and within the townlands of Laghty, Ardmoneen, Carrickrevagh and Moneyduff, Co. Leitrim (ITM Grid Ref. X 602372 Y 839019). A site location map is provided in Figure 2.1.

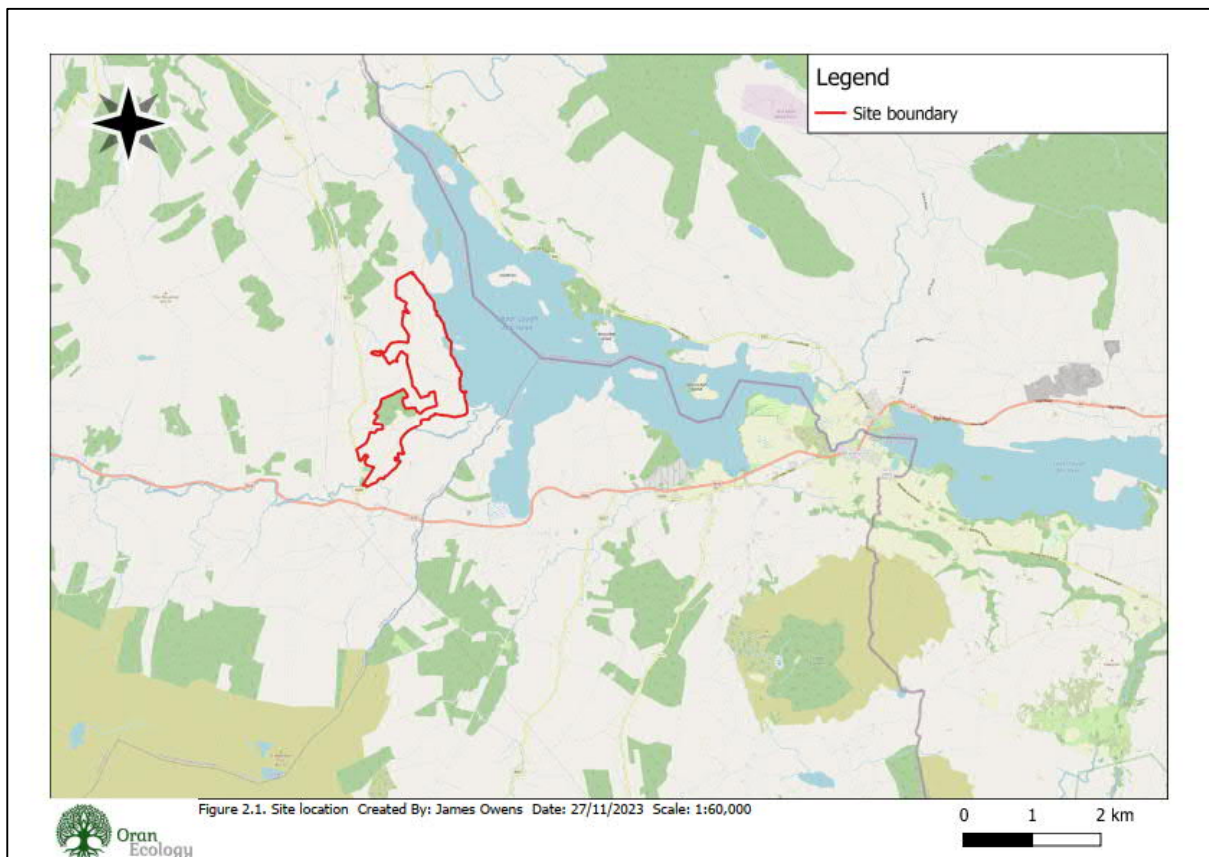


Figure 2.1 Site location

2.2 Characteristics of the Project

Coillte Teoranta intend to develop and enhance amenity facilities at Glenfarne Wood. The proposed development will consist of the following elements;

- Provision of an amenity starting point at the gate lodge entrance consisting of a carpark, service building, playground and sensory trail.
- Glenfarne River greenway
- Lake slipway and forest bathing area consisting of new carparking facilities, new trails and forest bathing areas
- Long Tom's View (Myle's Big Stone) panoramic platform
- Native tree arboretum
- Ladies View changing place
- Floating boardwalk
- Upgrades to existing forest roads and signage
- Wastewater treatment system and surface water drainage

- Lighting

The proposed development site layout is shown in Figure 2.2 and Figure 2.3. The design drawings for the proposed boardwalk are given in Appendix 1.

2.2.1 Main Elements of the Proposed Development

Glenfarne Wood Gate Lodge Entrance / Amenity Start Point

An information point will be provided for visitors arriving at Glenfarne Wood. The proposed development includes an information point and small parking area for vehicles and bicycles, located adjacent to the new trails. As is currently the case the main car parking provision will be nearly 3km into the wood close to the lake and the existing car park. This small car park and orientation point addresses a known issue that new visitors are uncertain and need clearer information. This facility will also provide a small trail head for a river side greenway link to the main trailhead.

Main Trailhead

A new trailhead centre point for the wood is proposed, which shall connect to the existing trail network as well as the proposed greenway from the Gate Lodge entrance. The proposed trailhead centre point includes a service building, vehicle and bicycle parking, sheltered event space, open playground and sensory trail.

Service Building

The changing rooms and toilet building will also include a small office and storage facility.

Congregation Area

The extended roof of the Service Building will provide a rudimentary shelter to form part of a congregation area. The congregation area is suitable for small groups of circa 30 for casual interaction, as a meeting point, a small group performance area or for an outdoor lecture. The alignment of the space with the service block and storage/shelter area provides electrical and other services and supports the use of this area as an adventure activities base. The shelter can be operated as either a rudimentary shelter for participants in bad weather or as a partially enclosed interpretive space.

Playground

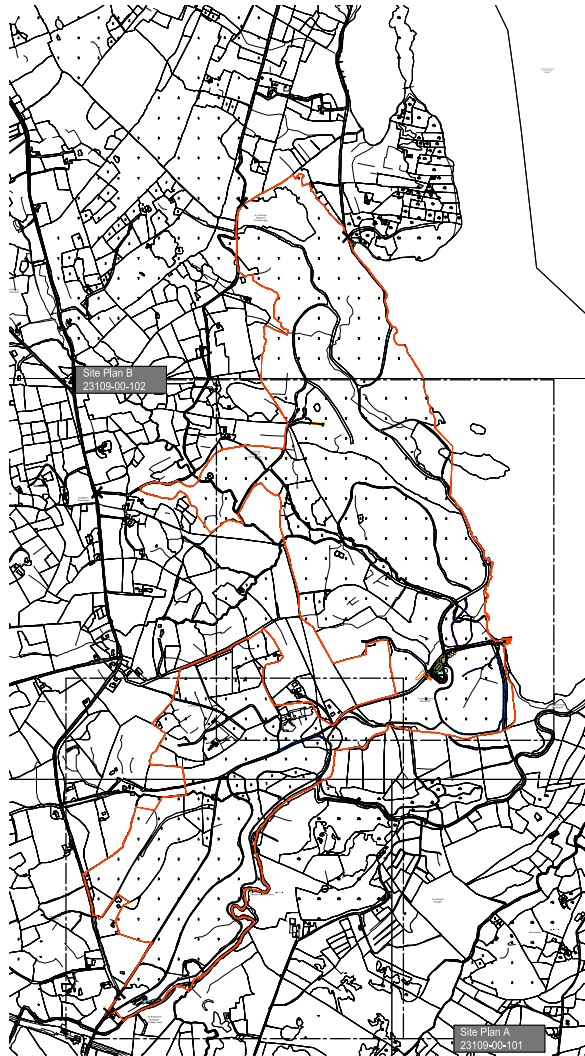
The playground features will blend between the trees, and they will be primarily manufactured from wood. A peripheral fence will be installed to prevent child wandering, appropriate parental sightlines throughout and strategically placed benches for oversight will also be included. Individual play items include a see-saw, low ropes course, slide, balance trail and a climbing frame.

Sensory Trail

The proposed sensory trail includes features, surfaces, objects and plants that stimulate the senses. This trail shall be calming with scented plants, wildlife friendly plants, a therapeutic space for people to recuperate, a learning zone with things to touch and smell and fully universal accessible garden.

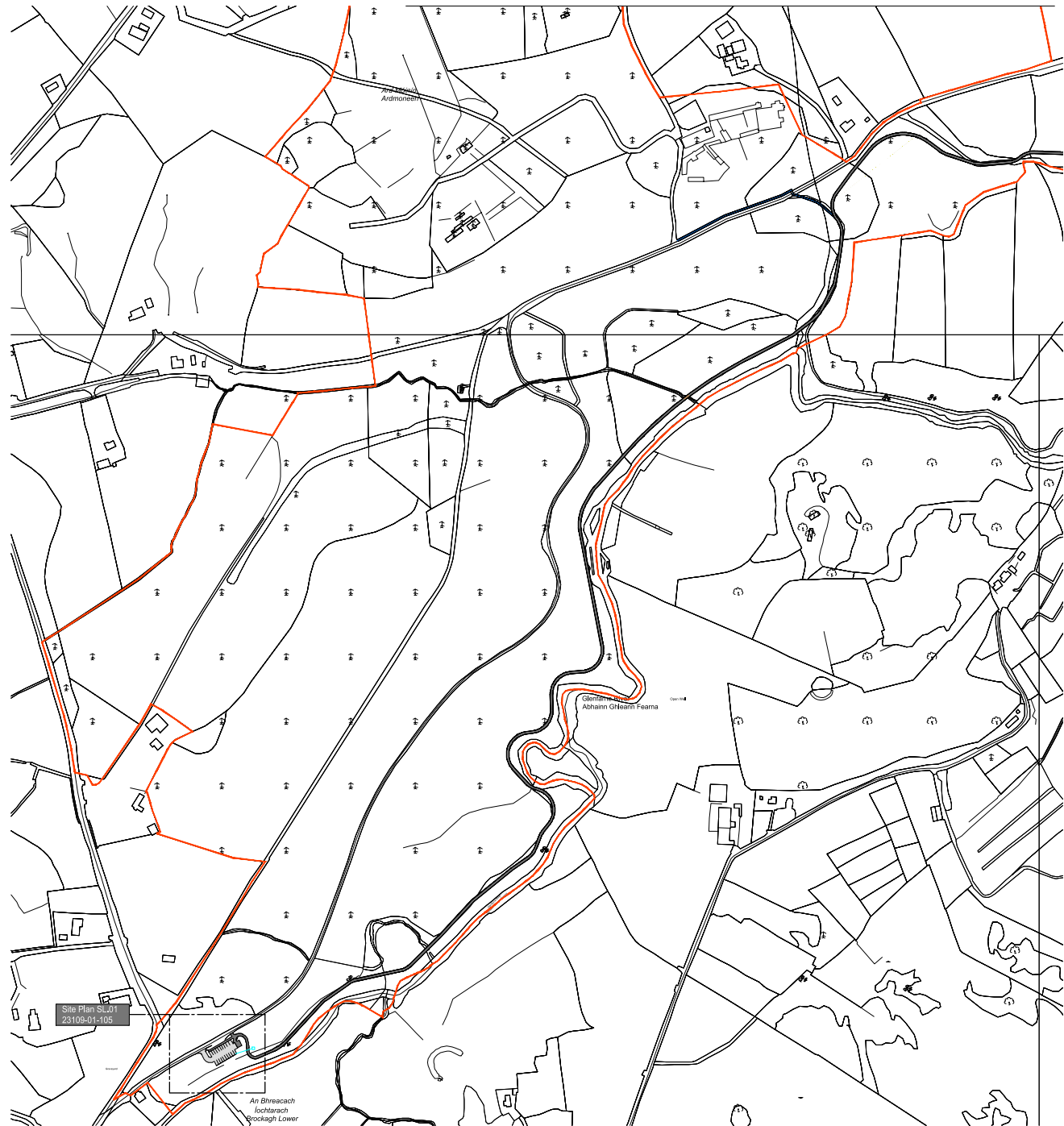
Lake Slipway & Forest Bathing

The current car park is located at the slipway but it becomes overcrowded and lead to issues in accessing the slipway. Therefore, the area is being redesigned and the main car parking provision moved approximately 200m further west from the slipway and expanded to cope with the larger visitor numbers anticipated. The proposed development includes vehicle control measures,



Proposed Overall Site Layout Plan
Scale 1:10,000

✕ Marks approx Location of Site Notice



Proposed Part Site Layout Plan A
Scale 1:2500

Proposed Site Boundary

Drawing Details

Drawing Title:

Site Layout Plan A

Ref: 23109-00-101

Scale: @ A1

Project Description:

Proposed Development,
Glenfane Woods,
Co. Leitrim.

Project Stage: Part 8 Application

Client Details:
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All dimensions to be checked on site.

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use figured dimensions only.
Refer to Engineer's drawings and specification
for all structural and services information.

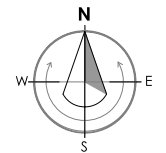
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Figure 2.2

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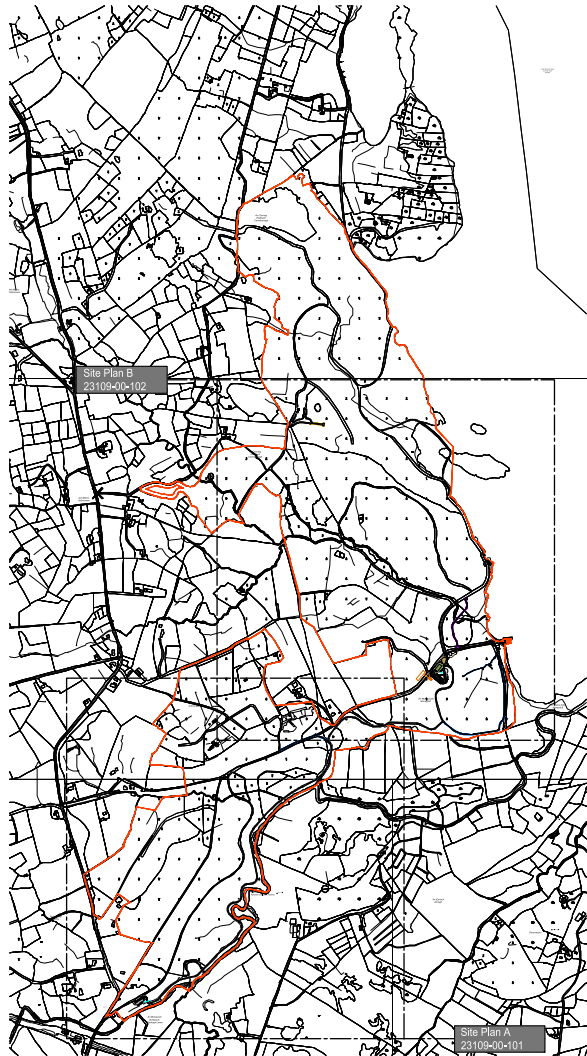


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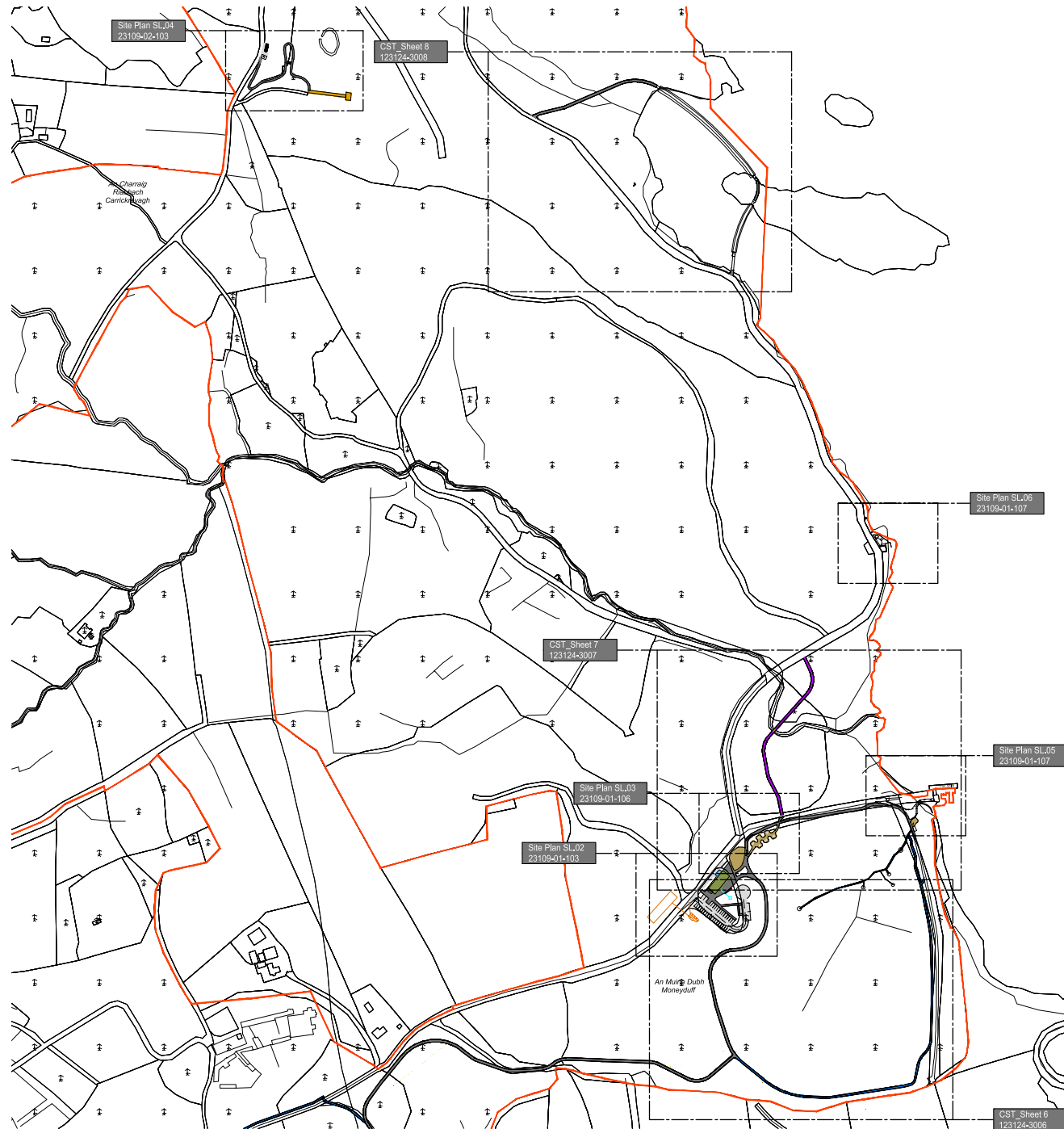
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Proposed Overall Site Layout Plan
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Proposed Part Site Layout Plan B
Scale 1:2500

Proposed Site Boundary

Drawing Details

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Site Layout Plan B

Ref: 23109-00-102

Scale: @ A1

Project Description:

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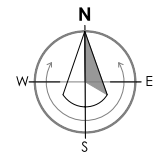
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Figure 2.3

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1	Issued for Part 8 Submission	1



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designated parking for slipway users only, a new trail access point, additional picnic benches and bike parking. The current interpretive and information points will also be enhanced. From the slip way area a new trail will provide access to four specifically designed forest bathing locations. These locations have been specifically located in the adjacent forest to provide green based contemplative spaces one of which will be universally accessible. Forest bathing will be facilitated by simple sitting structures.

Glenfarne Wood River Lake:Greenway

A key element of the the Glenfarne Wood Options Report, and the subsequent Strategic Plan was to provide a connecting spine to the various outdoor recreation resources within the wood from the Gate Lodge entrance via Glenfarne Hall ruins to the Trailhead and lake.

A greenway standard trail will start at the Gate Lodge entrance and run parallel to the Glenfarne River. As the rivers meanders away from the forest the proposed trail will link in with ruins of Glenfarne Hall before descending through a cutting to the new Trailhead.

The Glenfarne Wood project and specially the River Lake Greenway element has the potential to connect Glenfarne Wood and the Sligo Leitrim Northern Counties Railway (SLNCR) Greenway when this Greenway is completed. This connectivity between Glenfarne Wood and the SLNCR Greenway positions Glenfarne as an important hub and adds value to the Greenway experience.

Long Tom's View (Myle's Big Stone) Panoramic Platform

The existing Glenfarne Cycle and Walk Loop leads to one of the high points in the Wood known as 'Long Toms' where a glacial erratic boulder 'Myle's Big Stone' was deposited. The ground here falls steeply towards the lake and where a multi access viewing platform extending out from the Myles Big Stone will provide a panorama of the forest and the lake which cannot be otherwise seen within the forest. This wooden platform will stand above the treeline and will include two panorama information panels.

The Native Tree Arboretum

An arboretum is a specific collection and demonstration of trees designed to promote conservation and engage in public outreach and education to protect and preserve trees. The theme of the Glenfarne arboretum is a section or series of native trees which represent various parts of the County.

The proposed arboretum will be developed in an area of mature conifer plantation which has been approved under licence LM07-FL0030 by the Department of Agriculture, Food and the Marine.

Ladies View Changing Place

Ladies View is an already popular open water swimming location facilitated by stepped access into the lake. A simple sheltered changing screen is planned to provide basic facilities for users.

Floating Boardwalk

A floating boardwalk is proposed from just beyond Ladies View out to the wooded Bilberry Island and back to shore.

The proposed boardwalk will be constructed using one of two potential construction methodologies. Both construction methods are taken into consideration in this assessment. One method involves constructing the boardwalk using an anchor block and chain method and the second method involves piling to support the boardwalk. Each 15m long x 3m wide x 1m CCP pontoon unit will be delivered to

site using extendable flatbed trailers by a heavy haulage contractor. In the case of the block anchor method, the concrete blocks will be delivered to the site at the same time as the pontoons. The pontoon units will be lifted into the water using a mobile crane. The size of the crane is yet to be confirmed. The certificates for the crane and lifting equipment must be made available before entering the site.

Further details of the proposed construction methods are given below.

Anchor block and chain method

Assembly of CCP walkway

- Once all the CCP units have been unloaded and moved to the install area, the connection of the units will take place.
- The location for the positioning of the anchor blocks will be marked out with a total station or GPS and the locations marked with temporary floating marker buoys.
- The first CCP unit nearest to the bank will be towed into place using the workboat and positioned to its install location and temporarily secured. The mooring chain should then be connected to the anchor block that is currently on the workboat which is then moved to corresponding install position as set out in the mooring design. Once over the associated location the block should be slowly lowered down to the lake bed. This is to be repeated for each of the chain and anchor positions.
- The 2nd CCP unit will then be positioned into place with the workboat and joined to the first at the connection points with the skewed ends through the connector boxes with end-to-end connectors fed through and loosely tightened. Once in place then the anchor blocks are to be added like on the first unit. This is to be repeated for each of the remaining CCP units until the walkway is in place.
- Once all CCP units are in place then the end-to-end connectors can be tightened up to ensure that the walkway is secure and matches the layout and also make any necessary adjustments to the mooring chains to ensure that they are acting as required and keeping the floating walkway in position.
- The same process is repeated for the 2nd walkway.

Installation of access gangways

- The hinged gangways shall be brought into position by placing on the Corresponding CCP units prior to being towed into final install position and once all is in place then the hinged end can be lifted into position onto the concrete shore blocks (by others) with the hinge pins inserted and ensure that the gangway rollers are centred on the pontoons and rolling freely with the flap falling uniformly.

Installation of handrails on walkway

- The actual design of the handrails is yet to be determined so fixing methods may vary based on design chosen.
- Once the main floating walkway is in place and connections tightened then the railings can be fitted. The railing posts are to be fitted down to the concrete deck at regular intervals as per the design with the fixing anchors securing them in place, this is repeated for all posts on both sides of the walkway.

- Once all posts are in place then the rails between shall be fitted to the preinstalled fixing holes / brackets along the length of the walkway at both sides, all connections to be checked and tightened as needed to give uniformity across the walkways.

Piling method

Installation of piles

Installation of new steel piles, circa 4m dimensions at circa 10 meter intervals, pile structures into sediments to depths of approximately 3 m (min 50% of pile length above bed level). Piling will be carried out by a side grip rig with side grip hammer attachment working from a self-propelled barge.

Piles will be delivered to site on extendable trailers and offloaded by the side grip rig from the lake area adjacent to the existing roadway. The side rig will self load piles which will be installed at the locations as directed by the client to level or refusal. The barge will be positioned to accommodate the rigs reach to install the pile, over the front or side of the barge. If appropriate floating silt barriers will be employed.

Once the pile is in position and the verticality checked in both planes, the operator will be instructed to commence driving the pile. He will engage the vibro hammer and exert a downward force from the main boom/dipper arm to drive the pile. After the initial first section of the pile has been driven, the position and verticality of the pile will be checked. If the pile is not within the contract requirements, the pile will be extracted and the process commenced again. Once the pile is in a satisfactory position, the hammer will stop driving and the jaws released. The hammer will then be repositioned further up the pile and reclamped to drive the next section of pile.

Where localised obstructions are encountered, where possible installation will continue. This will be notified to the client and instruction will be sought with regards to the next action to be taken.

The barge is self-propelled however a workboat will be on site to assist with manoeuvring. The workboat will be used to transfer personnel from shore to the pontoon and used to assist manoeuvring the pontoon by tying up alongside or to the stern to move the pontoon as a composite unit.

Assembly of CCP walkway

Once all the CCP units have been unloaded and moved to the install area, the connection of the units will take place.

The first CCP unit nearest to the bank will be towed into place using the workboat and positioned to line up the pile (installed by others) with the pile guide bracket connected around the pile and to the side of the CCP unit in the provided fixing position.

The 2nd CCP unit will then be positioned into place with the workboat and joined to the first at the connection points with the skewed ends through the connector boxes with end-to-end connectors fed through and loosely tightened and the pile bracket added. This is to be repeated for each of the remaining CCP units until the walkway is in place.

Once all CCP units are in place then the end-to-end connectors can be tightened up to ensure that the walkway is secure and matches the layout and also make any necessary adjustments to the pile brackets to ensure that they are moving smoothly.

The same process is repeated for the 2nd walkway.

Installation of access gangways and fixed platform

- The fixed platform shall be brought to install site using the workboat and lifted into position lining up the frame with the installed support piles and lowered into position. The platform will then be secured using the brackets and fixings.
- With the fixed platform in position then the fixed gangway can be positioned into place, this will either be carried out by a small shoreside mobile crane or from the workboat. The fixed gangway is to be lined up with the shore block, cast by others, and with the fixed platform on the piles. It is to be lowered into position and connected to the brackets and the fixings tightened.
- The hinged gangways shall be brought into position by placing on the Corresponding CCP units prior to being towed into final install position and once all is in place then the hinged end can be lifted into position onto the fixed platform or the concrete shore block (by others) with the hinge pins inserted and ensure that the gangway rollers are centred on the pontoons and rolling freely with the flap falling uniformly.
- Once the gangways are in place the railings should be added to the fixed raised platform to provide protection.

Installation of handrails on walkway

Handrail installation will follow the same process as that described above for the block and anchor construction.

2.2.2 Trail Construction

The proposed Glenfarne River-Lake Greenway will be 3m wide and consist of a bound surface. Two spurs off the greenway, one to the ruins of Glenfarne Hall and the other, an alternative route to the slip way, will both be 2m wide and unbound. The proposed trail in the arboretum will be 2m wide and unbound. The trail in the Forest Bathing will be 1m wide and unbound for the most part, access to the first sit spot will be wider at 2m to facilitate universal access.

Where crossing of a stream or larger drains is required a clearspan wooden bridge will be used. Small land drains will be culverted.

2.2.3 Associated Site Works and Services

It is proposed to install a wastewater treatment system for the main service building. The wastewater treatment system will consist of an O'Reilly Oakstown EN Treatment system (50PE System) or similar certified system, Ecoflo Coco Filter and gravel pressurised bed which will be installed in accordance with BS 6297 (2007) Code of Practice for the design and installation of drainage fields for use in wastewater treatment and the EPA's Wastewater treatment manual - Treatment systems for small communities, business, leisure centres and hotels (1999). Figure 2.4 shows the layout of the proposed wastewater treatment system.

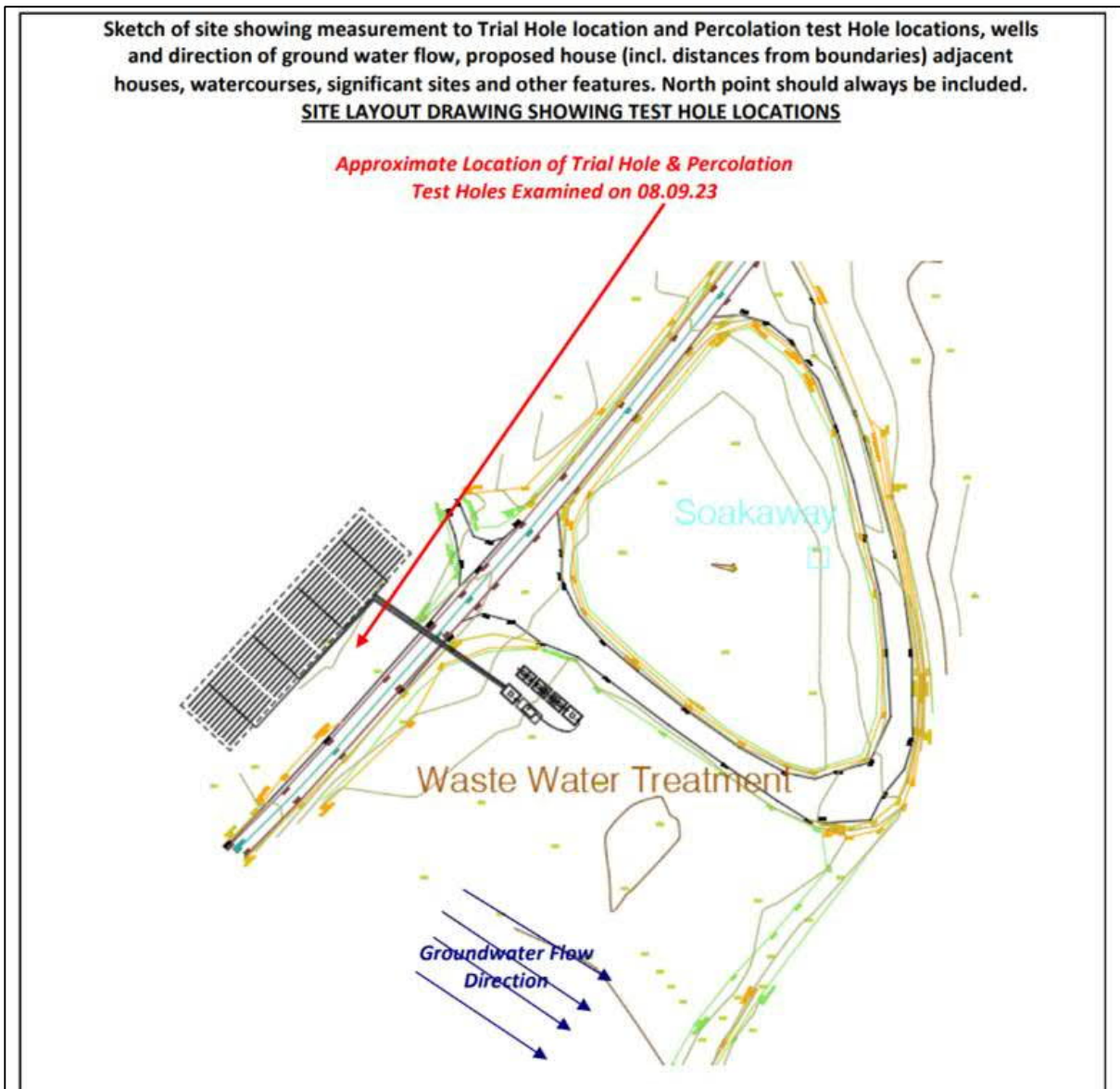


Figure 2.4 Proposed wastewater treatment system layout

Proposed new carparks will be constructed from Tarmacadum. The surface water run-off will be collected and passed through petrol interceptors. The water will be discharged to the ground via appropriately constructed soakaways.

New public lighting is proposed around the service building and adjacent carpark only for the safe use of the building after daylight hours. No further public lighting proposed in this development. The following will apply to lighting at the site;

- Column lights are kept under 8m, 6m high proposed.
- Directional downlights do not exceed the 70o angle above the vertical plane. Lighting of treelines, hedgerows and scrub to be avoided/minimised.
- Lights with a high UV component, such as metal halide, mercury vapour and tungsten halogen.
- 3000K LED lanterns will be employed to meet the requirement of Public Lighting design standards.

Minor works are proposed to the existing forestry roads, primarily limited too, the construction of vehicle passing points, erection of directional signage, construction of a vehicle height restriction barrier at the lake slipway and general road line markings to direct vehicles.

3 Methodology

3.1 Forming an Ecological Baseline

To assess the impacts of any project and associated activities an understanding of the ecological baseline conditions prior to and at the time of the project proceeding is required. Ecological Baseline conditions are those existing in the absence of proposed activities (CIEEM 2018).

The following sections outline the methods utilised to establish the baseline ecological condition of the proposed development site.

3.1.1 Desk Study

A desk study was undertaken to collect any available information on the ecology of the area where the proposed development site is located. The following sources were consulted;

- Review of aerial photography of the study using Geohive (map.geohive.ie)
- Review of online web-mappers: National Parks and Wildlife Service (NPWS), Environmental Protection Agency (EPA)
- Review of NPWS GIS datasets
- Review of NPWS Site Synopses
- A search of the NBDC database for protected flora and fauna, species of conservation concern and Third Schedule invasive species was undertaken

3.1.2 Field Survey

Multi-disciplinary walkover surveys were undertaken by James Owens (BSc, MSc) on the 14th of December 2022 and the 29th of May 2023 in accordance with *Ecological Surveying Techniques for Protected Flora & Fauna during the Planning of National Road Schemes* (NRA, 2009) to provide baseline information on the ecology of the site. All habitats within the site were categorised in accordance with *A Guide to Habitats in Ireland* (Fossitt, 2000) and habitat mapping was done in accordance with *Best Practice Guidance for Habitat Survey and Mapping* (Smith et al., 2011). All habitats were readily identifiable at the time of the surveys and the 2023 survey was undertaken within the optimal survey period for habitat surveys, April-September.

Dedicated surveys for otter and badger were also undertaken at the site. Incidental records of bird and other faunal species were also recorded, if encountered.

The potential for suitable bat roosting, foraging and commuting habitats to occur were assessed based on the 'Negligible, Low, Moderate and High' classification described in Table 4.1 of *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins (ed.), 2016).

3.1.3 Aquatic Surveys

Triturus Environmental Ltd. were commissioned to undertake a baseline aquatic assessment of the area of Lough MacNean Upper where the floating boardwalk is proposed. The site visit was conducted on Lough MacNean Upper on the 6th July 2023. The lake was broadly characterised in terms of its physical habitats, fisheries habitat, macro-invertebrate, macrophyte (aquatic plant) and aquatic bryophyte communities. Targeted surveys of macro-invertebrates, crayfish, physiochemical water quality and macrophytes and aquatic bryophytes were undertaken. The full report on the findings of the survey is available in Appendix 2.

3.2 Assessment Methodology

The criteria used to assess the ecological value and geographical significance of the site for habitats and species follows Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009) and is consistent with Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018). The guidelines provide a basis for determination of whether any particular site is of importance on the following scales:

- International
- National
- County
- Local Importance (Higher Value)
- Local Importance (Lower Value)

Locally Important (lower value) receptors contain habitats and species that are widespread and of low ecological significance and only important in the local area. Internationally Important receptors are either designated for conservation as part of the Natura 2000 Network (SAC or SPA) or provide the best examples of habitats or internationally important populations of protected flora and fauna.

3.2.1 Impact Assessment Criteria

The impact assessment methodology follows guidelines set out in the EPA, 2017 draft document 'Guidelines on the information to be contained in environmental impact assessment reports', specifically Table 3.3 of the guidelines, and is described below. Paragraphs outline the methodology used to assess the effects of the project on the receiving environment. When characterising the effects, the following parameters are used where appropriate:

- Magnitude relates to the quantum of effect, for example the number of individuals affected by an activity;
- Extent should also be predicted in a quantified manner and relates to the area over which the effect occurs;
- Duration is intended to refer to the time during which the effect is predicted to continue, until recovery or re-instatement;
- Reversibility should be addressed by identifying whether an effect is ecologically reversible either spontaneously or through specific action; and,
- Timing/frequency of effects in relation to important seasonal and/or life-cycle constraints should be evaluated. Similarly, the frequency with which activities (and associated effects) would take place can be an important determinant of the effect on receptors.

Any impact assessment should take into consideration of construction and operational phases; direct, indirect and synergistic effects; and, those that are temporary, reversible and irreversible. Effect magnitude, type and significance criteria for assessment are given in Table 3.1 and 3.2. When quantifying duration, the following terms are defined (EPA, 2017):

- Momentary effects - Effects lasting from seconds to minutes
- Brief effects - Effects lasting less than a day
- Temporary effects - Effects lasting less than a year
- Short-term – 1 to 7 years
- Medium term – 7 to 15 years

- Long term – 15 to 60 years
- Permanent – over 60 years
- Reversible effects - Effects that can be undone, for example through remediation or restoration.

Table 3.1 Criteria for assessing significance of effect (EPA, 2017)

Effect Magnitude	Definition
No change	No discernible change in the ecology of the affected feature.
Imperceptible effect	An effect capable of measurement but without noticeable consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight effect	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate effect	An effect that alters the character of the environment that is consistent with existing and emerging trends.
Significant effect	An effect which, by its character, its 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 effect	An effect which obliterates sensitive characteristics.

Table 3.2 Criteria for assessing effect quality (EPA, 2017)

Effect Type	Criteria
Positive	A change which improves the quality of the environment e.g. increasing species diversity, improving reproductive capacity of an ecosystem or removing nuisances.
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 e.g. lessening species diversity or reducing the reproductive capacity of an ecosystem or by causing nuisance.

4 Description of Baseline Environment

4.1 Desk Study

4.1.1 European Designated Sites

The potential for impacts as a result of the proposed development on European Sites is assessed in an Appropriate Assessment Screening Report (AASR) prepared as part of this planning application.

The AASR concluded the following;

'Through an assessment of the pathways for effects and an evaluation of the proposed development, taking account of the processes involved it can be concluded at this stage that there will be no likely significant effects on the qualifying interests or the special conservation interest species of any designated European site.

It is concluded beyond reasonable scientific doubt, in consideration of best scientific knowledge and on the basis of objective information that the proposed project will not result in significant effects on any European site whether direct, indirect, or in-combination, in view of the conservation objectives of the habitats or species for which it was designated, either alone or in-combination with other plans or projects.'

Therefore, European Sites are not considered further in this Ecological Impact Assessment.

4.1.2 Nationally Designated Sites

Nationally designated sites consist of Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA). Under the Wildlife Amendment Act (2000), NHAs are legally protected from damage from the date they are formally proposed for designation. A list of pNHAs were published on a non-statutory basis in 1995, but have not since been statutorily proposed or designated. Prior to statutory designation, pNHAs are subject to limited protection, in the form of agri-environmental farm planning schemes, a Forest Service requirement for NPWS approval for afforestation on pNHA land and a recognition of the ecological value of pNHAs by Planning and Licencing Authorities.

Table 4.1 provides an assessment of the designated sites within the potential zone of influence and Figure 4.1 shows the location of the designated sites in relation to the project.

Table 4.1 Nationally Designated Sites within the potential Zone of Influence

Designated sites	Distance from proposed development site	Main Feature of Interest	Potential Pathway for Effect
Lough Macnean Upper pNHA [000986]	0.5km	Lake	<p>The proposed development site is located outside the boundary of the designated sites, therefore no pathway for direct effects exists.</p> <p>The proposed development includes in-stream works within Lough Macnean and</p>

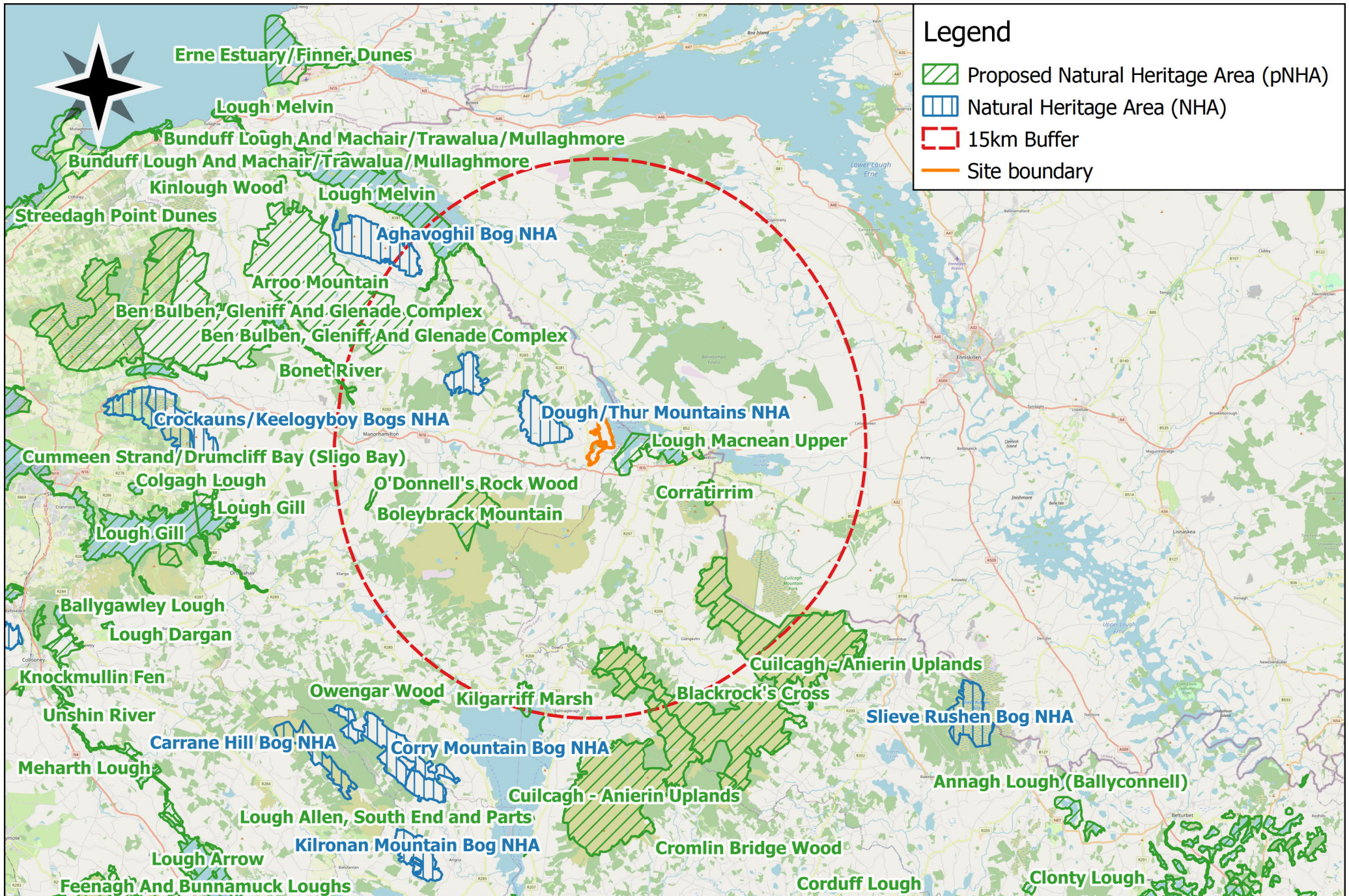


Figure 4.1. Nationally Designated Sites within 15km Created By: James Owens Date: 24/11/2023 Scale: 1:500,000

Designated sites	Distance from proposed development site	Main Feature of Interest	Potential Pathway for Effect
			<p>some works adjacent to the Glenfarne River. The proposed works are small scale and a major pollution event is not likely. However, given the hydrological connection with the designated site and its proximity to the proposed works, the potential for significant effects to occur cannot be dismissed.</p> <p>Potential for likely significant effects cannot be ruled out. Therefore, further assessment is required.</p>
Dough/Thur Mountains NHA [002384]	1.9km	Peatlands	<p>The proposed development site is located outside the boundary of the designated site, therefore no pathway for direct effects exists.</p> <p>No pathway for effect exists between the proposed development site and terrestrially dependent habitat. Due to distance, nature and scale of the proposed development significant effects are not anticipated.</p> <p>No pathways for direct or indirect effects were identified and therefore the designated site is not considered further in this assessment.</p>
Corratirrim pNHA [000979]	5.8km	Limestone pavement	<p>The proposed development site is located outside the boundary of the designated sites, therefore no pathway for direct effects exists.</p> <p>No pathway for effect exists between the proposed development site and terrestrially dependent habitat. Due to distance, nature and scale of the proposed development significant effects are not anticipated.</p> <p>No pathways for direct or indirect effects were identified and therefore the</p>

Designated sites	Distance from proposed development site	Main Feature of Interest	Potential Pathway for Effect
			designated site is not considered further in this assessment.
Boleybrack Mountain pNHA [002032]	7.0km	Lake, peatlands, heath, grasslands	<p>The proposed development site is located outside the boundary of the designated sites, therefore no pathway for direct effects exists.</p> <p>The proposed works area is located over 4km from the designated site. No pathway for effect was identified with regard to the terrestrially dependent habitats.</p> <p>The proposed development site is located in the same surface water catchment (Macnean Loughs connector_SC_010) as the designated site. However, the designated site is located up-catchment of the proposed development site and no surface water connection exists between the proposed development site and the surface water dependent habitats.</p> <p>No pathways for direct or indirect effects were identified and therefore the designated site is not considered further in this assessment.</p>
Cuilcagh - Anierin Uplands pNHA [000584]	9.3km	Lake, peatlands, heath, grasslands, calcareous springs, slender green-feather moss	<p>The proposed development site is located outside the boundary of the designated sites, therefore no pathway for direct effects exists.</p> <p>The proposed works area is located over 9km from the designated site. No pathway for effect was identified with regard to the terrestrially dependent habitats.</p> <p>Part of the designated site is located within an entirely separate river catchment (Shannon) to the proposed development site (Erne) and the remaining part of the designated site are located in separate sub-catchments (MacneanTribCuilcaghMountains_SC_010;</p>

Designated sites	Distance from proposed development site	Main Feature of Interest	Potential Pathway for Effect
			<p>Swanlinbar_SC_010; Blackwater[Newtowngore]_SC_010) to the proposed development site. Therefore, no surface water connectivity exists between the proposed development site and the designated site.</p> <p>The proposed development site is located within a separate groundwater catchment (Ballintempo) to the designated site (Glenade/Dowra; Lough Allen Upland; Anerin-Cuilcagh East; Cladagh-Swanlinbar). Therefore, no effects on groundwater dependent habitats are anticipated.</p> <p>No pathways for direct or indirect effects were identified and therefore the designated site is not considered further in this assessment.</p>
Lough Melvin pNHA [000428]	12.8km	Lake, grasslands, Atlantic salmon, otter	<p>The proposed development site is located outside the boundary of the designated sites, therefore no pathway for direct effects exists.</p> <p>The designated site is located up-catchment and within a separate surface water sub-catchment (Drowes_SC_010) to the proposed development site (Macnean Loughs connector_SC_010). Therefore, no surface water connection exists between the proposed development site and the designated site.</p> <p>The proposed works area is located over 12km from the designated site. No pathway for effect was identified with regard to the terrestrially dependent habitats.</p> <p>No pathways for direct or indirect effects were identified and therefore the</p>

Designated sites	Distance from proposed development site	Main Feature of Interest	Potential Pathway for Effect
			designated site is not considered further in this assessment.
O'Donnell's Rock Wood pNHA [001418]	13.2km	Woodland	<p>The proposed development site is located outside the boundary of the designated sites, therefore no pathway for direct effects exists.</p> <p>No pathway for effect exists between the proposed development site and terrestrially dependent habitat. Due to distance, nature and scale of the proposed development significant effects are not anticipated.</p> <p>No pathways for direct or indirect effects were identified and therefore the designated site is not considered further in this assessment.</p>
Arroo Mountain pNHA [001403]	13.7km	Heath, peatlands, calcareous springs, scree and rocky slopes	<p>The proposed development site is located outside the boundary of the designated sites, therefore no pathway for direct effects exists.</p> <p>The designated site is located up-catchment and within a separate surface water sub-catchment (Drowes_SC_010) to the proposed development site (Macnean Loughs connector_SC_010). Therefore, no surface water connection exists between the proposed development site and the designated site.</p> <p>The proposed development site is located within a separate groundwater catchment (Ballintempo) to the designated site (Glenade; Glenaniff; Rossinver). Therefore, no effects on groundwater dependent habitats are anticipated.</p> <p>The proposed works area is located over 12km from the designated site. No pathway for effect was identified with</p>

Designated sites	Distance from proposed development site	Main Feature of Interest	Potential Pathway for Effect
			<p>regard to the terrestrially dependent habitats.</p> <p>No pathways for direct or indirect effects were identified and therefore the designated site is not considered further in this assessment.</p>
Kilgarriff Marsh pNHA [000426]	14.6km	Marsh	<p>The proposed development site is located outside the boundary of the designated sites, therefore no pathway for direct effects exists.</p> <p>No surface water connectivity exists between the proposed development site and the designated site. Due to distance, nature and scale of the proposed development significant effects are not anticipated.</p> <p>No pathways for direct or indirect effects were identified and therefore the designated site is not considered further in this assessment.</p>
Aghavoghil Bog NHA [002430]	14.9km	Peatlands	<p>The proposed development site is located outside the boundary of the designated sites, therefore no pathway for direct effects exists.</p> <p>No surface water connectivity exists between the proposed development site and the designated site. Due to distance, nature and scale of the proposed development significant effects are not anticipated.</p> <p>No pathways for direct or indirect effects were identified and therefore the designated site is not considered further in this assessment.</p>
Bonet River pNHA [001404]	15.0km	River, grasslands,	<p>The proposed development site is located outside the boundary of the designated</p>

Designated sites	Distance from proposed development site	Main Feature of Interest	Potential Pathway for Effect
		woodland, otter	<p>sites, therefore no pathway for direct effects exists.</p> <p>The proposed works area is located within a separate surface water catchment (Erne) to the designated site (Sligo Bay). No surface water connection exists between the proposed development site and the designated site.</p> <p>The proposed works area is located over 14km from the designated site. No pathway for effect was identified with regard to the terrestrially dependent habitats.</p> <p>No pathways for direct or indirect effects were identified and therefore the designated site is not considered further in this assessment.</p>

4.2 NPWS GIS Habitat Data

GIS shapefiles of Annex I lake, woodland and grassland habitats were downloaded from the NPWS website and overlain on the proposed development site. No Annex I habitats were recorded within or adjacent to the proposed development site.

4.3 NPWS Data

A data request was sent to NPWS in January 2023 for protected species data within a 5km radius of the proposed development site. Results of protected flora and fauna are displayed in Table 4.2.

Table 4.2 NPWS species records within 5km radius which are protected under European and national legislation

Species Name	Conservation Status
Common Frog (<i>Rana temporaria</i>)	Annex V; WA
White-clawed Crayfish (<i>Austropotamobius pallipes</i>)	Annex II, V; WA
Common Lizard (<i>Lacerta vivipara</i>)	WA
Marsh Fritillary (<i>Euphydryas aurinia</i>)	Annex II
Pine Marten (<i>Martes martes</i>)	Annex V; WA
Badger (<i>Meles meles</i>)	WA
Otter (<i>Lutra lutra</i>)	Annex II, IV; WA
Irish Hare (<i>Lepus timidus subsp. hibernicus</i>)	Annex V; WA

Hedgehog (<i>Erinaceus europaeus</i>)	WA
Red Squirrel (<i>Sciurus vulgaris</i>)	WA
Irish Stoat (<i>Mustela erminea</i> subsp. <i>hibernica</i>)	WA
<i>Cladonia portentosa</i>	Annex V
Small-white Orchid (<i>Pseudorchis albida</i>)	FPO
Globeflower (<i>Trollius europaeus</i>)	FPO
Fir Clubmoss (<i>Huperzia selago</i>)	Annex V

Annexes II, IV and V of the Habitats Directive, WA= Wildlife Acts 1976-2021, FPO= Flora Protection Order (2015)

4.3.1 National Biodiversity Data Centre (NBDC)

A search of the NBDC database was carried out for birds of conservation concern, bird species listed under Annex I of the Birds Directive, protected flora and fauna and species listed under the Third Schedule of the Birds and Natural Habitats Regulations (2011) within hectad H03. Results of protected flora and fauna are displayed in Table 4.3, birds of conservation concern in Table 4.4 and Third Schedule invasive species in table 4.5.

Table 4.3 NBDC flora and fauna records for hectad H03 which are protected under European and national legislation

Species Name	Conservation Status
Common Frog (<i>Rana temporaria</i>)	Annex V; WA
Freshwater White-clawed Crayfish (<i>Austropotamobius pallipes</i>)	Annex II, V, WA
Marsh Fritillary (<i>Euphydryas aurinia</i>)	Annex II
Common Lizard (<i>Zootoca vivipara</i>)	WA
Pine Marten (<i>Martes martes</i>)	Annex V; WA
Badger (<i>Meles meles</i>)	WA
Red Squirrel (<i>Sciurus vulgaris</i>)	WA
Hedgehog (<i>Erinaceus europaeus</i>)	WA
Otter (<i>Lutra lutra</i>)	Annex II, IV; WA
Irish Hare (<i>Lepus timidus</i> subsp. <i>hibernicus</i>)	Annex V; WA
Irish Stoat (<i>Mustela erminea</i> subsp. <i>hibernica</i>)	WA
Fallow Deer (<i>Dama dama</i>)	WA
Brown Long-eared Bat (<i>Plecotus auritus</i>)	Annex IV; WA
Daubenton's Bat (<i>Myotis daubentonii</i>)	Annex IV; WA
Leisler's Bat (<i>Nyctalus leisleri</i>)	Annex IV; WA
Natterer's Bat (<i>Myotis nattereri</i>)	Annex IV; WA
Common Pipistrelle (<i>Pipistrellus pipistrellus</i>)	Annex IV; WA
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	Annex IV; WA

Annexes II, IV and V of the Habitats Directive, WA= Wildlife Acts 1976-2021

Table 4.4 NBDC Records of birds listed under Annex I of the Birds Directive and Birds of Conservation Concern In Ireland (BOCCI) Red list species for hectad H03

Species Name	Conservation Status
Barn Owl (<i>Tyto alba</i>)	BOCCI Red List (breeding)
Goldeneye (<i>Bucephala clangula</i>)	BOCCI Red List (wintering)
Kingfisher (<i>Alcedo atthis</i>)	EU Birds Directive Annex I
Kestrel (<i>Falco tinnunculus</i>)	BOCCI Red List (breeding)

Pochard (<i>Aythya ferina</i>)	BOCCI Red List (breeding and wintering)
Common Snipe (<i>Gallinago gallinago</i>)	BOCCI Red List (breeding and wintering)
Common Swift (<i>Apus apus</i>)	BOCCI Red List (breeding)
Curllew (<i>Numenius arquata</i>)	BOCCI Red List (breeding and wintering)
Woodcock (<i>Scolopax rusticola</i>)	BOCCI Red List (breeding)
Golden Plover (<i>Pluvialis apricaria</i>)	EU Birds Directive Annex I, BOCCI Red List (breeding and wintering)
Greater White-fronted Goose (<i>Anser albifrons</i>)	EU Birds Directive Annex I
Grey Partridge (<i>Perdix perdix</i>)	BOCCI Red List (breeding)
Grey Wagtail (<i>Motacilla cinerea</i>)	BOCCI Red List (breeding)
Hen Harrier (<i>Circus cyaneus</i>)	EU Birds Directive Annex I
Meadow Pipit (<i>Anthus pratensis</i>)	BOCCI Red List (breeding)
Red Grouse (<i>Lagopus lagopus</i>)	BOCCI Red List (breeding)
Redwing (<i>Turdus iliacus</i>)	BOCCI Red List (wintering)
Whooper Swan (<i>Cygnus cygnus</i>)	EU Birds Directive Annex I

Table 4.5 NBDC records of Third Schedule invasive species for hectad H03

Species Name
Japanese Knotweed (<i>Fallopia japonica</i>)
<i>Rhododendron ponticum</i>
Salmonberry (<i>Rubus spectabilis</i>)
Canadian Waterweed (<i>Elodea canadensis</i>)
Indian Balsam (<i>Impatiens glandulifera</i>)
Eastern Grey Squirrel (<i>Sciurus carolinensis</i>)
Brown Rat (<i>Rattus norvegicus</i>)
Roach (<i>Rutilus rutilus</i>)

4.3.2 Fisheries (Taken from Appendix 2)

According to Inland Fisheries Ireland (Kelly et al. 2016), a total of six fish species and one cyprinid hybrid were recorded on Lough Macnean Upper during July 2016, with 778 fish being captured. Perch (*Perca fluviatilis*) was the most common fish species recorded, followed by roach (*Rutilus rutilus*), roach x bream hybrids, eel (*Anguilla anguilla*), bream (*Abramis brama*), brown trout (*Salmo trutta*) and pike (*Esox lucius*). The lake can thus be considered representative of a mixed coarse fishery with a small salmonid population.

4.3.3 Water Quality

The Glenfarne River flows adjacent to part of the proposed development site and is part of the CORNAVANNIGE_020 river waterbody which has a Water Framework Directive (WFD) Status 2016-2021 of 'High'. The waterbody has a risk rating of 'Not at risk'. The nearest EPA water quality sampling point (Station code: RS36C040600) is located 200m upstream of the proposed development near the village of Glenfarne (Br u/s L Macnean). The most recent Q-value for the station is 4-5 corresponding to a status of 'High' and was assessed in 2022.

Lough Macnean Upper lake waterbody has a Water Framework Directive (WFD) Status 2016-2021 of 'Poor' and the waterbody has a risk rating of 'At risk'.

4.3.4 Consultation

Scoping packs were sent to Inland Fisheries Ireland (IFI), the Developments Applications Unit (DAU) of the National Parks and Wildlife Service and the Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland between January and May 2023.

IFI noted that the Glenfarne River is regarded as an important salmonid fishery and requested that the catchment be regarded as environmentally sensitive in any assessment. They stated that extreme care and diligence be taken in preventing adverse impacts during construction and operation of the scheme.

The DAU stated that they were not in a position to make specific comment on this particular referral at this time.

DAERA highlighted the importance of Lough MacNean Upper for fisheries habitat and stated the following;

'Inland Fisheries would recommend that the applicant ensure, before any construction takes place that all potential pathways for deleterious materials to enter the aquatic environment are identified and appropriate mitigation is in place to prevent such materials from entering the river. Assuming appropriate mitigation is in place DAERA Inland Fisheries is content that there is unlikely to be any significant impact to fisheries interests during the construction phase in the vicinity of the proposal.'

4.4 Field Survey

All habitats on site were categorised in accordance with *A Guide to Habitats in Ireland* (Fossitt, 2000). Habitat maps of the study site are shown in Figure 4.2 and Figure 4.3 and the habitats recorded within and adjacent to the development are provided in Table 4.6.

Table 4.6 Fossitt (2000) habitat categories recorded at the site

Habitat	Fossitt Code
Treelines	WL2
Oak-birch-holly woodland	WN1
Buildings and artificial surfaces	BL3
Spoil and bare ground	ED2
Eroding/upland rivers	FW1
Drainage ditches	FW4
Mesotrophic lakes	FL4
Mixed broadleaved woodland	WD1
Mixed broadleaved/conifer woodland	WD2
Conifer plantation	WD4

The walking trails are located within Conifer plantation (WD4), Oak-birch-holly woodland (WN1) dominated by birch, existing forest roads and tracks categorised as Spoil and bare ground (ED2) and Mesotrophic lakes (FL4). The Glenfarne River-Lake Greenway begins at the south-western corner of the site where a small car-park area is proposed within an area of mature Sitka spruce (*Picea sitchensis*) Conifer plantation (WD4) and an existing Coillte forest road categorised as Spoil and bare ground (ED2) (Plate 4.1). The trail then runs adjacent to the Glenfarne River, categorised as Upland/eroding rivers (FW1), for approximately half of the trail length in a north-easterly direction (Plate 4.2). The landward side of the river is dominated by immature Sitka spruce Conifer plantation (WD4) and a fringing Treeline (WL2) of mature beech (*Fagus sylvatica*) trees initially (Plate 4.3). The remainder of the Treeline (WL2) contained a mix of beech, ash (*Fraxinus excelsior*), willow (*Salix* sp.) and holly (*Ilex aquifolium*). The trail crosses a small modified unnamed stream (approximately 0.5m wide) which connects to the Glenfarne River and which was also categorised as Eroding/upland rivers (FW1). Scattered shrubs of Rhododendron (*Rhododendron ponticum*) and cherry laurel (*Prunus laurocerasus*) were recorded in parts adjacent to the river. The greenway trail then splits with one spur passing through immature Conifer plantation (WD4) in a westerly direction to rejoin an existing forest road and provide access to the remains of Glenfarne Hall which is within mature Conifer plantation (WD4). The main trail continues east through immature Conifer plantation (WD4), Mixed broadleaved/conifer woodland (WD2) and mature Conifer plantation (WD4) (Plate 4.4). The Mixed broadleaved/conifer woodland (WD2) consisted of mature Scot's pine (*Pinus sylvestris*), beech, Sitka spruce, pedunculate oak (*Quercus robur*), holly and downy birch (*Betula pubescens*). Rhododendron was recorded occasionally in parts of the woodland. Ground flora was relatively species-poor and consisted of broad buckler-fern (*Dryopteris dilatata*), wood sorrel (*Oxalis acetosella*) and the bryophytes *Rhytidiadelphus triquetrus*, *Eurhynchium striatum* and *Thuidium tamariscinum*. The trail splits into two again with one path leading north to the proposed carpark and main services area with the second trail veering east through Conifer plantation (WD4) before turning north along the eastern side of the forestry and adjacent to an existing track which leads back to the slipway area. A spur comes off this trail in a westerly direction into the Conifer plantation (WD4) to where the forest bathing area (sit-spots) are proposed. The existing slipway area is categorised as Buildings and artificial surfaces (BL3).

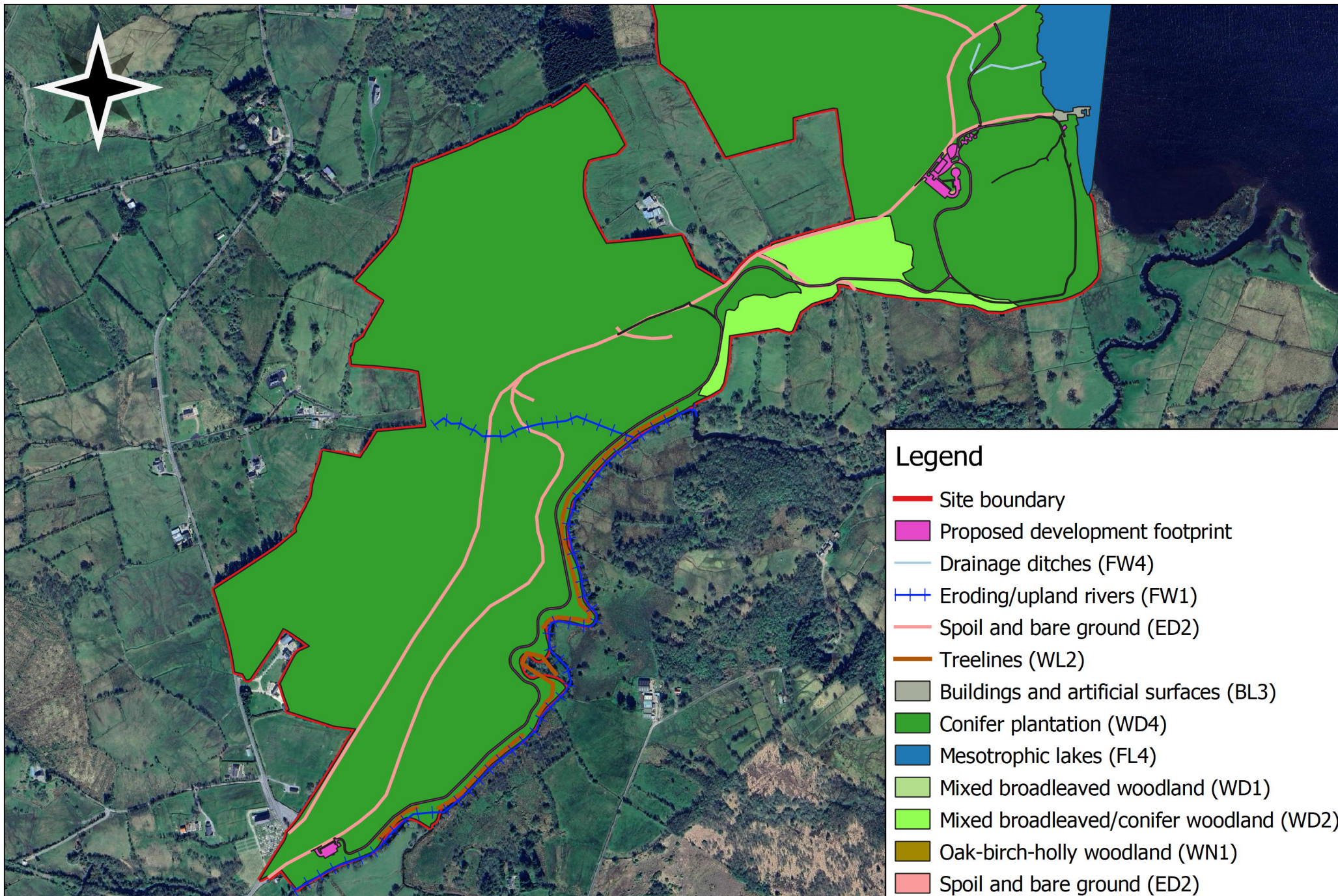


Figure 4.2. Habitats (southern half) Created By: James Owens Date: 01/12/2023 Scale: 1:9,000

0 0.1 0.2 km





- ### Legend
- Site boundary
 - Proposed development footprint
 - Drainage ditches (FW4)
 - ++ Eroding/upland rivers (FW1)
 - Spoil and bare ground (ED2)
 - Treelines (WL2)
 - Buildings and artificial surfaces (BL3)
 - Conifer plantation (WD4)
 - Mesotrophic lakes (FL4)
 - Mixed broadleaved woodland (WD1)
 - Mixed broadleaved/conifer woodland (WD2)
 - Oak-birch-holly woodland (WN1)
 - Spoil and bare ground (ED2)
 - Otter spraint

Figure 4.3. Habitats (northern half) Created By: James Owens Date: 01/12/2023 Scale: 1:8,000

0 0.1 0.2 km

The proposed main services block, play areas and carpark will be constructed within an area of pre-thicket Sitka spruce Conifer plantation (WD4) which is fringed by immature willow and birch (Plate 4.5). A proposed trail will go north from this into a proposed arboretum area. This is currently over-mature Conifer plantation (WD4) consisting of Scots pine and Sitka spruce, some of which has been windblown. A Drainage ditch (FW4) with a low flow passes through this area of woodland. The arboretum trail then connects back on to an existing forest road and leads to Lady's View which is categorised as Buildings and artificial surfaces (BL3). The forest road continues north to the proposed floating boardwalk area. The road runs adjacent to Lough MacNeen Upper, which is categorised as Mesotrophic lakes (FL4), and mature Conifer plantation (WD4) occurs on the landward side of the road (Plate 4.6). The proposed boardwalk crosses the lake to Bilberry Island. The island consisted of Norway spruce (*Picea abies*) dominated Conifer plantation (WD4) which contained numerous boulders, especially along the shoreline (Plate 4.6). The shoreline was composed of fringing broadleaf trees such as willow and birch. Ground flora on the island consisted of wood sorrel, great wood-rush (*Luzula sylvatica*) and *Rhytidiadelphus triquetrus*. The Mesotrophic lake (FL4) habitat in the vicinity of the proposed boardwalk was characterised by common club rush (*Schoenoplectus lacustris*), common reed (*Phragmites australis*), reedmace (*Typha latifolia*), lesser pond sedge (*Carex acutiformis*) and yellow water lily (*Nuphar lutea*)

The proposed boardwalk connects back to land again in an area of Oak-birch-holly woodland (WN1) (Plate 4.7). This woodland was characterised by downy birch, some of which was planted and relatively small (5m high), with holly and willow occurring at lesser frequency. A small stream (0.5m wide), categorised as Eroding/upland rivers (FW1), flowed through the woodland (Plate 4.8). The field layer was characterised by bracken (*Pteridium aquillinum*), bramble (*Rubus fruticosus* agg.), foxglove (*Digitalis purpurea*), wood sorrel, hard fern (*Blechnum spicant*) and great wood-rush with remote sedge (*Carex remota*) occurring close to the stream. Rhododendron shrubs were frequently occurring on the boundary between this woodland and the adjacent mature Conifer plantation (WD4) which was dominated by Scots pine. The trail then connects back to the existing forest road network. An area of immature planted oak and birch with scattered mature Scots pine was recorded outside the proposed development boundary adjacent to these habitats and categorised as Mixed broadleaved woodland (WD1).

The last piece of the proposed development consists of a viewing point within an area of immature and mature Conifer plantation (WD4) comprised of Sitka spruce with immature birch also regenerating.

Rhododendron ponticum was recorded in a number of locations within woodland habitats and within and adjacent to the proposed walking trails. Rhododendron is listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011). None of the habitats recorded within or adjacent to the proposed development footprint corresponded to habitats listed under Annex I of the EU Habitats Directive.



Plate 4.1 Conifer plantation (WD4) at the location of the amenity start point and beginning of greenway



Plate 4.2 The Glenfarne River (FW1) along part of the proposed greenway route



Plate 4.3 Treeline (WL2) and young Conifer plantation (WD4) along the route of the proposed greenway



Plate 4.4 Young conifer plantation (WD4) and Mixed broadleaved/conifer woodland (WD2) along part of the trail



Plate 4.5 Young conifer plantation (WD4) and existing forest road (ED2) at the location of the proposed services area and new carpark



Plate 4.6 Lough MacNea Upper (FL4) looking across to Bilberry Island



Plate 4.7 Example of birch dominated Oak-birch-holly woodland (WN1)



Plate 4.8 Small stream (FW10 which flows through the birch woodland (WN1)

4.4.1.1 Significance of Habitats

Habitats recorded at the site were evaluated according to their geographic significance as per *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009).

Conifer plantation (WD4), Buildings and artificial surfaces (BL3), Drainage ditches (FW4) and Spoil and bare ground (ED2) were the dominant habitats within the proposed development footprint. These habitats are highly modified and of relatively low ecological value and therefore were categorised as being of Local Importance (Lower value).

The Glenfarne River (FW1) and Lough MacNeen Upper (FL4) were categorised as being of County Importance considering the habitat they provide for salmonids in the case of the Glenfarne River and coarse fish and other aquatic species in the case of Lough MacNeen Upper.

The remaining small Upland/eroding rivers (FW1), Treelines (WL2), Oak-birch-holly woodland (WN1), Mixed broadleaved woodland (WD1) and Mixed broadleaved/conifer woodland (WD2) are relatively common in the surrounding region and were categorised as Local Importance (Higher Value) as they provide ecological corridors between features of higher biodiversity value and are habitats with high biodiversity in a local context. The Mixed broadleaved woodland (WD1) was outside the proposed development footprint.

4.4.2 Fauna

Mammals

Dedicated badger (*Meles meles*) and otter (*Lutra lutra*) surveys were undertaken as per *Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes* (NRA, 2009).

The river, lake and stream have the potential to offer suitable supporting habitat to otter (*Lutra lutra*). No signs of otter were recorded along the Glenfarne River or its tributary within the proposed development footprint or along the lake shoreline with the mainland. Otter spraints were recorded on boulders on the shoreline of Bilberry Island (Figure 4.3). However, no slides, couches or holts were found during the survey.

No badger setts were identified during the walkover. However, the woodland habitat does offer potentially suitable supporting habitat for badgers (*Meles meles*). Red squirrel (*Sciurus vulgaris*) was seen during the survey in mature woodland with the Coillte property providing abundant suitable supporting habitat for red squirrel.

Trees within conifer plantation were assessed as providing Negligible bat roosting potential. A number of old beech trees adjacent to the Glenfarne River and along the proposed River-Lake Trail were assessed as providing Low-Moderate bat roosting potential. The Coillte property is dominated by conifer plantation and contains limited areas of broadleaf woodland. No old buildings, caves or veteran trees were identified within or adjacent to the proposed development footprint which would provide suitable roosting habitat for bats. The woodland and edge habitats do provide High commuting and foraging potential for bats.

No evidence of any additional protected mammal species was recorded.

Birds

Mallard (*Anas platyrhynchos*), moorhen (*Gallinula chloropus*) and heron (*Ardea cinerea*) were recorded on part of the lake. Common woodland birds such as treecreeper (*Certhia familiaris*), jay

(*Garrulus glandarius*), woodpigeon (*Columba palumbus*), blackbird (*Turdus merula*) and robin (*Erithacus rubecula*) were also recorded during the walkover survey. The woodland habitats provide potentially suitable nesting habitat for birds.

Amphibians/Reptiles

No amphibians or reptiles were recorded during the walkover surveys.

4.4.3 Aquatic Ecology

Lough MacNea Upper is a deep mesotrophic lake of moderate alkalinity with peat stained water. The study area in the vicinity of Billberry Island had a moderate diversity of macrophyte plants but did not support any rare or protected macrophytes or associated lacustrine Annex I aquatic habitats.

In July 2023, three composite macro-invertebrate sweep samples were collected from the lake (east and west). A total of n=22 species representing n=20 families were recorded. The abundances of macro-invertebrates were relatively low overall (≤ 53 per sample).

Coleopteran diversity was not high with only three species recorded. *Gyrinus substriatus* was recorded in moderate densities in sample 2. However, this whirligig beetle species is of least concern and common in sheltered bays adjoining macrophyte vegetation. Two caddis species were recorded namely, *Anthripsodes atterimus* and *Plectronemia conspersa*. Both are ubiquitous caddis species of lentic waterbodies, rivers and streams with a widespread distribution in Ireland (O' Connor, 2020). A single mayfly species, *Cloeon simile* was recorded. This species is a widespread species of lentic waterbodies but avoids highly acidic sites (Kelly-Quinn & Regan, 2012).

In summary there were no rare or protected macro-invertebrate species recorded in the Lough MacNea Upper samples according to national red lists for aquatic beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012) and other relevant taxa (e.g., molluscs; Byrne et al., 2009).

No white-clawed crayfish were recorded during the targeted trapping, snorkelling and sweep sampling. The higher alkalinity of the southern basin of the lake being of limestone, has more suitability for crayfish and this may explain the species absence from the study area. This would be supported by the known records for the species according to the NBDC (refer to desktop review).

The lake fisheries habitat was representative of a mixed coarse fishery with a small brown trout population (Kelly et al. 2016). However, no highly sensitive fisheries habitat overlapped the proposed boardwalk areas, which have been positioned to minimise contact with emergent macrophytes in the lake littorals. This approach avoids aquatic habitats of greater importance that would act as invertebrate and coarse fish nursery areas.

The Glenfarne River consisted mainly of riffle and pool habitat along its length with the Coillte property and was dominated by boulder and cobble which has the potential to provide suitable habitat for white-clawed crayfish, should they occur there. The small streams encountered elsewhere in the site were 0.5 or less in width and flowed through woodland and commercial forestry and offered limited potential fisheries habitat.

4.4.3.1 Significance of Fauna

No signs of otter were recorded within or immediately adjacent to the proposed development footprint. Two spraints were recorded on Billberry Island, to the east of the proposed boardwalk and walkway location. The Glenfarne River and Lough MacNea Upper provide suitable supporting for otter. The otter population at the site is assessed as Local Importance (Higher value).

Red squirrel was seen at the proposed development site and the Coillte property provides abundant supporting habitat for the species. The red squirrel population with the potential to be affected is assessed as Local Importance (Higher value).

No evidence of badger was recorded from the field surveys. However, there are badger records from the wider area and the woodland habitats provide potentially suitable supporting habitat for the species. Badger are assessed as Local Importance (Higher value).

No old buildings, caves or veteran trees were identified within or adjacent to the proposed development footprint which would provide suitable roosting habitat for bats. The woodland and edge habitats do provide High commuting and foraging potential for bats. It is anticipated that the site of the proposed development provides foraging and commuting habitat for a bat population of Local Importance (Higher value).

No highly sensitive fisheries habitat was recorded in the Lough MacNeane surveys. The lake provides habitat for a mixed coarse fishery categorised as of Local Importance (Higher Value). The Glenfarne River is noted as an important salmonid fishery and has the potential to provide suitable supporting habitat for freshwater white-clawed crayfish and is therefore categorised as being of County Importance.

The bird species recorded are all common and widespread and typical of both woodland and lake habitats. None of the bird species recorded are listed on Annex I of the EU Habitats Directive or on the BOCCI red list. The bird species recorded are categorised as representing a local population of Local Importance (Higher value).

4.5 Summary of Ecological Evaluation

Ecological features are valued as being of local importance (higher value) or above as per the geographic significance classification. The ecological features with the potential to be significantly affected are summarised in Table 4.8 below.

Table 4.8 Ecological features that have been identified within the Zone of Influence

Site/Species/Habitat	Ecological Value	Ecological Feature
Lough Macneane Upper pNHA [000986]	National Importance	Yes
Birds	Local Importance (Higher value)	Yes
Mammals	Local Importance (Higher value)	Yes
Amphibians and reptiles	Not recorded	No
Coarse fish	Local Importance (Higher value)	Yes
Aquatic invertebrates	Local Importance (Lower value)	No
Oak-birch-holly woodland (WN1)	Local Importance (Higher value)	Yes
Spoil and bare ground (ED2)	Local Importance (Lower value)	No
Eroding/upland rivers (FW1)	County Importance & Local Importance (Higher value)	Yes
Mesotrophic lakes (FL4)	County Importance	Yes

Conifer plantation (WD4)	Local Importance (Lower value)	No
Mixed broadleaved/conifer woodland (WD2)	Local Importance (Higher value)	Yes
Buildings and artificial surfaces (BL3)	Local Importance (Lower value)	No
Treelines (WL2)	Local Importance (Higher value)	Yes

5 Assessment of Effects and Mitigation Measures

5.1 Do Nothing Scenario

If the proposed development was not to go ahead, the site would continue to be used for recreation by walkers and anglers. The forestry would also continue to be managed by Coillte for commercial purposes.

5.2 Construction Phase

5.2.1 Assessment of Effects on Habitats

5.2.1.1 Construction Phase

The majority of the proposed development lies within modified habitats and forestry plantation of low biodiversity value. The new greenway and trails will mainly be within areas of Conifer plantation (WD4). There will be no in-stream works within the Glenfarne River and there will be no requirement for in-stream works where the trail crosses small watercourses as this will be facilitated using clearspan bridges. The new carparks and main services block will all be within existing hardstanding areas categorised as Spoil and bare ground (ED2) or within Conifer plantation (WD4). The arboretum area will be located within an area of the existing mature Conifer plantation (WD4) which Coillte are already planning to clearfell under licence application LM07-FL0030. A short section of trail runs through Conifer plantation on Bilberry Island also. Spoil and bare ground (ED2) and Conifer plantation (WD4) have limited diversity and are categorised as Local Importance (Lower value). Trees are generally well spaced within any areas of mature woodland and trails will be routed to avoid mature trees. There will be no requirement for a permanent loss of woodland in the construction of any trails. The only permanent loss of woodland will be of conifer plantation of low ecological significance at the location of the proposed carparks and main service area. The proposed raised viewing platform will only require the selective removal of individual trees.

There will be a small area of Conifer plantation (WD4) lost as part of the proposed development. The proposed floating boardwalk will result in some small-scale piling of the lake bed (if that option is followed) but there will be no loss of lake habitat.

There will be no loss of Oak-birch-holly woodland (WN1), Eroding/upland rivers (FW1), Mixed broadleaved/conifer woodland (WD2), Treelines (WL2) or Mesotrophic lakes (FL4) as a result of the proposed development.

The impact prior to mitigation is considered to be Permanent Slight Negative Effect.

Mitigation Measures

- The proposed works areas will be clearly demarcated in advance of works taking place and works will be restricted to this area.

Residual Impact

Significant effects are not anticipated.

5.2.1.2 Operational Phase

There will be no changes to habitats as part of the operational phase of the proposed development.

Significant effects are not anticipated.

5.2.2 Assessment of Effects on Mammals

5.2.2.1 Construction Phase

The footprint of the proposed development will be primarily within modified habitats. No built structures or caves were recorded within the site which could provide potential roosting habitat for bats. Trees within the proposed development footprint were categorised as offering Negligible roosting potential. There is no requirement to remove mature trees as it will be possible to route the trails around them. The conifers to be lost at the proposed new carpark areas and the main services area were assessed as offering Negligible bat roosting potential. Therefore, direct effects on bats are not anticipated. The small areas of conifer woodland which will be lost to facilitate carparks and the services area will be negligible in relation to the overall woodland area at the site. In addition, there will be the creation of additional edge habitat as a result of the removal of a small area of conifers. There will be no loss of foraging or commuting habitat for bats as a result of the proposed development.

No signs of otter were recorded within or immediately adjacent to the proposed development footprint. The only signs of otter were recorded on part of Bilberry Island. No holts or couches were identified anywhere within the survey area. Therefore, the potential for disturbance/displacement effects on otter are considered low.

Red squirrels utilise the woodland habitats at the proposed development site. There is a requirement for the permanent removal of a small area of conifer plantation (0.5ha) to facilitate the proposed carparks and services areas. However, this is negligible in relation to the overall woodland area at the site. In addition, the main services area will be constructed within young pre-thicket conifer plantation which is unlikely to be utilised by squirrels. Given the small area of the proposed development footprint within the overall woodland, the potential for disturbance/displacement effects on otter are considered low.

No signs of badger were recorded during the surveys although the woodland habitat does offer potentially suitable supporting habitat for the species.

Due to the nature and scale of the proposed development, significant effects on mammals are unlikely. However, taking a pre-cautionary approach, there is the potential for changes in activity or for otter, red squirrel or badger to take up residence within or adjacent to the proposed works footprint since the surveys for this report. Therefore, significant effects cannot be completely ruled out in the absence of mitigation.

Mitigation Measures

- A pre-construction otter and badger survey be carried out to ensure no holts, couches or setts have been established in the intervening period. Surveys will be carried out in accordance with Guidelines for assessment of Ecological Impacts of National Road Schemes, (NRA, 2009), Guidelines for the treatment of otters prior to the construction of national road schemes (NRA, 2008) and Guidelines for the treatment of badgers prior to the construction of National road schemes (NRA, 2006). Should any breeding or resting sites be encountered they will be subject to procedures described in NRA guidance.
- A pre-commencement survey will be conducted for red squirrel in accordance with Guidelines for assessment of Ecological Impacts of National Road Schemes, (NRA, 2009) where there is a

requirement to fell mature conifers. Should any dreys be encountered they will be subject to procedures described in NRA guidance.

- All construction plant and equipment to be used on-site will be modern equipment and will comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988 (as amended).
- Regular maintenance of plant will be carried out in order to minimise noise emissions.
- Machines will be turned off during periods when they are not in use.
- Work hours will be confined to daylight hours.

Residual Impact

Significant effects are not anticipated.

5.2.2.2 Operational Phase

New public lighting is proposed around the service building and adjacent carpark only for the safe use of the building after daylight hours which consist of a very small area within the property. No further public lighting proposed in this development. The area requiring lighting is within a very small area and very localised with the remainder of the property maintaining darkness. However, there is the potential for lighting to cause some disturbance/displacement related effects for bats and other mammals.

Glenfarne Wood is currently used as an amenity resource by walkers and anglers. Bilberry Island is frequently used by fishermen as well. The proposed development has the potential to increase the number of visitors to the area. However, mammal species will already be habituated to human activity to a degree. Species such as otter are crepuscular in nature and generally avoid times of peak human activity. Therefore, no additional disturbance related effects are anticipated.

Lighting in the absence of mitigation at the proposed development site has the potential to result in Permanent Slight Negative Effects.

Mitigation Measures

- Column lights are kept under 8m, 6m high proposed.
- Directional downlights do not exceed the 70° angle above the vertical plane. Lighting of treelines, hedgerows and scrub to be avoided/minimised.
- Lights with a high UV component, such as metal halide, mercury vapour and tungsten halogen.
- Dark zones will be maintained within the proposed development site and its environs. This will be primarily the retained central wetland and woodland area. Where required, any external lighting will be kept to a minimum, and light columns will be kept as low as possible using the lowest lux value permitted for health and safety.
- There will be no flood lighting of the proposed development or its surrounds.

Residual Impact

Significant effects are not anticipated.

5.2.3 Assessment of Effects on Fisheries Habitat

5.2.3.1 Construction Phase

No in-stream works are proposed within the Glenfarne River or any stream. In-stream works are proposed within part of Lough MacNea Upper as part of the proposed boardwalk construction. The

targeted aquatic surveys identified the lake fisheries habitat to be representative of a mixed coarse fishery with a small brown trout population. No highly sensitive fisheries habitat overlapped the proposed boardwalk areas, which have been positioned to minimise contact with emergent macrophytes in the lake littorals. This approach avoids aquatic habitats of greater importance that would act as invertebrate and coarse fish nursery areas.

The impact prior to mitigation is considered to be Short-term Moderate Negative Effect.

Mitigation Measures

- In-stream construction work will be avoided during coarse fish spawning times from February to late April.

Residual Impact

Significant effects are not anticipated.

5.2.3.2 Operational Phase

Significant effects are not anticipated.

5.2.4 Assessment of Effects on Birds

5.2.4.1 Construction Phase

Most of the bird species recorded during the ecological walkover survey are common and widespread. The proposed development site consisted of woodland and lake fringing vegetation which offer potentially suitable nesting habitat for birds. Most of the woodland habitat will be retained apart from approximately 0.5ha to facilitate carparks and a services area. There will also be a requirement to remove individual trees and shrubs as part of trail construction. Removal of vegetation during the bird nesting season has the potential to result in injury or death to bird species.

The impact prior to mitigation is considered to be Permanent Significant Negative Effect.

Mitigation Measures

- Removal of woody vegetation will be done in accordance with the provisions of the Wildlife Acts 1976-2021

Residual Impact

No potential for significant effects to occur exists.

5.2.4.2 Operational Phase

There will be no requirement to interfere with avian habitats during the operational phase. Significant disturbance related effects are not anticipated during the operational phase.

Significant effects are not anticipated.

5.2.5 Assessment of Effects: Pollution of Watercourses and Waterbodies

5.2.5.1 Construction Phase

Part of the newly proposed trail runs adjacent to the Glenfarne River. This trail also crosses a small stream which is connected to the Glenfarne River. The proposed trail is located 10m or more away

from the river for most of its length apart from a few locations. No in-stream works in the Glenfarne River or the small stream are proposed as part of the trail construction. Works 10m or more from watercourses are not likely impact water quality, however, there is the potential for pollutants such as hydrocarbons and sediments to enter the watercourse as a result of trail construction where it works are within 10m of the river.

The trail crosses a large drain at the arboretum location and it is proposed to also utilise a small clear span wooden bridge here. The proposed development involves the construction of a floating boardwalk in part of Lough MacNea Upper. This will involve the use of machinery on floating pontoons and a small amount of concrete pouring to secure the shore blocks in place. These works have the potential to result in hydrocarbon pollution in the event of a fuel or oil spill or concrete entering the lake waters. The new trail on Bilberry Island and through the Oak-birch-holly woodland has the potential to release sediments during their construction where it is constructed within 10m of water. The new trail will cross a small stream within the Oak-birch-holly woodland (WN1) using a clear span wooden bridge.

The impact prior to mitigation is considered to be Short-term Significant Negative Effect.

Mitigation Measures

General Best Practice: Site Set-up

- A construction site compound will be established within the proposed development site and located 30m minimum distance away from watercourses or the lake. The site compound will be secured and all fuels, machinery and materials will be stored in this defined area.
- Prior to the commencement of works, the proposed development footprint area will be clearly demarcated with marking tape and no works will be permitted outside of this area.

Environmental Management

The contractor will assign a member of staff as the environmental officer who will be responsible for ensuring that all mitigation measures will be implemented full.

Sediment Control

- A 10m works buffer will be established along watercourses/waterbodies and no works or machinery will be permitted inside this buffer.
- At locations where it is not possible to maintain a 10m buffer, silt fencing consisting of posts and geotextile membrane will be erected between the works area and watercourse/waterbody. The silt fence will be secured by burying the geotextile membrane approximately 150mm below ground. Where ground conditions do not allow the burying of a silt fence due to it being rocky, sandbags can also be used.
- All stockpiles of material will be stored 30m away from watercourses/waterbodies.

Concrete Pouring

- Formwork of the appropriate dimensions and sufficient freeboard will be used for concrete pouring related to the securing of the shore blocks.
- Excess concrete will be disposed of at a dedicated area of the site with contained run-off.
- There will be no washing of concrete from machinery within 50m of watercourses or lake.
- Weather forecasts will be checked in advance of concrete pouring and will only take place during dry conditions. Concrete will not be poured during times when heavy rain is predicted.

- Care will be taken during concrete works to prevent any concrete entering the waterbody.

Hydrocarbons

- Refuelling will only be undertaken by dedicated trained and competent personnel and within the site compound.
- Fuel, oils and lubricants will be stored in a bunded area
- Plant will be inspected daily for leaks and emissions
- Spill-kits and drip trays will be kept on-site at all times.

Excavations

- Excavations will be kept to the minimum amount necessary and excavated material will be re-used where possible.
- Should any ingress of water require pumping, this will be pumped into a sealed clean tanker and removed from the site and spread on improved agricultural grassland at a distance of 50m from any watercourse or disposed of at a licenced waste facility.

Waste Management

- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for licenced disposal or recycling
- All construction waste material will be stored within the site prior to removal to a licenced waste facility
- Welfare facilities will be provided for construction operatives and will comprise of individual 'portaloo's' with no foul sewer discharge on site. The portaloo's will contain an integrated waste holding tank and they will be located within the site compound. The portaloo facility will be maintained by the service provider and removed from the site once the works are finished.

5.2.5.2 Operational Phase

It is proposed to install a wastewater treatment system for the main service building. The wastewater treatment system will consist of an O'Reilly Oakstown EN Treatment system (50PE System) or similar certified system, Ecoflo Coco Filter and gravel pressurised bed which will be installed in accordance with BS 6297 (2007) Code of Practice for the design and installation of drainage fields for use in wastewater treatment and the EPA's Wastewater treatment manual - Treatment systems for small communities, business, leisure centres and hotels (1999).

Proposed new carparks will be constructed from Tarmacadum. The surface water run-off will be collected and passed through petrol interceptors. The water will be discharged to the ground via appropriately constructed soakaways.

Significant effects are not anticipated.

5.3 Assessment of Effects on Nationally Designated Sites

The potential for significant effects to occur on Lough Macnean Upper pNHA [000986] was identified in Section 4.5. A pathway for effect was identified in relation to a deterioration of water quality affecting overall lake water quality during construction and operation. This potential effect is assessed in Section 5.2.5 above.

No significant effects as a result of the proposed development on nationally designated sites are anticipated.

5.3.1 Assessment of Effects: Biosecurity

5.3.1.1 Construction Phase

Rhododendron and cherry laurel within and adjacent to the proposed development footprint during the field surveys. Rhododendron is listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011). Most of the proposed trail locations can be routed to avoid Rhododendron and laurel. There may be some locations where this is not possible and without the appropriate measures in place, construction works have the potential to exacerbate and spread invasive species within the site.

The impact prior to mitigation is considered to be Long-term Moderate Negative Effect.

Mitigation Measures

- Prior to the outset of works a suitably qualified ecological clerk of works (ECoW) will mark any laurel or Rhododendron which occur within or immediately adjacent to the proposed development footprint with yellow marker tape.
- Invasive species outside of the proposed development footprint will be avoided and marked by the ECoW if necessary with red and white marker tape to ensure they are not disturbed.
- Prior to the commencement of works the ECoW will hold a toolbox talk with the contractor to clearly explain the following mitigation described in this plan. The ECoW will supervise all of the invasive species works.
- All stems of the marked laurel and Rhododendron plants within and immediately adjacent to the proposed development footprint will be cut close to the ground. Cut material will be stacked away from cut stumps and formed into a dead hedge or alternatively mulched and material removed from site.
- If creating a dead hedge, care should be taken not to bury branches in soil where they have the opportunity to re-sprout
- The remaining stumps and root balls should be dug out using an excavator removing all viable roots with the excavator or manually.
- As much soil as possible should be knocked off the root system and the roots should be turned upside down to expose the roots to the air and to allow rain to wash off remaining soil.
- Stumps should then be removed from the site to be burnt or left in situ upside down.
- Imported stone or fill will be sourced from a site free of invasive species.
- Good construction site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (e.g. Rhododendron etc.) by thoroughly washing vehicles prior to entering and leaving any site.
- All machinery entering or leaving the site will be thoroughly washed down.
- Any stone used at the site will be screened for invasive species

Residual Impact

Significant effects are not anticipated.

5.3.1.2 Operational Phase

No significant effects as a result of biosecurity are anticipated.

6 Cumulative Effects

The proposed development was considered in combination with other plans and projects in the area that could result in cumulative effects on ecological receptors.

A search of the online planning system for Leitrim County Council for existing, proposed and approved projects recent planning applications within the past five years was undertaken on the 01/12/2023 for the townlands of Laghty, Ardmoneen, Carrickrevagh and Moneyduff. Refused, withdrawn and incomplete information applications were not included in the assessment. No planning applications were returned for the townland of Laghty, Ardmoneen or Moneyduff.

The following planning application was returned for Carrickrevagh;

- PI. Ref. 22150 elevational changes to the existing dwelling granted under parent planning ref 03/1396 and upgrade of wastewater treatment system.

The proposed arboretum will be developed within an area where the following forestry felling licence has been applied for;

- LM07-FL0030

The following other plans and projects that were considered in the assessment;

- The Leitrim County Development Plan 2023-2029 was reviewed and considered as part of this assessment. The review focused on policies and objectives that relate to biodiversity and designated sites.

After the assessment of impacts was undertaken in Section 5, no pathways for effect were identified after the design and mitigation of the proposed project were identified when the project is considered individually. In the review of other plans and projects described above, no additional pathways for effect on ecological receptors were identified as a result of those plans or projects. Neither was there any potential for additional effects resulting from the combination of the various projects and plans in association with the proposed development.

No potentially adverse cumulative and/or in-combination effects on any ecological receptor has been identified with regard to the proposed project.

7 Conclusion

The project was assessed following the consideration of residual effects (post implementation of mitigation) and it can be concluded that the proposed development will not result in any significant effects on the biodiversity of the existing environment.

As long as the proposed development is constructed and operated in accordance with the design and mitigation that is described within this report, significant effects are not anticipated on biodiversity at any geographical scale.

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Appendix 1: Proposed Boardwalk Design Drawings



Access path, needs to be determined by on-site

Hinged gateway into floating concrete boardwalk

Rails to sides of boardwalk, design TSD

Piercion units received others. Positioning, depth and diameter TSD

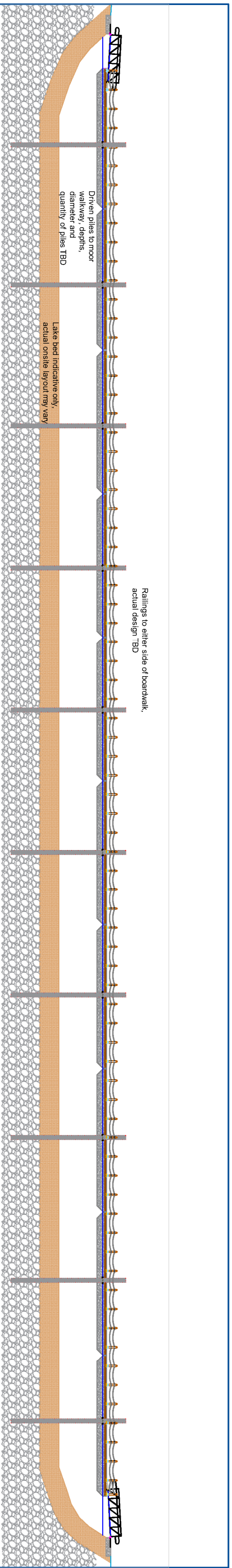
Concrete slabs between gateway connection

Link path between floating boardwalks

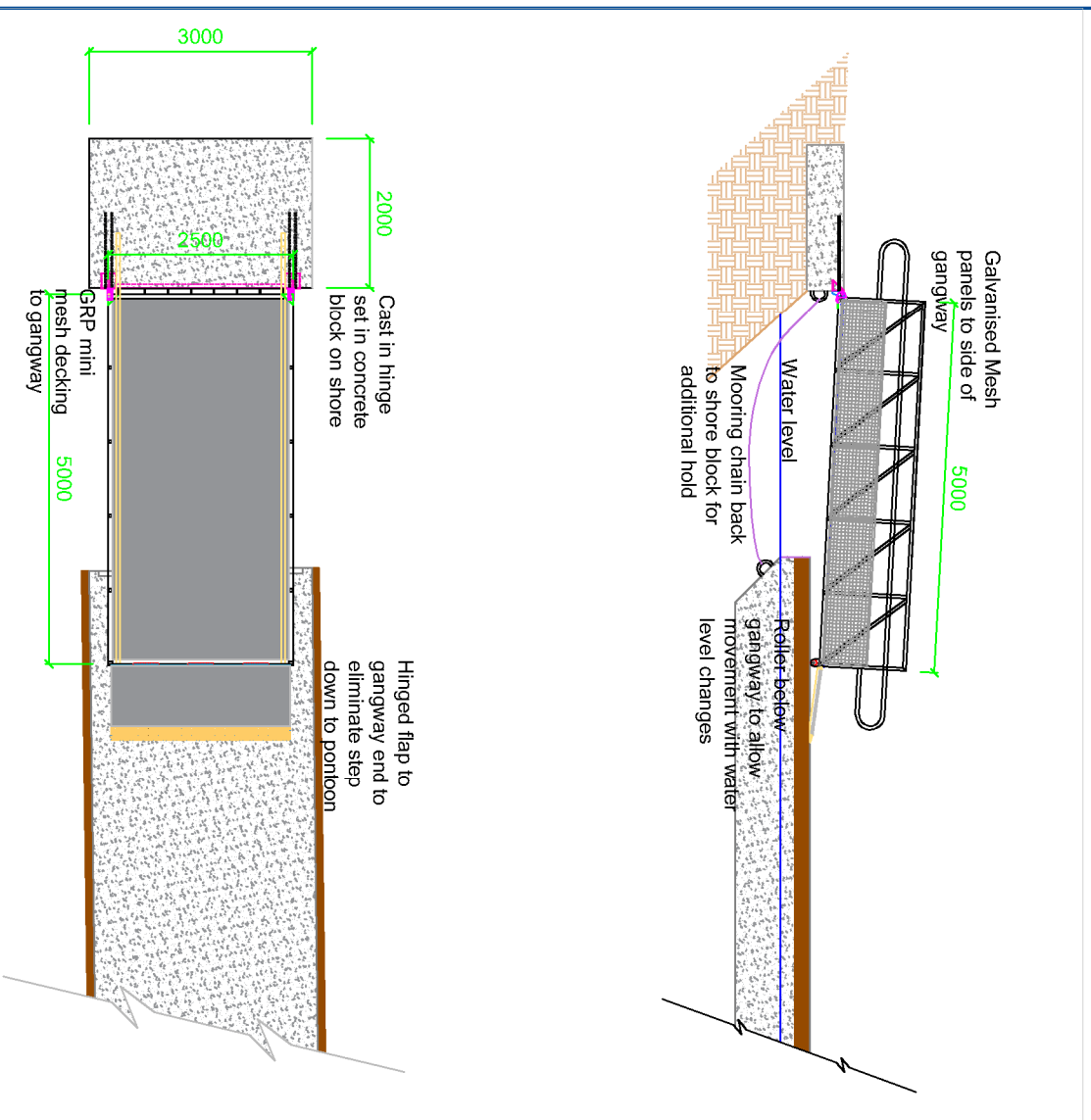
Exact positioning of floating piercion units must be determined under conditions, distance around interlocks may be necessary

Platform on piles with fixed gateway deck to shore and hinged down to TSD

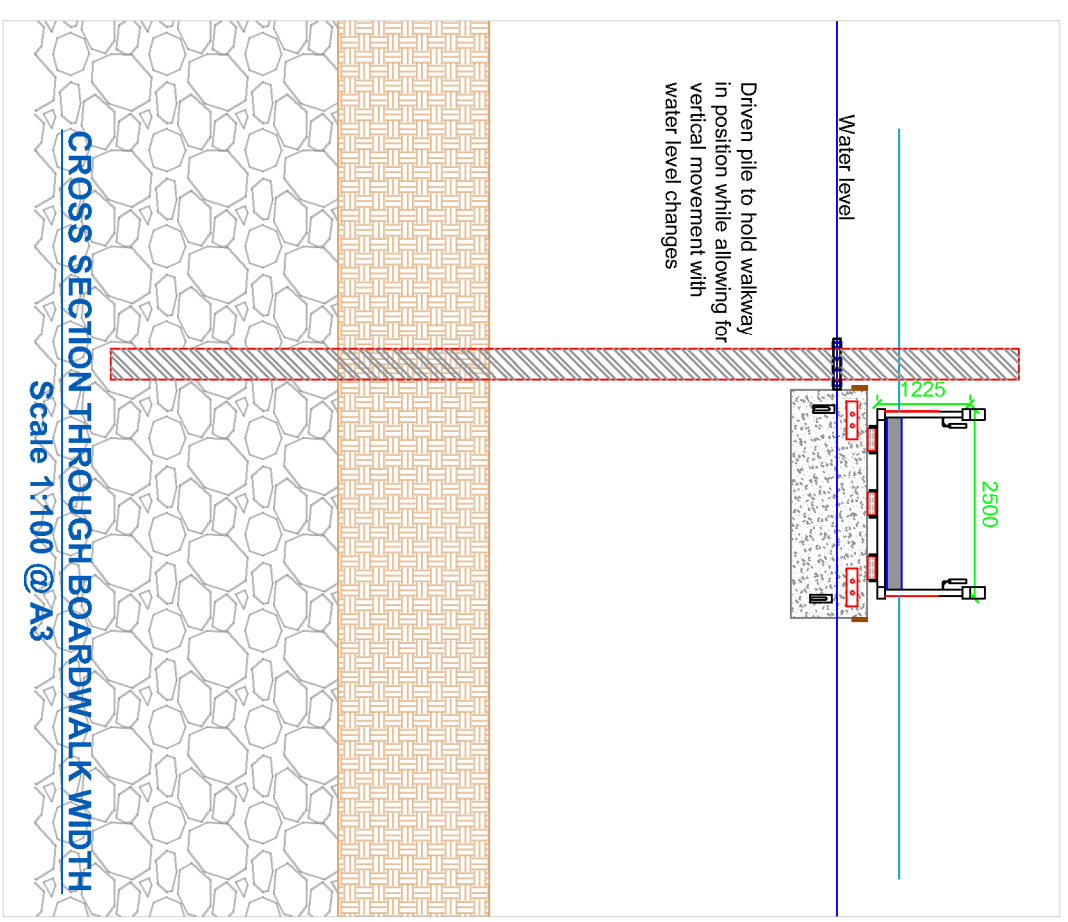
		CLIENT Queensland Government Queensland Department of Environment and Science Queensland Department of Transport and Main Roads
PROJECT Queensland Damages Floating boardwalks		DATE 28/01/23
DRAWING TITLE Proposed Layout - Drive pile option CONSULTANTS IONS/ES/BR/ONS		SCALE 1:400 @ A1
BUDGET DRAWING		DATE 28/01/23
DESIGNER KT		SCALE 1:400 @ A1
ENGINEER KT		DATE 28/01/23
CHECKER KT		SCALE 1:400 @ A1
APPROVER KT		DATE 28/01/23
COMMENTS		DATE 28/01/23
REVISIONS		DATE 28/01/23
APPROVALS		DATE 28/01/23



CROSS SECTION THROUGH BOARDWALK LENGTH
Scale 1:400 @ A3



GANGWAY LINK TO BOARDWALK
Scale 1:100 @ A3



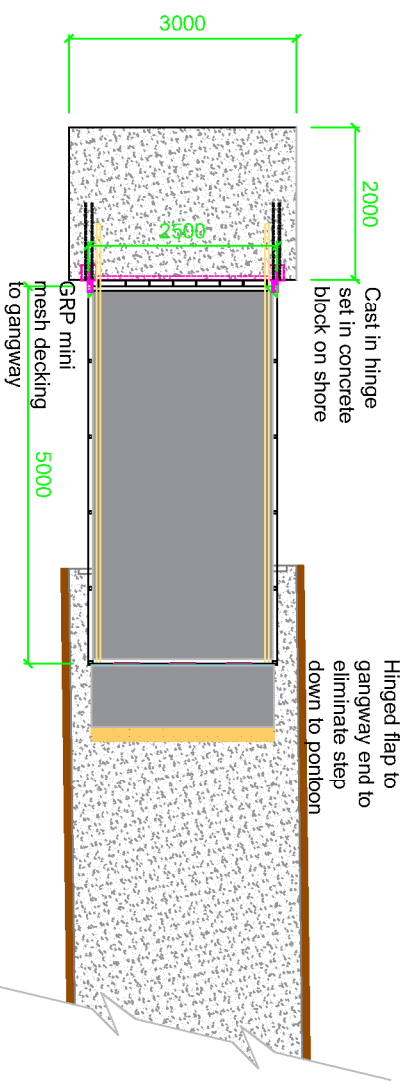
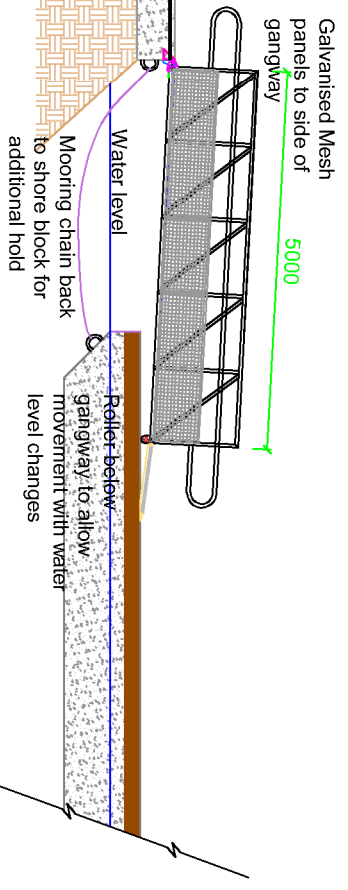
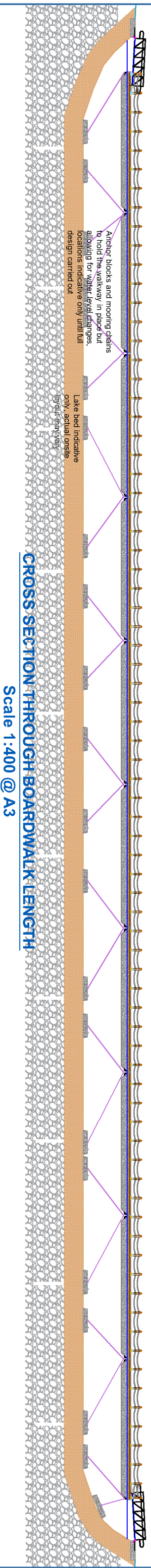
CROSS SECTION THROUGH BOARDWALK WIDTH
Scale 1:100 @ A3

		CLIENT Coilte PROJECT Glenfarne Demense - Floating Boardwalk		Grades of Steel (if applicable) Structural Steel Grade to EN 10025: 2004 Minimum S235 for Hollow Section and S275 for Other Sections Welding: (if applicable) Metal Arc Welding to EN 1011-1 and EN 1011-2 Braze Filler Welds, Next Finish, Grind Smooth Finishing: (if applicable) All steelwork to be hotdip galvanized to I.S. EN 1461:2009 Venting & draining holes as required	
TENDER DRAWING		Drawn by: KT	Material: XXX	Rev: 0	COMMENTS
DRAWING TITLE Cross section & Gangway connection - Piled option	DATE 03/05/2023	Eng. Check: XX	Weight (Kg) XXX	0 XXX	Date By
DRAWING NUMBER ICM/S/2298/00/04	SCALE As Shown @ A3	OP's Check: XX	Total XXX	Rev. 0	By
		Quantity Left XXX	Right XXX		

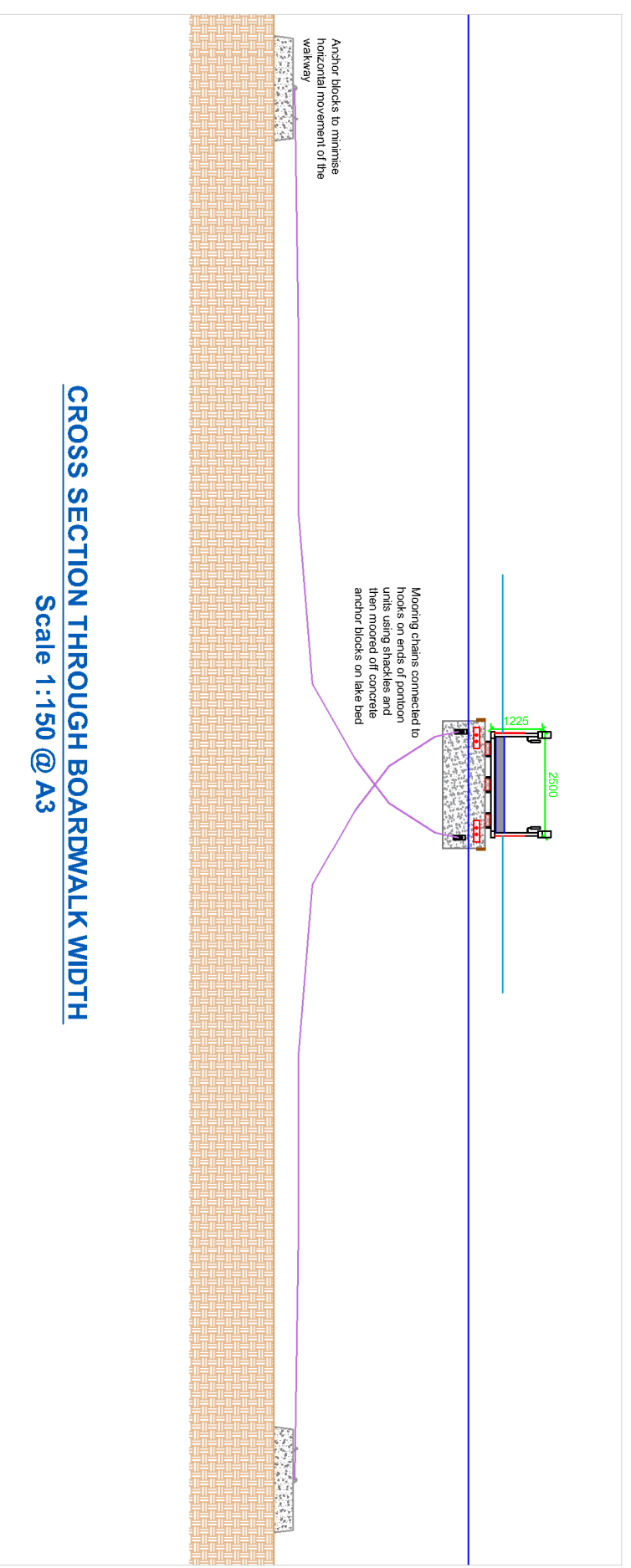
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Railings to either side of boardwalk.
actual design TBD

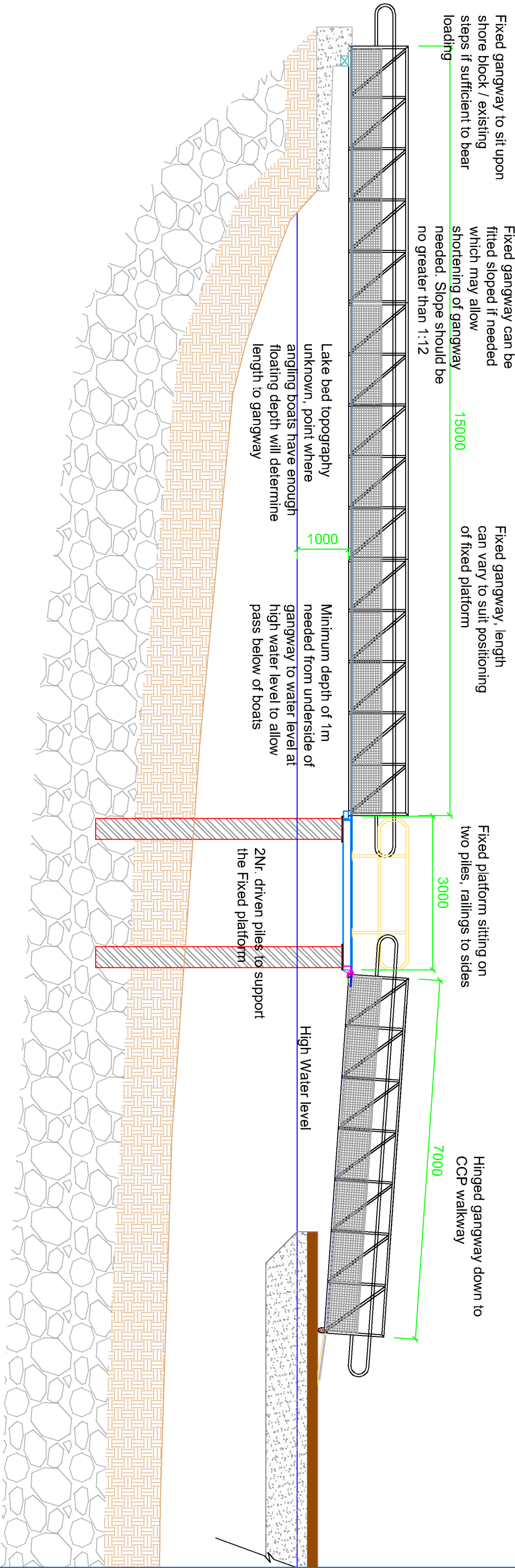


GANGWAY LINK TO BOARDWALK
Scale 1:100 @ A3



CROSS SECTION THROUGH BOARDWALK WIDTH
Scale 1:150 @ A3

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<p>TENDER DRAWING</p>		<p>Drawn by: KT</p>		<p>Material: XXX</p>		<p>Rev: 0 XXXX</p>		<p>COMMENTS</p>		<p>Date By</p>	
<p>DRAWING TITLE Cross section & Gangway connection - Anchor block / Mooring chain option</p>		<p>DATE 03/05/2023</p>		<p>Eng. Check: XX</p>		<p>Weight (Kg)</p>		<p>Quantity</p>		<p>Rev.</p>	
<p>DRAWING NUMBER ICMS/2298/00/03</p>		<p>SCALE As Shown @ A3</p>		<p>OP's Check: XX</p>		<p>Total XXX</p>		<p>Left XXX</p>		<p>COMMENTS</p>	
				<p>Right XXX</p>							



Fixed gangway to sit upon shore block / existing steps if sufficient to bear loading

Fixed gangway can be fitted sloped if needed which may allow shortening of gangway needed. Slope should be no greater than 1:12

Fixed gangway, length can vary to suit positioning of fixed platform

Fixed platform sitting on two piles, railings to sides

Hinged gangway down to CCP walkway

Lake bed topography unknown, point where angling boats have enough floating depth will determine length to gangway

Minimum depth of 1m needed from underside of gangway to water level at high water level to allow pass below of boats

2Nr. driven piles to support the Fixed platform

High Water level

		CLIENT Coilte PROJECT Glenfarne Demense - Floating Boardwalk	
DRAWING TITLE Fixed gangway & platform elevation for boat pass under		Drawn by: KT	
DRAWING NUMBER ICMS/2298/00/05		DATE 14/06/2023	
SCALE 1:75 @ A3		Eng. Check: XX	
OP's Check: XX		Material XXX	
Quantity		Weight (Kg) XXX	
Total XXX		Total XXX	
Left XXX		Left XXX	
Right XXX		Right XXX	
Rev. 0 XXX		COMMENTS	
Date By		Date By	

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Grades of Steel (if applicable)
 Structural Steel Grade EN 10025: 2004
 Minimum S235 for Hollow Section and S275 for Other Sections
Welding: (if applicable)
 Metal Arc Welding to EN 1011-1 and EN 1011-2
 Semi-Automatic Metal Arc Welding to EN 1011-1 and EN 1011-2
Finishing: (if applicable)
 All steelwork to be hotdip galvanized to U.S. EN 1461:2009
 Venting & draining holes as required

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Appendix 2: Aquatic Survey Report

Aquatic baseline report for proposed floating boardwalk development at Lough MacNea Upper



Prepared by Triturus Environmental Ltd. for Coillte

October 2023

Please cite as:

Triturus (2023). Aquatic baseline report for proposed floating boardwalk development at Lough MacNea Upper. Prepared by Triturus Environmental Ltd. for Coillte. October 2023.

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were contracted by Coillte to conduct an aquatic baseline survey of Lough MacNea Upper at Glenfarne near Bilberry Island, Co. Fermanagh (**Figure 1.1**). The objective of the survey was to establish an aquatic and fisheries baseline on the western side of the lake basin in the vicinity of a proposed floating boardwalk development. This included a combined approach of documenting the physical condition of the lake habitat, physiochemical water quality analysis, macro-invertebrates (including crayfish), macrophytes and assessing the fisheries status of the survey area. The data was compiled using a combination of a desktop review and onsite data collation through a comprehensive boat based survey. This would inform ecological constraints (i.e. the presence of sensitive aquatic habitats and species) that would inform the design proposals to minimise impacts to the sites ecological sensitivities.

1.2 Study site

Lough MacNea is a large lake with a surface area of 644ha that crosses shares borders with three counties, Fermanagh, Leitrim and Cavan with the northern Ireland border running in a north south plane through the lake basin (**Figure 1.1**). Lough MacNea is considered a mesotrophic lake with a mean depth of 5.2m and maximum depth of 22.7m (Kelly et al. 2014). According to Kelly et al. (2014) the lake falls into typology class 8 (as designated by the EPA for the Water Framework Directive), i.e. deep (>4m), greater than 50ha and of moderately alkaline (20-100mg/l CaCO₃). The majority of lake basin lies on Upper Visean Sandstone with parts of the southern shoreline being of Upper Carboniferous Limestone.

This Lake has both a 'High Visual Amenity' and an 'Outstanding Views and Prospects' designation in the County Development Plan (EPA, 2021). Lough MacNea Upper also has a proposed Natural Heritage Area (pNHA) designation for its southern basin and shoreline area (EPA, 2021; NPWS, 2009). This extends from the early work of Roger Goodwillie given the limestone bedrock of the Cavan shoreline supports a notable lakeshore community with nationally localised species such as Northern Bedstraw (*Galium boreale*) (Goodwillie, 1981). The lake supports notable aquatic plant communities with species including six-stamened waterwort (*Elatine hexandra*) and needle spike-rush (*Eleocharis acicularis*) (NPWS, 2009), albeit these species are not nationally scarce.

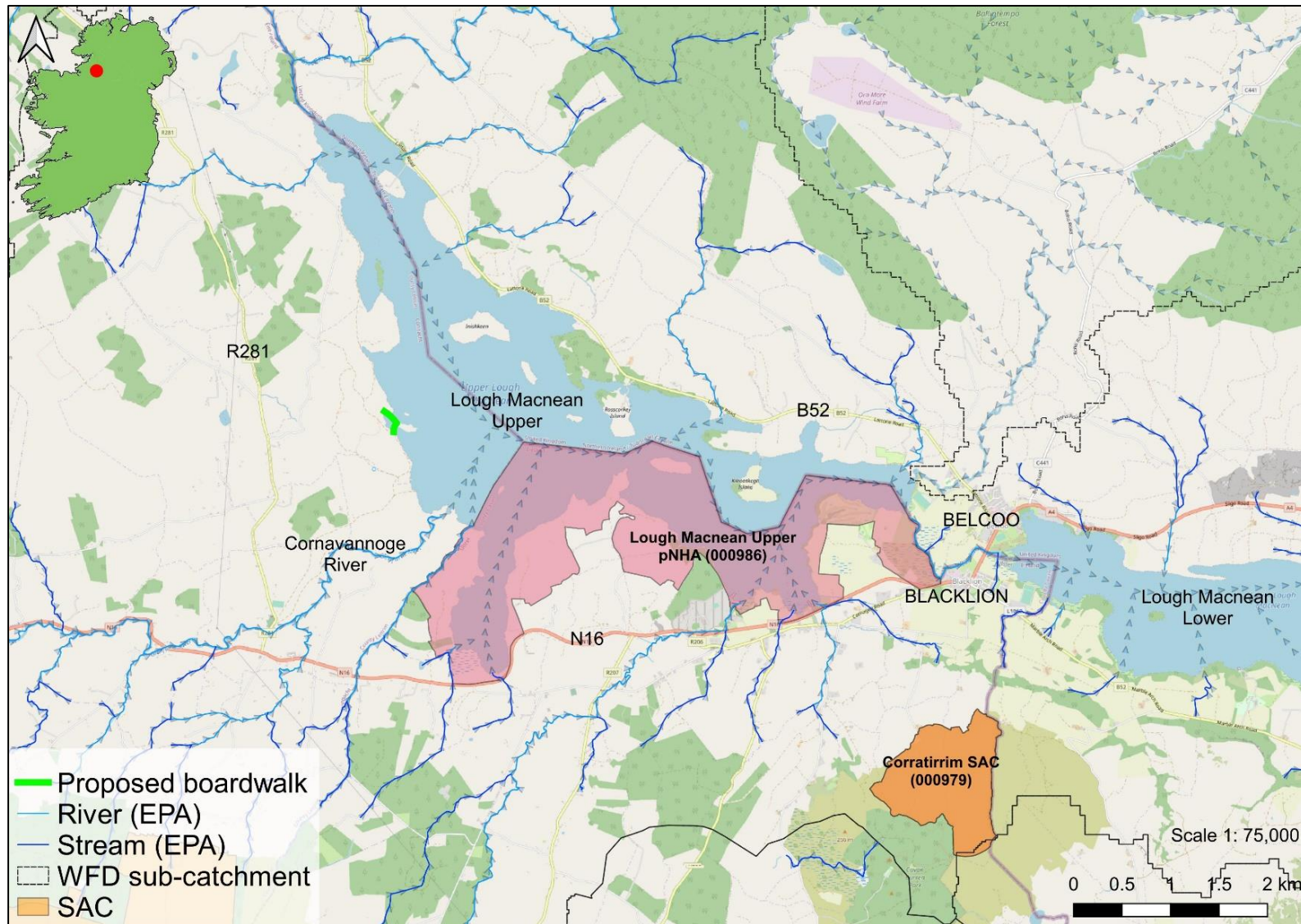


Figure 1.1 Overview map of the Lough MacNeen Upper study area showing the pNHA designation along the southern shoreline

2. Methodology

2.1 Desktop review – rare and protected aquatic species

A desktop survey of published and unpublished data for the study area in the vicinity of Lough MacNea Upper in respect of rare and or protected aquatic flora and fauna. This was undertaken by searching the NBDC, BSBI and WFD Fish databases to establish records in the vicinity of the study area.

2.2 Site visit

A site visit was conducted on Lough MacNea Upper on the 6th July 2023. The lake was broadly characterised in terms of its physical habitats, fisheries habitat, macro-invertebrate, macrophyte (aquatic plant) and aquatic bryophyte communities. These approaches are detailed below. The survey area overlapped the proposed footprint of the floating boardwalk to examine for the presence of aquatic ecological features of interest over the proposed footprint. This was conducted over two transects (areas A & B; **Figure 2.1**).

2.3 Macro-invertebrates

Three composite macro-invertebrate samples (from several sweep samples) were collected from the Lough MacNea Upper between Bilberry Island and the connecting shorelines overlapping the proposed boardwalk in July 2023, by boat traversing the lake littorals. The composite sample was taken with a standard kick sampling hand net (250mm width, 300mm deep with 500µm mesh size). The net was also moved along the bed to collect epibenthic and epiphytic invertebrates from the substratum and macrophytes (as per Cheal et al., 1993). A 3-minute sampling period was divided amongst the range of meso-habitats present to get a representative sample for mesohabitats (e.g., macrophyte beds, silt, gravel areas etc.). Samples were elutriated, live sorted and fixed in 70% ethanol for subsequent laboratory identification. Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), stoneflies (Feeley et al., 2020), mayflies (Kelly-Quinn & Regan, 2012) and other relevant taxa (e.g., Byrne et al., 2009; Nelson et al., 2011).

2.4 Crayfish

The crayfish survey was undertaken under the National Parks and Wildlife (NPWS) under license no. C24/2023, as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2012) to capture and release them to their site of capture under the conditions of the licence.

Twelve 50cm x 20cm, 20mm diamond mesh polypropylene “Trappy” crayfish traps, ballasted with extra rock to prevent excessive movement, were positioned along Bilberry Island and along the shoreline tie in points for the boardwalk. Traps were fished in pairs and were positioned in suitable marginal areas the night before and retrieved the following morning. All traps were baited with 100grams of tuna-flavoured cat food placed in cable-tied mesh bags. Oily food such as tuna-based products offer greater attractant properties to crayfish because of the oil-scent dispersion (pers. obs.).

Snorkel surveys and boat drifts with a bathyscope were also employed to visually examine the lake littorals for crayfish. Macrophyte vegetation was also swept using pond nets to examine for the presence of juvenile crayfish. Combined, these methods helped maximise the detection of crayfish.



Plate 2.1 Crayfish traps prior to deployment, with sweep net and bathyscope to aid with physical and visual searches

2.5 Physiochemical water quality

Two composite physiochemical water quality samples were collected from Lough MacNea Upper in July 2023 from the open water in the vicinity of the proposed boardwalk area. Samples were cooled and delivered to the laboratory for analysis on the day of collection. The samples were tested for a suite of physiochemical parameters that would help determine lake trophy and alkalinity, namely;

- Conductivity @25°C ($\mu\text{s}/\text{cm}$)
- pH
- Total Alkalinity ($\text{mg CaCO}_3/\text{l}$)
- Suspended solids (mg/l)
- Ortho-phosphate ($\text{mg P}/\text{l}$)
- Total phosphorus ($\text{mg P}/\text{l}$)
- Chlorophyll a ($\mu\text{g}/\text{l}$)
- Nitrate ($\text{mg N}/\text{l}$)
- Nitrite ($\text{mg N}/\text{l}$)
- Unionised ammonia ($\text{mg N}/\text{l}$)
- Total ammonia ($\text{mg N}/\text{l}$)

2.6 Macrophyte and aquatic bryophyte survey

Macrophyte (aquatic plant) and bryophyte (aquatic mosses and liverworts) surveys were conducted using a macrophyte grapnel from the boat. Specimens were identified to species level, where possible, using relevant taxonomic keys. Species were cross-referenced with relevant red lists (i.e. Lockhart et al., 2012; Wyse-Jackson et al., 2016). The macrophytes recorded are summarised under the transect surveys in the results section below.

2.7 Biosecurity

In keeping with standard best practice for environmental surveys, a strict biosecurity protocol following the Check-Clean-Dry approach was employed during the survey. Equipment and PPE used was also disinfected with Virkon® before and after use to further prevent the transfer of pathogens and/or invasive species.



Figure 2.1 Map of two transect survey areas overlapping the proposed floating boardwalk at Lough MacNeen, July 2023

3. Results

3.1 Desktop review

Rare and protected aquatic species

A comprehensive desktop review of available data did not identify a low number of rare and or protected aquatic species records for the 1km grid square (H0239) containing the study area in the vicinity of Bilberry Island.

No aquatic macrophytes or bryophytes listed under the Flora (Protection) Order S.I. No. 235 (2022) were present in the 1km grid square containing the study area on review of the BSBI database. In a similar fashion no red-list stonewort (Stewart and Church, 1992) are known from the study area.

White-clawed crayfish are known from the 1km grid square south of the study area (H0238) but not within the 1km grid square overlapping the study area (H0239).

Fisheries

According to Inland Fisheries Ireland (Kelly et al. 2016), a total of six fish species and one cyprinid hybrid were recorded on Lough Macnean Upper during July 2016, with 778 fish being captured. Perch (*Perca fluviatilis*) was the most common fish species recorded, followed by roach (*Rutilus rutilus*), roach x bream hybrids, eel (*Anguilla anguilla*), bream (*Abramis brama*), brown trout (*Salmo trutta*) and pike (*Esox lucius*). The lake can thus be considered representative of a mixed coarse fishery with a small salmonid population.

3.2 Site description

Survey Area A

Survey area A was situated between the point to the island (**Figure 2.1; Plates 3.1 & 3.2**). The proposed boardwalk location minimised overlap with well-developed reed fringes and associated macrophyte communities. The lake had shallow littorals of mixed rocky boulder and compacted mud and silt. The littorals supported abundant common club rush (*Schoenoplectus lacustris*) on the shelf zone of the lake littoral with frequent common reed (*Phragmites australis*) in the margins to the north of the boardwalk intersection with the shoreline. Reedmace (*Typha latifolia*) and lesser pond sedge (*Carex acutiformis*) were localised with yellow water lily (*Nuphar lutea*) recorded as rare but becoming more frequent west of the boardwalk intersection with the landward side of the study area. The lake littorals had higher densities of macrophyte plants north of the landward side of the floating boardwalk and west of the intersection with the southern shoreline of Bilberry Island. This is also visible from ortho-photography (**Figure 2.1**).

Water horsetail (*Equisetum fluviatile*) and white water lily (*Nuphar alba*) were occasional along the western fringes of Bilberry Island in small patches in the littorals along with more frequent clubrush and phragmites. The moss species *Fontinalis antipyretica* was recorded as occasional on large boulder with *Platyhipnidium riparoides* and *Porella pinnata* recorded as rare. Grapnel samples from the deeper water only recorded *Elodea canadensis* that was frequent overall with *Nitella* sp. being recorded as

rare. The island littorals also supported occasional purple loosestrife (*Lythrum salicaria*) and marsh cinquefoil (*Comarum palustre*). The proposed location for the boardwalk limited encroachment on the identified macrophyte plant communities with sparse common reed cover being the most common species where the boardwalk intersected Bilberry Island.



Plate 3.1 Representative image of the southern shoreline of Bilberry Island at the proposed boardwalk intersection with the island



Plate 3.2 Representative image of the western shoreline on the landward side of the proposed boardwalk, Lough MacNea Upper

Survey Area B

Survey area B was situated between the north shoreline of Bilberry Island and the large bay to the northwest where the proposed boardwalk intersected with the land (**Figure 2.1; Plates 3.3 & 3.4**). The lake had shallow littorals of mixed rocky boulder and compacted mud and silt on the landward side. The littorals supported abundant common club rush on the shelf zone of the lake littoral with frequent common reed but these were very sparse in the boardwalk footprint. Yellow water lily and broadleaved pondweed were recorded as rare. Grapnel samples from the deeper water only recorded occasional Canadian pondweed. The landward side of the boardwalk supported abundant grey willow (*Salix cinerea* sp. *oleifolia*) with occasional ash (*Fraxinus excelsior*) and frequent downy birch (*Betula pubescens*) along the bank top. Rhododendron (*Rhododendron ponticum*) was present locally near the point in the north of the bay. The boardwalk intersection with the north side of Bilberry Island supported no macrophytes as the shelf zone was vertical and deep with large boulders precluding silt settlement for rooting macrophytes. The margins supported purple loosestrife and marsh ragwort (*Jacobaea aquatica*) very locally with both species recorded as rare. The island support mature trees comprising grey willow, alder, birch, ash, holly (*Ilex aquifolium*) and lodgepole pine (*Pinus contorta*).

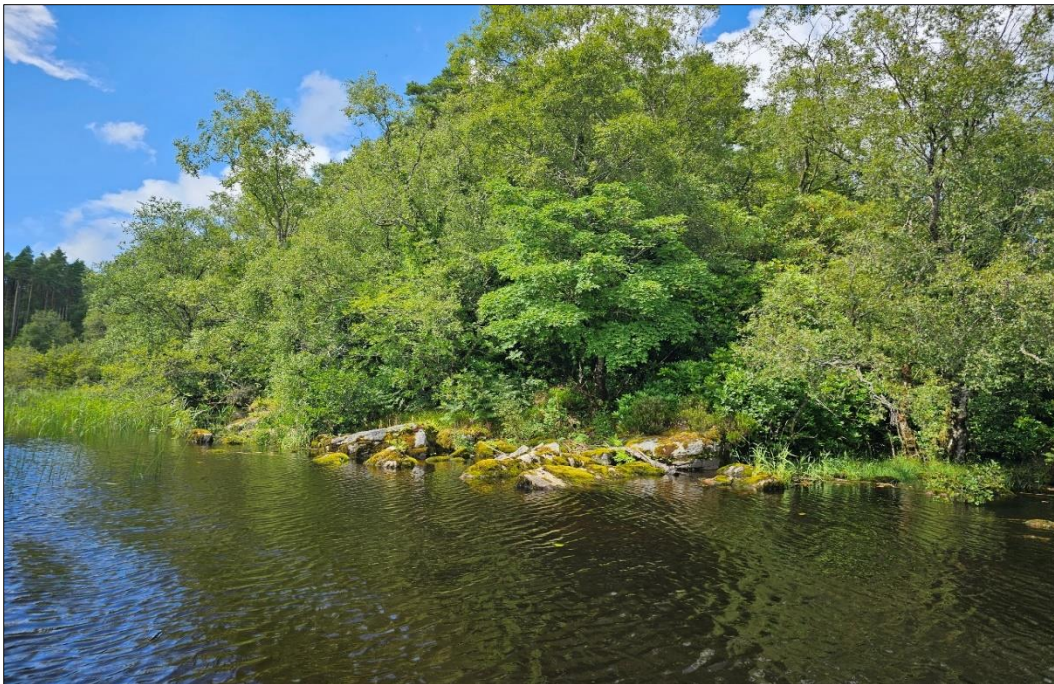


Plate 3.3 Representative image of the landward site of the proposed boardwalk northwest of Bilberry Island



Plate 3.4 North side of Bilberry Island shelving into the deep water of Lough MacNea Upper

3.3 Macro-invertebrate community including crayfish

In July 2023, three composite macro-invertebrate sweep samples were collected from the lake (east and west). A total of $n=22$ species representing $n=20$ families were recorded (**Table 3.1**). The abundances of macro-invertebrates were relatively low overall (≤ 53 per sample).

Coleopteran diversity was not high with only three species recorded. *Gyrinus substriatus* was recorded in moderate densities in sample 2. However, this whirligig beetle species is of least concern and common in sheltered bays adjoining macrophyte vegetation. Two caddis species were recorded namely, *Anthripsodes atterimus* and *Plectonemia conspersa*. Both are ubiquitous caddis species of lentic waterbodies, rivers and streams with a widespread distributions in Ireland (O' Connor, 2020). A single mayfly species, *Cloeon simile* was recorded. This species is a widespread species of lentic waterbodies but avoids highly acidic sites (Kelly-Quinn & Regan, 2012).

In summary there were no rare or protected macro-invertebrate species recorded in the Lough MacNea Upper samples according to national red lists for aquatic beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012) and other relevant taxa (e.g., molluscs; Byrne et al., 2009).

No white-clawed crayfish were recorded during the targeted trapping, snorkelling and sweep sampling. The higher alkalinity of the southern basin of the lake being of limestone, has more suitability for crayfish and this may explain the species absence from the study area. This would be supported by the known records for the species according to the NBDC (refer to desktop review).

Table 3.1 Macro-invertebrate community recorded from Lough MacNean Upper, July 2023

Taxon	Family	Species	Common name	S1	S2	S3
Ephemeroptera	Baetidae	<i>Cloeon simile</i>	Lake olive	1		
Trichoptera	Leptoceridae	<i>Anthripsodes atterimus</i>	Silverhorn sedge	1		
Trichoptera	Polycentropodidae	<i>Plectronemia conspersa</i>	Caseless caddis			1
Odonata	Aeshnidae	<i>Aeshna</i> sp.	Hawker dragonfly		2	
Coleoptera	Dytiscidae	Dytiscid larvae	Predatory diving beetle	14	2	
Coleoptera	Gyrinidae	<i>Gyrinus substriatus</i>	Whirligig beetle		9	
Diptera	Ceratopogonidae	sp. indet.	Biting midges			1
Diptera	Chironomidae	Non <i>Chironomus</i> sp.	Non-biting midge	4	8	3
Diptera	Culicidae	sp. indet.	Mosquito			1
Amphipoda	Crangonyctidae	<i>Crangonyx</i> sp.	Freshwater shrimp	1		
Amphipoda	Gammaridae	<i>Gammarus duebenii</i>	Freshwater shrimp	2	7	14
Hemiptera	Corixidae	<i>Corixidae</i> nymph	Water boatman	1	2	1
Hemiptera	Corixidae	<i>Hesperocorixa linnaei</i>	Water boatman	5	7	1
Hemiptera	Notonectidae	<i>Notonectid</i> nymph	Backswimmer	1		
Crustacea	Asellidae	<i>Asellus aquaticus</i>	Freshwater hog louse	19	16	11
Mollusca	Bithyniidae	<i>Bithynia tentaculata</i>	Faucet snail	1		
Mollusca	Lymnaeidae	<i>Ampullacaena balthica</i>	Wandering snail	1		
Mollusca	Planorbidae	<i>Gyraulus albus</i>	White ramshorn		1	
Mollusca	Planorbidae	<i>Planorbis planorbis</i>	Margined ramshorn	2		
Mollusca	Sphaeriidae	sp. indet.	Pea mussel			1
Hirudinea	Glossiphoniidae	sp. indet.	Leech		1	1
Abundance				53	55	35
Taxon Richness				12	10	9

3.4 Physiochemical water quality

Two composite physiochemical water quality samples were collected from Lough MacNean (in July 2023). The results of the laboratory analysis are summarised below in **Table 3.2** below.

The pH levels were very normal (circum-neutral) (7.56 & 7.57, respectively) for a moderate alkalinity lake (29 mg CaCO₃/l at both sites) and were reflective of local sandstone geology and size best fell under a WFD lake typology of 8 (i.e., moderate alkalinity, large and deep).

With regards nutrients, levels of total phosphorus were low to moderate at 0.027mg P/l in both samples. Therefore, the lake failed marginally to achieve good status as required in the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. 77/2019) (i.e., good status is ≤0.025mg P/l). The levels of ortho-phosphate (the remaining phosphorous available for plant uptake, also called MRP, molybdate reactive phosphate) were low (≤0.003mg P/l) in July 2023. Ortho-P is subject to significant biological (plant) uptake in the growing season and can drop to very low concentrations in summer in waterbodies due to macrophyte and algae growth. Thus, our snapshot results are unlikely to accurately reflect the true levels of bioavailable phosphorus within the lake that is likely to be higher over annual monitoring (i.e., a multi-seasonal approach would be required for accurate results). This would be supported by the status of the lake being at risk and falling under 'moderate status' according to the EPA due to known catchment pressures from forestry and agriculture.

Whilst S.I. 77/2019 sets no specific boundary conditions for nitrate, EPA assessment of high-quality water (riverine) sources has set boundary conditions of 0.8 mg/l NO₃-N for high quality waters and 1.8 mg/l NO₃-N for good quality waters (O'Boyle et al., 2019). However, there are no set thresholds for nitrate in lakes under the legislation. Levels in Lough MacNean upper may be considered good overall (0.097 and 0.099 mg/ N). Furthermore, biological uptake of the available nitrogen by plants and algae during the growth season/summer results in the lowest annual concentrations and true values may be higher over the course of a year.

The chlorophyll a concentration was low at the time of sampling (11.15 & 11.65µg/l), thus indicating upper mesotrophic conditions (8-25µg/l; according to OECD, 1982). However, it should be noted that lake trophic status is only reliably calculated from annual maximum values of chlorophyll a, total phosphorus and water transparency (Secchi disc depth) across ≥10 samples during months with the greatest planktonic growth (O'Boyle et al., 2019). The ammonia levels were low for both total ammonia and unionised ammonia fractions (**Table 3.2**), the latter being toxic to aquatic life when high.

Table 3.2 Summary of physio-chemical water quality results for Lough MacNea Upper, July 2023

Parameter	S1	S2
Conductivity ($\mu\text{s}/\text{cm}$)	110	111
pH	7.56	7.57
Alkalinity ($\text{mg CaCO}_3/\text{l}$)	29	29
Suspended solids (mg/l)	3.3	3.5
Total phosphorous ($\text{mg P}/\text{l}$)	0.027	0.027
Ortho-P ($\text{mg P}/\text{l}$)	0.001	0.003
Chlorophyll a ($\mu\text{g}/\text{l}$)	11.15	11.65
Nitrate ($\text{mg N}/\text{l}$)	0.099	0.097
Nitrite ($\text{mg N}/\text{l}$)	0.003	0.003
Unionised ammonia ($\text{mg N}/\text{l}$)	<0.001	<0.001
Total ammonia ($\text{mg N}/\text{l}$)	0.015	0.011

4. Discussion

Lough MacNea Upper is a deep mesotrophic lake of moderate alkalinity with peat stained water. The study area in the vicinity of Billberry Island had a moderate diversity of macrophyte plants but did not support any rare or protected macrophytes or associated lacustrine Annex I aquatic habitats.

No rare or protected macro-invertebrate species were recorded in the composite lake samples collected when compared to national red lists for aquatic beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012) and other relevant taxa (e.g., molluscs; Byrne et al., 2009).

The lake fisheries habitat was representative of a mixed coarse fishery with a small brown trout population (Kelly et al. 2016). However, no highly sensitive fisheries habitat overlapped the proposed boardwalk areas, which have been positioned to minimise contact with emergent macrophytes in the lake littorals. This approach avoids aquatic habitats of greater importance that would act as invertebrate and coarse fish nursery areas.

Considering the absence of any highly sensitive aquatic habitats and species being present in the vicinity of the proposed floating boardwalk, no significant ecological constraints with regards to aquatic ecology were identified. This is also considered in light of the lower risk to the aquatic ecology of the lake posed by a non-permanent floating boardwalk structure.

5. References

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