NATURA IMPACT STATEMENT

Provision of a New Boathouse

Doorly Park, Sligo, County Sligo

Report prepared by Woodrow Sustainable Solutions Ltd.

For Sligo Rowing Club

October 2020

DOCUMENT CONTROL

Document	Natura Impact Statement for proposed Boat house, Garavogue River, Sligo Town, Co. Sligo.
Client	Sligo Rowing Club and Sligo Kayak Club Doorly Park, Sligo Town
Prepared by	Woodrow Sustainable Solutions Ltd, Main Street, Ballisodare, Co Sligo, Ireland. T: +353 719140542
Lead Author	Will Woodrow MSc MSc (Arch) CEcol MCIEEM
Checked internally	Róisín NigFhloinn
Checked by Client	Rory Clarke
Approved by	Róisín NigFhloinn and Will Woodrow
Status / Version / Date	Draft / D01 / 22.10.2020

STATEMENT OF AUTHORITY

The report has been written, checked and approved by Will Woodrow. Will is a Director at Woodrow Sustainable Solutions. Will Woodrow is an experienced ecologist with over 30 years of experience in ecological surveys and assessment.
Will is a Chartered Ecologist and a full member of the Chartered Institute of Ecology and Environmental Management. As such, he is required to abide by a strict code of professional conduct in all aspects of his work.

Nicole Fleming and Juliane Kohlstruck also provided input into this report. Nicole is a BSc graduate of Freshwater and Marine Biology. She is employed by Woodrow Sustainable Solutions as a graduate ecologist and ECoW. Nicole also assists in many surveys (bats, birds and habitats), data collection and analysis. Nicole provided input in the form of desk studies and collation of information for the report. Juliane has a MSc a BSc in Landscape Ecology. She undertakes ecological surveys, especially habitats and specialist plant surveys and provides input into reports from constraints studies to EcIAs and NISs.

An internal review and approval of this report was conducted by Róisín NigFhloinn. She is a Senior Ecologist with Woodrow Sustainable Solutions. She has completed an honours B.Sc. specialising in Botany and M.Sc. in Ecology and Management of the Natural Environment. She is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). She regularly carries out reporting on Ecological Impact Assessment and to inform the Appropriate Assessment process. Furthermore, the author has over nine years' experience in habitat surveys, mammal surveys, and bird and bat surveys for a number of large infrastructure schemes, commercial and residential projects.

Will Woodrow – Qualifications:
HND Conservation Management. Farnborough College of Technology, 1989.
M.Sc. – European Environmental Policy and Regulation, Lancaster University, 1994.
M.Sc. (Arch) – Advanced Environmental and Energy Studies. University of East London, 2006.

Nicole Fleming – Qualifications:
BA (Hons) - Applied Freshwater and Marine Biology. GMIT, 2017.

Juliane Kohlstruck – Qualifications:
BSc Landscape Ecology. Westfälische Wilhelms-Universität Münster, Germany, 2017.
MSc Landscape Ecology. Carl von Ossietzky University Oldenburg, Germany, 2020.

Róisín NigFhloinn – Qualifications:
B.A. Mod (Hons) – Natural Sciences (specialising in Botany), Trinity College Dublin, 2008.
MSc – Ecology and Management of the Natural Environment, University of Bristol, 2011.

Table of Contents

1. Introduction

1.1 Background and Scope

Woodrow Sustainable Solutions Ltd. (Woodrow) was engaged by the client to undertake an ecological impact assessment of a proposed new boat house at Sligo Rowing and Kayak Club along the Garavogue River that is part of Lough Gill SAC. The rationale for the requirement for a new boathouse is described by Sligo Rowing Club as follows:

> *Sligo Rowing Club who are affiliated to the sports national rowing body, Rowing Ireland are located on the banks of the Garavogue River in Doorly Park and have been in existence since 2006. Since that time, they have grown into a strong vibrant club catering for all ages and abilities accommodating both competitive and leisure rowing for ages from junior boys and girls of 12 years of age and upwards up to veteran level for both men and women.*
>
> *At the competitive level the club has enjoyed much success at the various national regattas throughout the country whilst also hosting its own annual Sprint Regatta and Head of the River events with clubs from throughout the country attending the race events in Doorly Park. The club also has rapidly progressed at competitive level on the international circuit resulting in one of the club's senior oarsmen winning his seat on the Irish Mens Lightweight Quad at the Home Internationals which won gold in Strathclyde, Scotland whilst more recently Sligo Rowing Clubs Brian Colsh won a Junior Coxless Quad Silver Medal from an entry of 17 nations at the European Junior Championships which were held in Belgrade , Serbia last month.*
>
> *Whilst the existing facility of trucking containers accommodated the start-up of the club in its infant years the continued existence of the now established club requires a fit for purpose permanent facility with adequate and accessible boat storage area coupled with changing rooms and associated toilet and shower facilities to cater for its existing members and boat fleet including safety launches. To this end the club together with Sligo Kayak Club who share the site and who have similar requirements are submitting for planning permission for a joint fit for purpose facility to accommodate their existing members in a safe environment and in what are basic requirements of any club.*

The proposed boathouse essentially therefore allows for the replacement of the existing trucking containers used by the clubs as storage.

1.2 Legislative Context for this report

1.2.1 Requirement for Appropriate Assessment Screening

An Appropriate Assessment Screening provides the information necessary to fulfil the requirements of Article 6 of the EU Habitats Directive 1992 and Regulation 42 of the (Birds and Natural Habitats) Regulations 2011 in determining the potential impacts of the proposal on European Sites (also known as Natura 2000 Sites). The European Directive 92/43/EEC (The Habitats Directive) was transposed into Irish law by the European Communities (Natural Habitats) Regulations 1997 and European Communities (Birds and Natural Habitats) Regulations 2011 (Habitats Regulations). Regulation 42(1) of the 2011 Regulations requires that:

"A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a Natura 2000 site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the Natura 2000 site".

If, following the screening process, a likely significant effect is predicted or cannot be ruled out; under Regulation 42(6), an Appropriate Assessment is required in order to determine the potential for impact on the integrity of a Natura 2000 Site. In the event of a negative assessment in terms of an adverse effect on site integrity, a proposal can only be consented in the absence of feasible alternatives and for 'Imperative Reasons of Overriding Public Interest' (IROPI). In such cases, compensatory measures to ensure the integrity of the Natura 2000 site is maintained, are required. Guidance document on Article 6(4) of the 'Habitats Directive' states that:

"any uncertainty over the precise nature and/or magnitude of the adverse effects should be thoroughly tested. Where appropriate, a precautionary approach should be adopted and the assessment of adverse effect based on a worse-case scenario.1"

If at this stage if the potential for likely significant effects to be identified - there is a requirement for a Natura Impact Assessment to be carried out.

1.2.2 Requirement for a Natura Impact Statement

Under Regulation 42(9) of the Habitats Regulations a public authority is required to conduct an Appropriate Assessment pursuant to *paragraph (6)* in relation to a plan or project that it proposes to undertake or adopt, it shall- (a) prepare a Natura Impact Statement (NIS), (b) compile any other evidence including, but not limited to, scientific evidence that is required for the purposes of the Appropriate Assessment, and (c) submit a Natura Impact Statement together with evidence complied under *subparagraph (b)* to the Minister not later than six weeks before it proposes to adopt or undertake the plan or project to which the Natura Impact Statement and evidence relates. The Appropriate Assessment test assesses whether, in view of best scientific knowledge and applying the precautionary principle, and in light of the conservation objectives of the relevant Natura 2000 Sites, the Proposed Development, either alone or in combination with other plans or projects, may adversely affect the integrity of any Natura 2000 Sites.

If, following the screening process, a potential significant effect is predicted or cannot be ruled out, under Regulation 42(6) of the 2011 Habitats Regulations an Appropriate Assessment is required in order to determine the potential for impact on integrity of a European Site.

With the Screening for Appropriate Assessment having determined that potential significant effects on European Sites could not be ruled out a Natura Impact Statement as required under Regulation 42(6) of the European Communities (Birds and Natural Habitats) Regulations 2011.

This Natura Impact Statement provides an assessment of the proposal considering potential impacts on Qualifying Interests within Natura 2000 sites and provides mitigation proposals to avoid impacts on the integrity of Natura 2000 sites. This allows for an audit trail through Article 6 of the EU Habitats Directive to facilitate an Appropriate Assessment by a competent authority.

In addition, this NIS has been produced in light of recent European and Irish case law which is relevant to the Appropriate Assessment process including:

Information to inform the Appropriate Assessment Process

- Case C-258/11, Peter Sweetman and Others v An Bord Pleanála - The Court of Justice of the European Union (CJEU) judgement 11 April 2013
- Case C-164/17, Edel Grace and Peter Sweetman v An Bord Pleanála – CJEU judgement 25 July 2018
- Case C-323/17, People Over Wind and Peter Sweetman v Coillte Teoranta Judgement 12 April 2018[1]

And Case Law Updates:

- Kelly v An Bord Pleanála & Anor (Aldi Stores) [2019] IEHC 84; and,
- Heather Hill Management Company Clg v An Bord Pleanála [2019] IEHC 450.
- Sweetman v An Bord Pleanála [2016] IEHC 277 (Killaloe By-Pass Case)
- Case C-461/17 Brian Holohan and Others v An Bord Pleanála

1.3 Structure/ Layout of the report

This Natura Impact Statement provides the information necessary for the Competent Authority, in this instance Sligo County Council, to undertake an Appropriate Assessment of the proposal. The report sections, paragraphs and tables relate in sequence to the process of assessing the potential impact of the project in the context of sequential requirements of Article 6 of the EU Habitats Directive.

1.4 Main Sources of Information

1.4.1 Appropriate Assessment of Plans and Projects in Ireland – Guidance for Local Authorities (2010)

The 'Appropriate Assessment of Plans and Projects in Ireland – Guidance for Local Authorities' (2010) ("the Appropriate Assessment Guidance") provides methodological and legislative guidance on Appropriate Assessment for any proposals that may impact on Natura 2000 sites in Ireland. These guidelines are highly relevant in assessing the potential impact on neighbouring Natura 2000 sites.

1.4.2 CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal.

The 'CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine' (2018)[2] (the CIEEM Guidelines"), published by the Chartered Institute of Ecology and Environmental Management ("CIEEM"), are the acknowledged reference on ecological impact assessment and reflect the current thinking on good practice in ecological impact assessment across the UK and Ireland. They are consistent with the British Standard on Biodiversity, which provides recommendations on topics such as professional practice, proportionality, pre-

[1] Judgement is available at: http://curia.europa.eu/juris/document/document.jsf?text=&docid=200970&pageIndex=0&doclang=en&mode=lst&dir=&occ=first&part=1&cid=5618971

[2] CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine.* Chartered Institute of Ecology and Environmental Management, Winchester. Updated September 2019.

application discussions, ecological surveys, adequacy of ecological information, reporting and monitoring.

1.4.3 Informal Consultation with Statutory Agencies

The proposal has been planned for a number of years, and at the start of the process, a site visit was undertaken with NPWS staff in 2015, including discussions on options of location and scope of the proposal.

1.4.4 Desk Study Information

The following information sources were consulted during a desk study:

- Department of Environment, Heritage and Local Government (DoEHLG, 2009a). *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*;
- European Community Habitats Directive (92/43/EEC) – The Habitats Directive;
- European Communities (Natural Habitats) Regulations 1997;
- European Commission Environment DG (2001). *Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*;
- *Managing Natura 2000 sites: The Provisions of Article 6 of the Habitats Directive 92/43/EEC*;
- Environmental Protection Agency (EPA) Maps[3];
- EPA Sewage Treatment Maps[4];
- National Parks and Wildlife Services online MapViewer[5];
- National Parks and Wildlife Services data (downloaded GIS datafiles[6]); and,
- Sligo County Council Planning Portal[7].

2 Description and features of the project

2.1 Location of the Application Site

The proposed development is situated in Doorly Park, Sligo Town, Co. Sligo, near the southern bank of the Garvogue River. The proposal falls largely within an area that includes existing boat storage (in the form of containers), hardstanding, parking, access and footpath areas, and some amenity grassland and planted trees within a mixed deciduous woodland. It falls partly within the Lough Gill SAC (SAC Site Code: 001976) and adjacent to the Lough Gill pNHA (Site Code 001976). The location of the Application Site is shown in Figure 1 in the context of the wider area and in Figure 2 in the context of local amenities.

[3] EPA Maps https://gis.epa.ie/EPAMaps/ (Accessed September 2020)
[4] EPA Sewage Treatment Maps https://gis.epa.ie/EPAMaps/SewageTreatment (Accessed September 2020)
[5] NPWS Map Viewer http://webgis.npws.ie/npwsviewer/ (Accessed September 2020)
[6] NPWS Maps and Data https://www.npws.ie/maps-and-data (Accessed September 2020)
[7] Sligo County Council Planning Applications Portal https://www.sligococo.ie/planning/SearchPlanningApplications/OnlinePlanningTools/ (Accessed September 2020)

2.2 Project Details

The proposal is for the replacement of temporary storage containers used by the Sligo Rowing Club and Sligo Kayak Club for storage of boats and equipment, and used as a temporary gym, with a permanent building that incorporates:

- Boat storage areas
- Gymnasium area
- Dressing rooms
- Meeting room

The boat house will be located on the south bank of the Garavogue river in the same location as the already existing shipping containers used by the rowing and kayak clubs. The application site covers an area of 0.256ha.

This proposed boat house will provide the necessary facilities needed for the club members, such as accessible boat storage area giving them easy access to the ramp and jetty already on site allowing safer more efficient launches. The extent of proposed boat storage room is not significantly larger than that which currently exists within the storage containers, but will facilitate easier storage and movement of larger boats and easier and safer movement of boats generally. Accompanied with the storage area would be facilities such as toilets, showers and changing rooms to provide the necessary amenities for members as currently they have a temporary mobile toilet.

Figure 3 illustrates the existing and proposed services associated with the proposed boat house and for the proposed drainage channel and oil interceptor piped to river underneath the bitumen parking area from the boat house. A storm water drainage system has been designed to cater for the proposed Rowing and Kayak Club Facility, including roofs, footpaths, roadway and car parking. All surface water generated from the development will discharge by gravity through storm water sewers and discharged to the river to the rear of the Application Site through a Bypass Separator.

An arborist assessment was carried out of the surrounding trees and woodland and specifically to assess the impact of the proposal on trees, how the retention of trees could be maximised and the need for any tree removal at the Application Site. In the interest of safety for the proposed building some trees will be removed due to their condition (dead, overcrowding or leaning on other trees as support).

Figures 4 to 6 show proposed building plans and elevations for the building. No changes will be made on the existing walking trail / pathway to the north of the building, although there will be a new access footpath to the building entrance to the south of the proposed building.

Figure 1 - Location of the Application Site in the context of Sligo Town

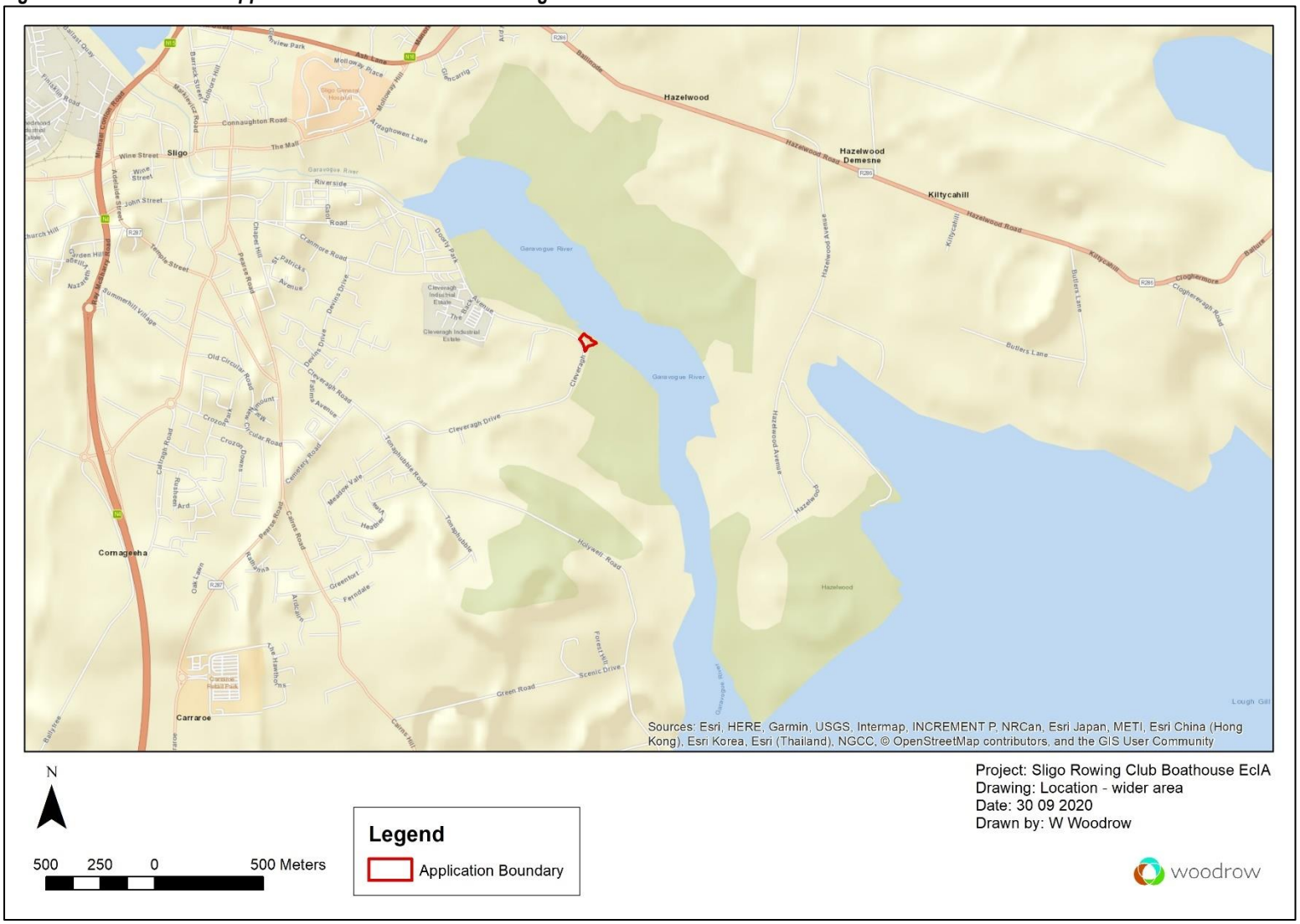


Figure 2 - Location of the Application Site in the context of local amenities

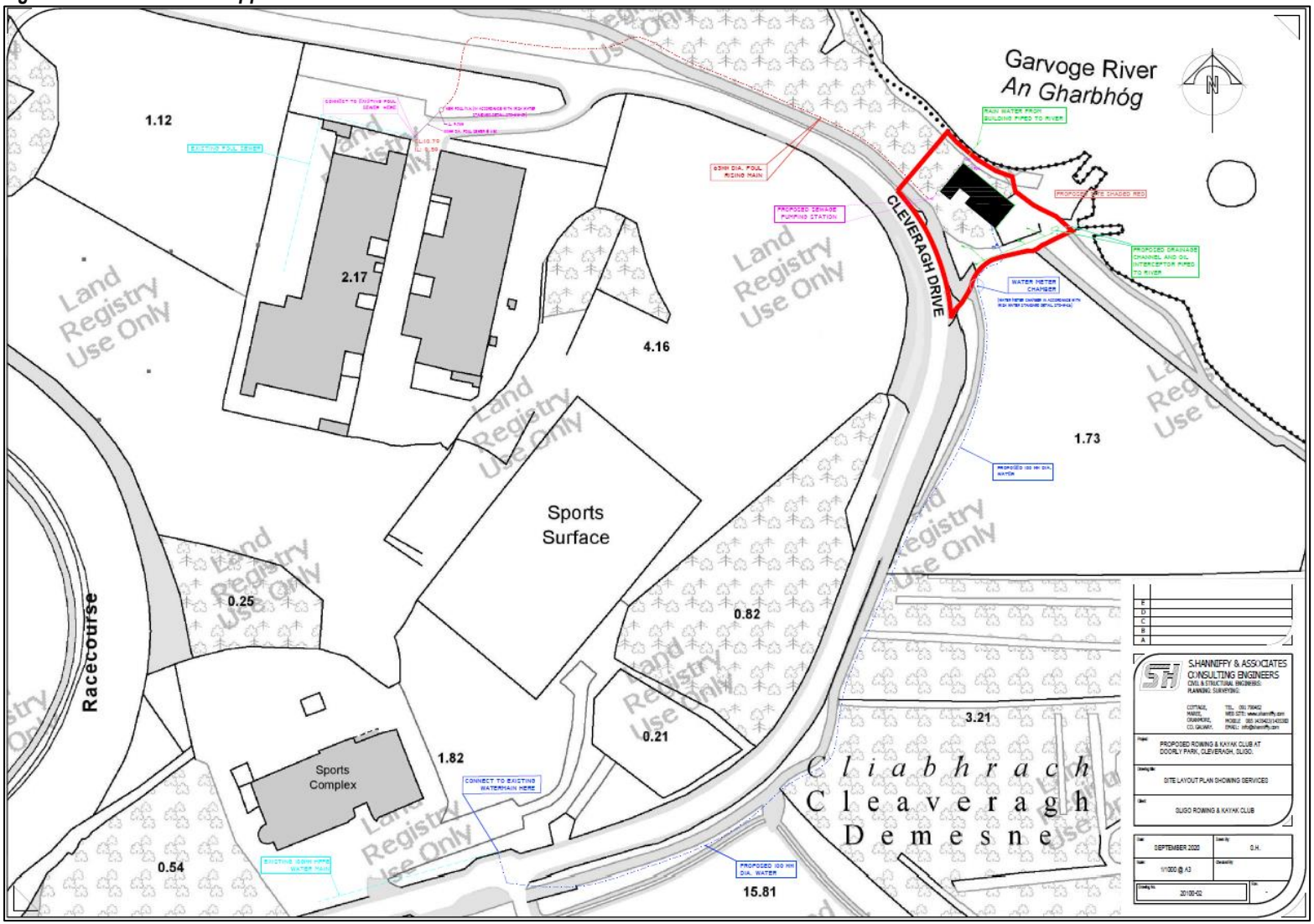


Figure 3 – Proposed Layout, also showing footprint of existing containers (dashed line)

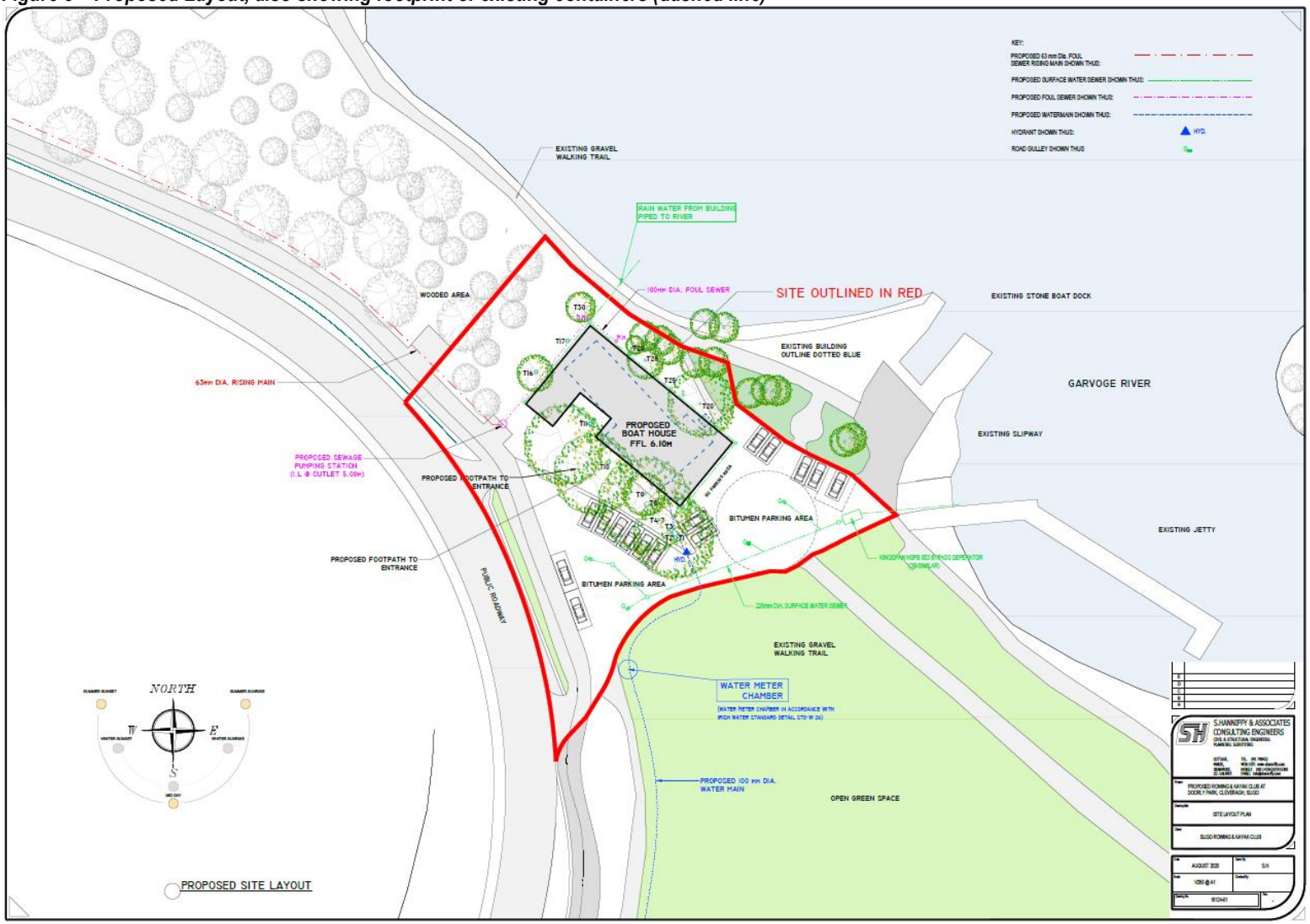


Figure 4 - Building Plan (ground floor)

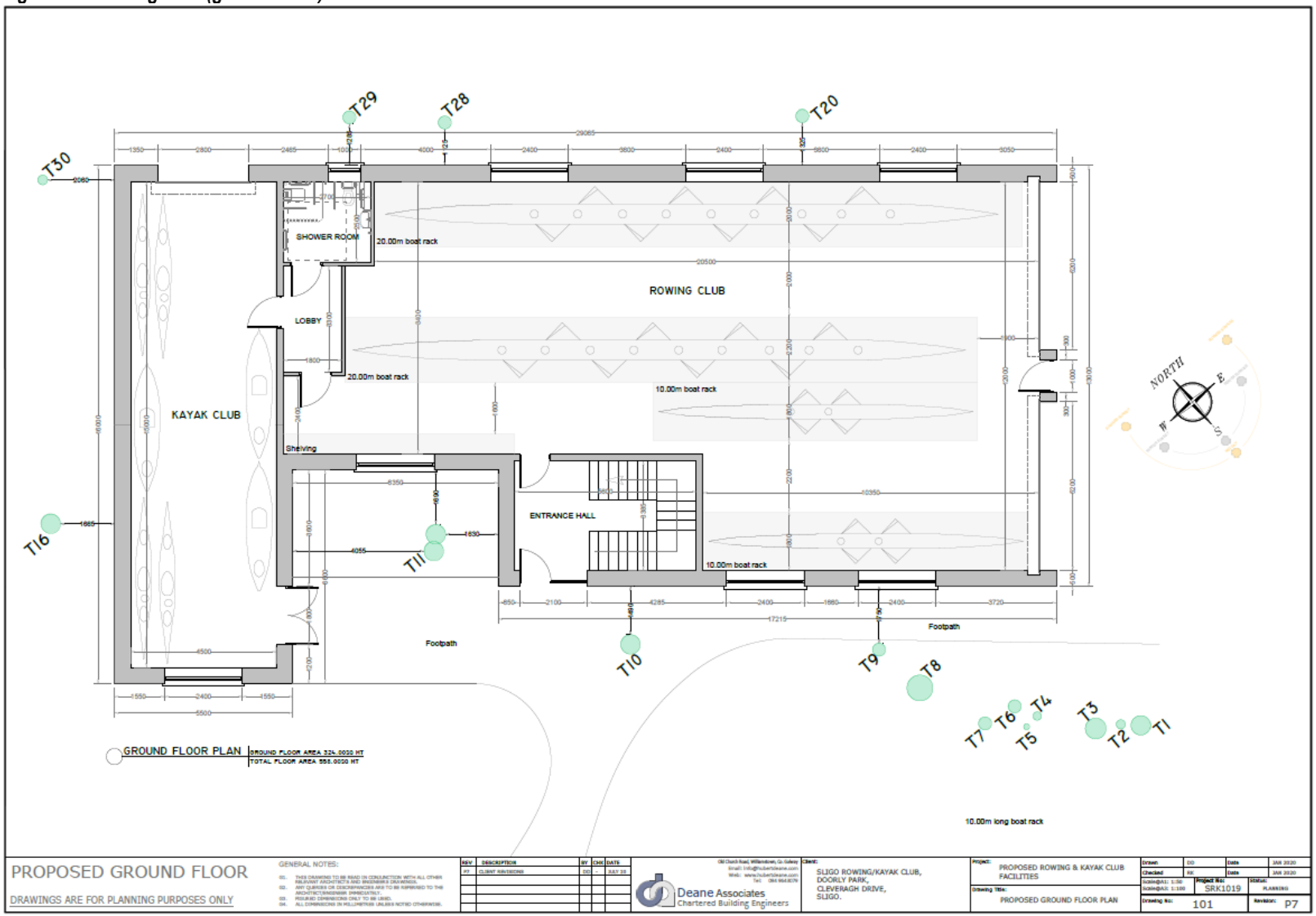


Figure 5 Building Plan (first floor), also showing section through building

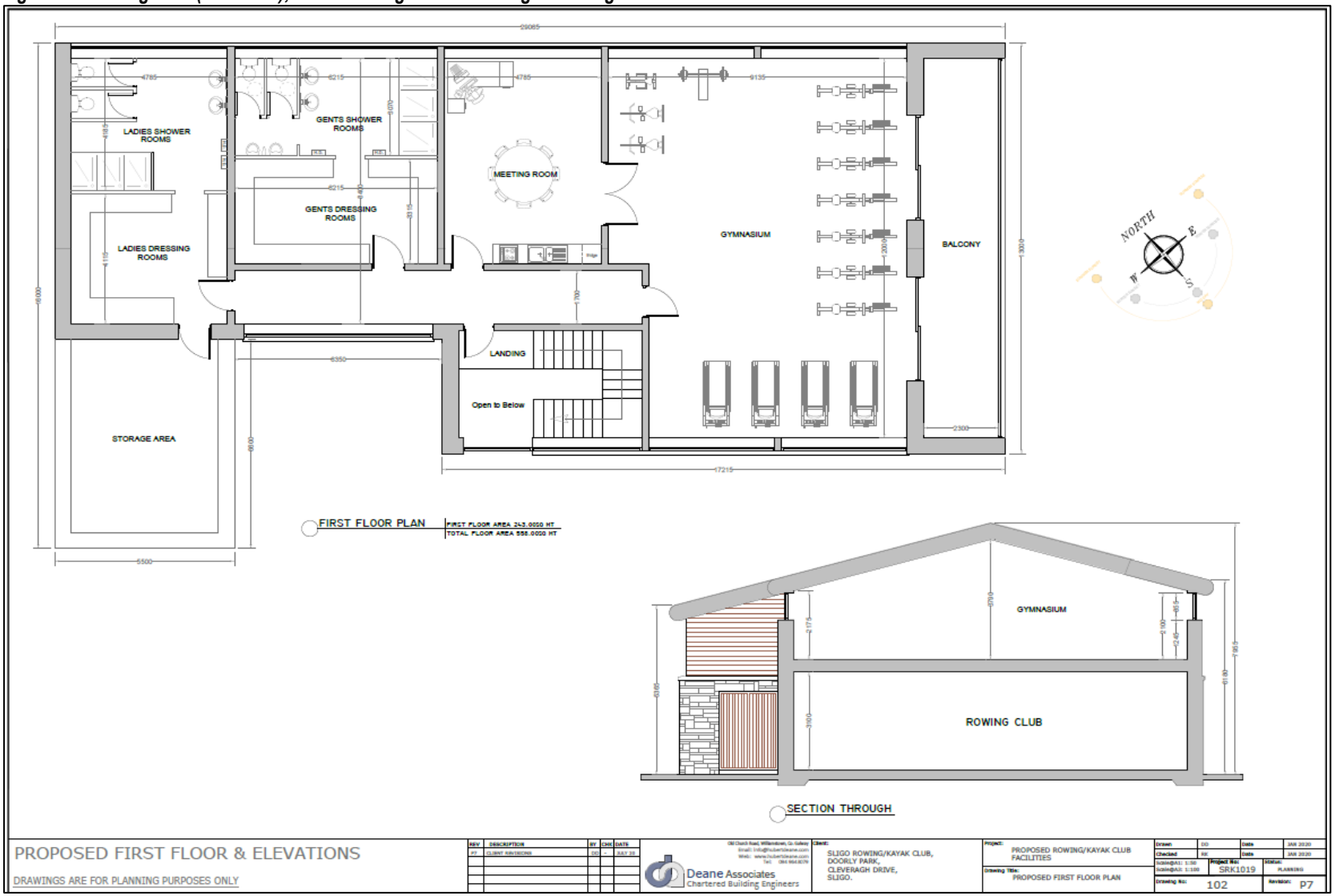
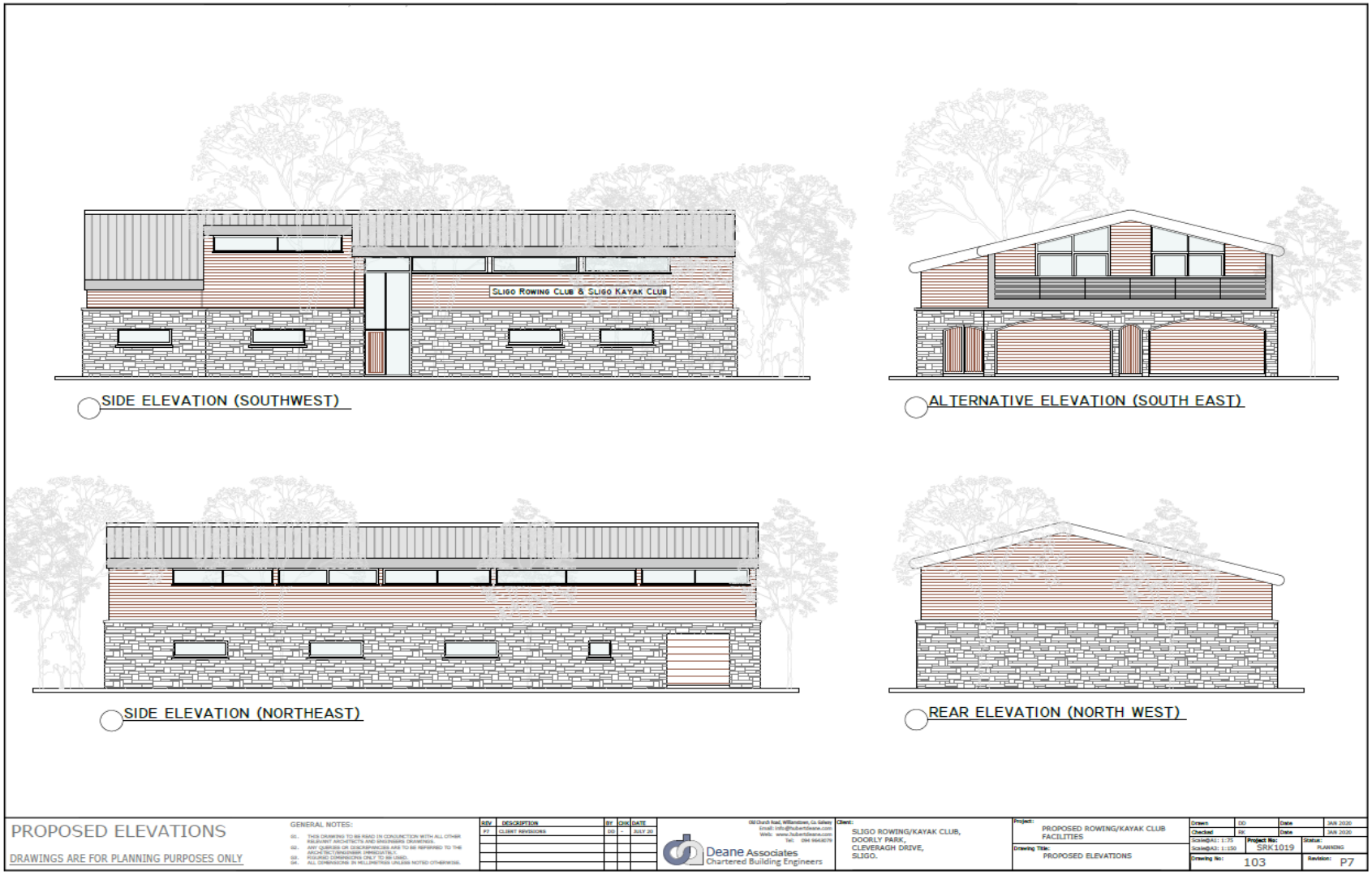


Figure 6 Building Elevations



2.3 Site Description and Current Management

The Application Site covers an area of *c.* 0.256ha and lies between the Garavogue River and a minor road on the eastern outskirts of Sligo Town.

The site largely comprises tarmac parking and circulation areas, connecting the minor road to an existing slipway and pontoon, as well as storage containers, which are used for storage of boats and as a gym. The storage containers are located on a raised section of hardcore area.

The site holds a number of mature trees, including non-native species such as beech *Fagus sylvatica* and holm oak *Quercus ilex*. These trees surround the existing containers on three of four sides, providing some visual shielding from the road and the river. The site includes small areas of amenity grassland and adjoins a larger area of amenity grassland that lies to the south east. The site is regularly used for access to the Garavogue River, for access to a footpath. Below, Plates 1 to 3 show the site, and Figure 7 illustrates an orthophotograph of the current site, along with the outline of the existing storage containers, and proposed extent of the building in the context of the SAC boundary.

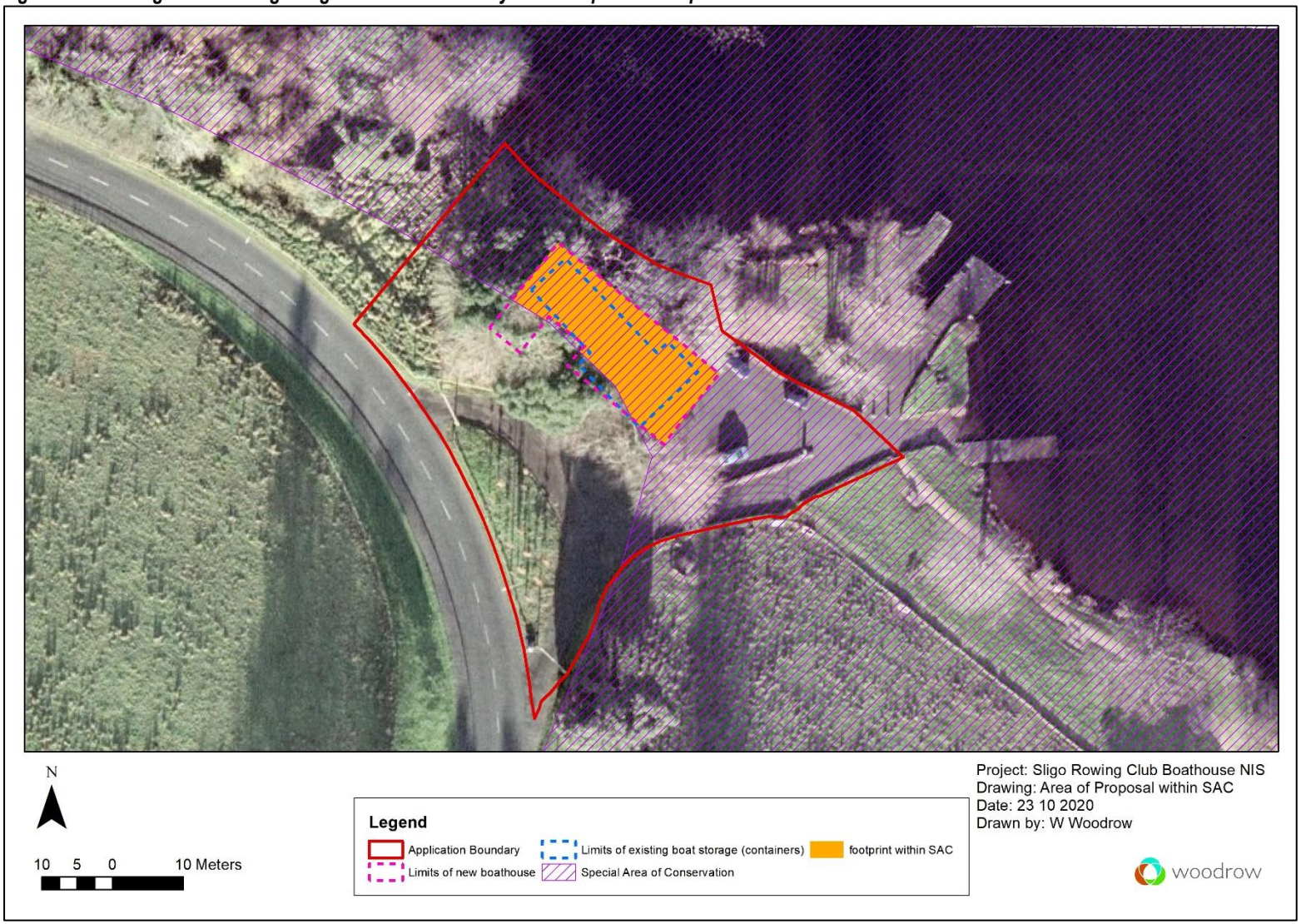
The area is used for storing the boats for the Sligo Rowing Club and Kayak Club, and is also used by the general public for launching boats and recreation.

Plate 1: Existing Site (storage containers), photo taken from east

Plate 2: Existing Site (storage containers), photo taken from west

Plate 3: Existing Site, including slipway area, photo taken from east

Figure 7 – Existing Site showing Lough Gill SAC Boundary and Footprint of Proposal within SAC



3 Potential for impacts of the proposal on European sites

The following sections provide information on the European Sites that have the potential to be affected by the Proposed Development. These can then be assessed based on factors including the Qualifying Interests (QIs) of the sites, the impacts from the development and any source-pathway-receptor linkages that could potentially connect adverse impacts to the habitats or species which are listed as QIs for European Sites, and therefore may have the potential to undermine the integrity of these sites.

3.1 European Sites within the Zone of Influence of the Application Site

In many cases a standard 15 km distance from a proposal is used as an initial possible Zone of Influence (ZoI) within which European Sites should be screened for likely impacts. However, in reality, potential impacts on sites are dependent on the nature of the impacts arising, the sensitivity of receptors and the causal links and conduits rather than distance. In many cases, the potential ZoI would be considerably less than 15 km (for example noise and airborne pollution) while the potential ZoI could be greater than 15 km, for example if there is a direct surface, or ground water connection to a SAC or SPA.

Therefore, the potential for Likely Significant Effects on European Sites have been assessed based on the likely impacts of the Proposed Development, the Qualifying Interests of each European Site and the identification of ecological / hydrological pathways. The European Sites considered in this screening report are shown in Table 1 below and are also represented in Figure 8 and Figure 9 below. Table 1 also states whether these sites are considered to be within the Zone of Influence of the proposal.

Figure 8 -Location of the Proposed Development in Doorly Park, Sligo in relation to Special Areas of Conservation within a 15 km radius.

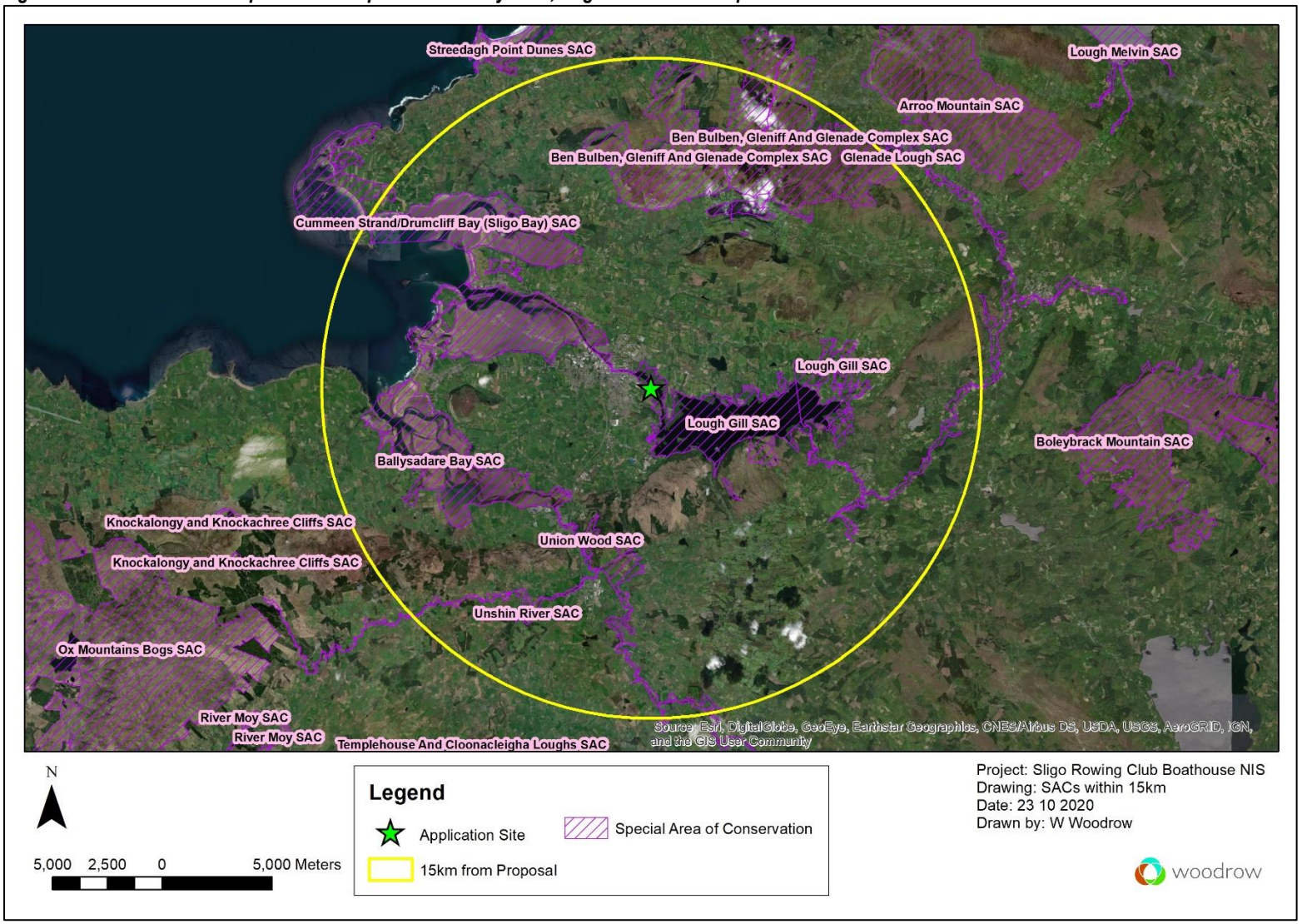


Figure 9 -Location of the Proposed Development in Doorly Park, Sligo in relation to Special Protection Areas within a 15 km radius.

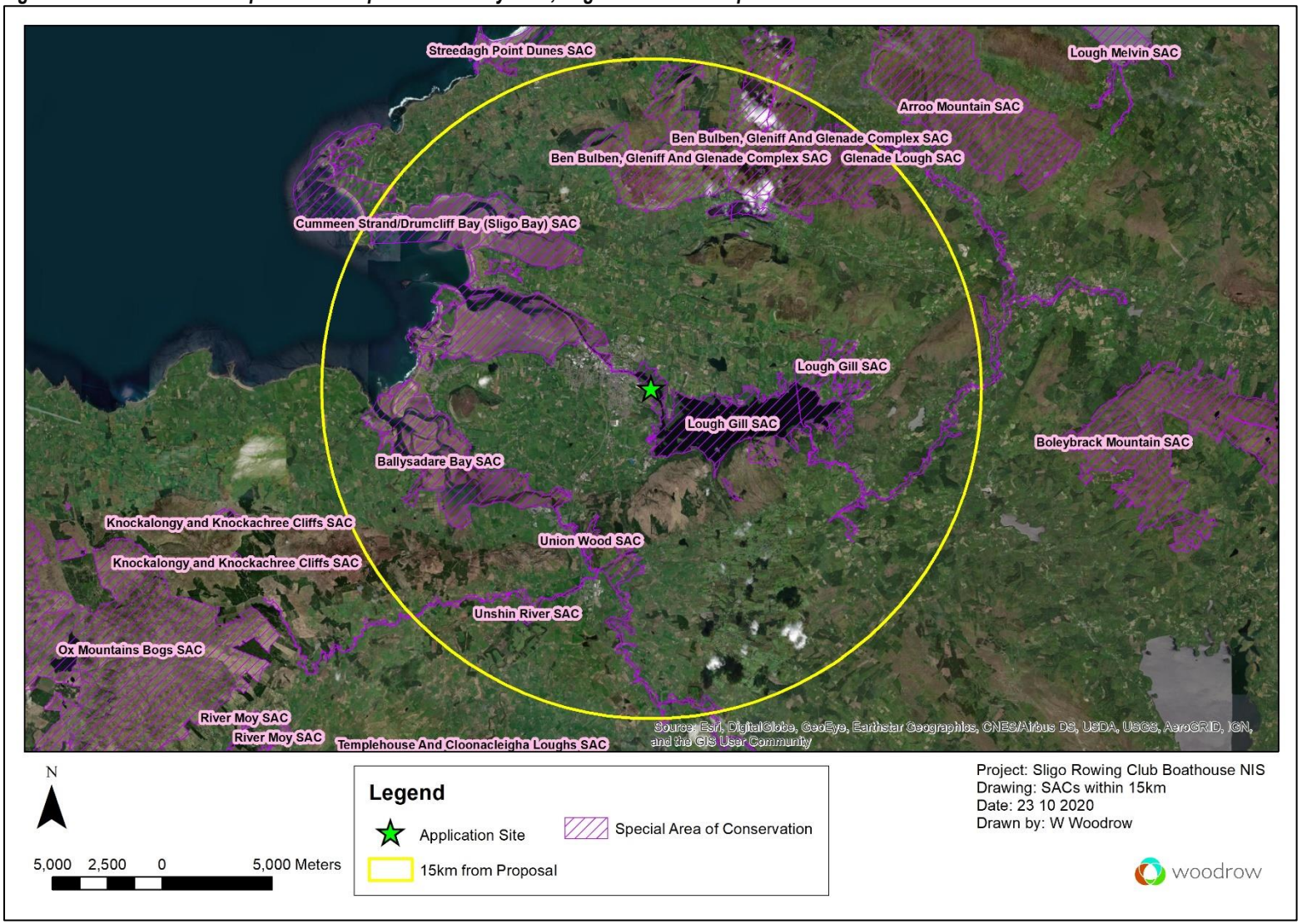


Table 1 – Designated Sites within 15 km of the Application Site and Potential Connectivity to the Proposal

Sites highlighted in grey, and QIs shown in **bold**, have the potential to be impacted by the Proposed Development.

European Site	**Features of Interest** *Qualifying Interests (QI's)* *Special Conservation Interests (SCI;s)* * = A priority habitat – habitats which are in danger of disappearing within the EU territory, are highlighted with an asterisk.	**Approximate Distance from Proposal**	**Within the Zone of Influence?**
SPECIAL AREAS OF CONSERVATION (SAC)			
Lough Gill SAC [001976]	• **Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150]** • Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] • **Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* [91E0]** • ***Austropotamobius pallipes* (White-clawed Crayfish) [1092]** • ***Petromyzon marinus* (Sea Lamprey) [1095]** • ***Lampetra planeri* (Brook Lamprey) [1096]** • **Lampetra fluviatilis (River Lamprey) [1099]** • ***Salmo salar* (Salmon) [1106]** • ***Lutra lutra* (Otter) [1355]**	0 m (proposal lies within SAC)	Yes, a direct potential source-pathway-receptor linkage exists with this site. The Application Site lies within the boundary of this SAC.
Cummeen Strand / Drumcliffe Bay (Sligo Bay) SAC [000627]	• **Estuaries [1130]** • **Mudflats and sandflats not covered by seawater at low tide [1140]** • Embryonic shifting dunes [2110] • Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] • Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] • *Juniperus communis* formations on heaths or calcareous grasslands [5130] • Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]	*c.* 1.99 km west of the proposal.	Yes, a direct potential source-pathway-receptor linkage exists with this site (it lies immediately downstream of the Lough Gill SAC).

European Site	Features of Interest *Qualifying Interests (QI's)* *Special Conservation Interests (SCI;s)* * = A priority habitat – habitats which are in danger of disappearing within the EU territory, are highlighted with an asterisk.	Approximate Distance from Proposal	Within the Zone of Influence?
	• Petrifying springs with tufa formation (Cratoneurion) [7220] • *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014] • ***Petromyzon marinus* (Sea Lamprey) [1095]** • ***Lampetra fluviatilis* (River Lamprey) [1099]** • ***Phoca vitulina* (Harbour Seal) [1365]**		
Ballysadare Bay SAC [002159]	• Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Embryonic shifting dunes [2110] • Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] • Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] • Humid dune slacks [2190] • *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014] • *Phoca vitulina* (Harbour Seal) [1365]	*c.* 6 km south-west of the proposal	No. No potential source-pathway-receptor linkage exists between the proposal and this site. There is no hydrological or habitat connectivity to this European Site.
Union Wood SAC [000638]	• Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]	*c.* 6.26 km south of the proposal	No. No potential source-pathway-receptor linkage exists between the proposal and this site. There is no hydrological or habitat connectivity to this European Site.
Unshin River SAC [001898]	• Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] • Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] • *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]	*c.* 7.09 km south of the proposal	No. No potential source-pathway-receptor linkage exists between the proposal and this site. There is no hydrological or habitat connectivity to this European Site.

European Site	Features of Interest *Qualifying Interests (QI's)* *Special Conservation Interests (SCI;s)* * = A priority habitat – habitats which are in danger of disappearing within the EU territory, are highlighted with an asterisk.	Approximate Distance from Proposal	Within the Zone of Influence?
	• Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] • *Salmo salar* (Salmon) [1106] • *Lutra lutra* (Otter) [1355]		
Benbulben, Gleniff and Glenade Complex SAC [000623]	• Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] • Northern Atlantic wet heaths with *Erica tetralix* [4010] • European dry heaths [4030] • Alpine and Boreal heaths [4060] • *Juniperus communis* formations on heaths or calcareous grasslands [5130] • Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] • Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] • Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] • Transition mires and quaking bogs [7140] • Petrifying springs with tufa formation (Cratoneurion) [7220] • Alkaline fens [7230] • Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) [8110] • Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*) [8120] • Calcareous rocky slopes with chasmophytic vegetation [8210] • Vertigo geyeri (Geyer's Whorl Snail) [1013] • Lutra lutra (Otter) [1355]	*c.* 8.08 km north of the proposal	No. No potential source-pathway-receptor linkage exists between the proposal and this site. There is no hydrological or habitat connectivity to this European Site.
SPECIAL PROTECTION AREAS (SPA)			

European Site	Features of Interest *Qualifying Interests (QI's)* *Special Conservation Interests (SCI;s)* * = A priority habitat – habitats which are in danger of disappearing within the EU territory, are highlighted with an asterisk.	Approximate Distance from Proposal	Within the Zone of Influence?
Cummeen Strand SPA [004075]	• **Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]** • **Oystercatcher (Haematopus ostralegus) [A130]** • **Redshank (Tringa totanus) [A162]** • **Wetland and Waterbirds [A999]**	*c.* 2.35 km north-west of the proposal	Yes, a direct potential source-pathway-receptor linkage exists with this site. There is a hydrological connection through Lough Gill to this site.
Sligo Leitrim Uplands SPA [004187]	• Peregrine (*Falco peregrinus*) [A103] • Chough (*Pyrrhocorax pyrrhocorax*) [A346]	*c.* 5.68 km north-east of the proposal	No. No potential source-pathway-receptor linkage exists between the proposal and this site. There is no hydrological or habitat connectivity to this European Site.
Ballysadare Bay SPA [004129]	• Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] • Grey Plover (*Pluvialis squatarola*) [A141] • Dunlin (*Calidris alpina*) [A149] • Bar-tailed Godwit (*Limosa lapponica*) [A157] • Redshank (*Tringa totanus*) [A162] • Wetland and Waterbirds [A999]	*c.* 6.81 km south-west of the proposal	No. No potential source-pathway-receptor linkage exists between the proposal and this site. There is no hydrological or habitat connectivity to this European Site.
Drumcliffe Bay SPA [004013]	• Sanderling (*Calidris alba*) [A144] • Bar-tailed Godwit (*Limosa lapponica*) [A157] • Wetland and Waterbirds [A999]	*c.* 6.85 km north-west of the proposal	No. No potential source-pathway-receptor linkage exists between the proposal and this site. There is no hydrological or habitat connectivity to this European Site.
Ballintemple and Ballygilgan SPA [004234]	• Barnacle Goose (*Branta leucopsis*) [A045]	*c.* 14.72 km north-west of the proposal	No. No potential source-pathway-receptor linkage exists between the proposal and this site. There is no hydrological or habitat connectivity to this European Site.

3.2 Description of European Sites within the Zones of Influence of the Proposed Development

As shown in Table 1 and illustrated in Figure 7 above, the Application Site is situated within the boundary of the Lough Gill SAC [001976]. Other European sites within the Zone of Influence are Cummeen Strand/ Drumcliff Bay SAC [000627], the Cummeen Strand SPA [004035]. These sites are described below.

3.2.1 Lough Gill SAC (Site Code: 001976)

This European Site includes Lough Gill, Doon Lough to the north-east, the Bonet River (as far as, but not including, Glenade Lough), and a stretch of the Owenmore River near Manorhamilton in Co. Leitrim. Lough Gill itself, 2 km east of Sligo town via the Garavogue River, lies at a geological junction of ancient metamorphic rocks which produce acid groundwater, and limestone which dissolves in the groundwater (NPWS, 2016a).

Qualifying Interests of SAC

Lough Gill SAC is designated for importance for three habitats listed on Annex I of the EU Habitats Directive, one of which has priority status* (meaning habitats which are in danger of disappearing within EU territory) and six Annex II species. The qualifying interests are as follows:

- Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation [3150]
- Semi-natural dry grasslands and scrubland facies on calcareous substrates *(Festuco-Brometalia)* (* important orchid sites) [6210]
- Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]
- *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* [91E0]
- *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]

Conservation Objectives for the Qualifying Interests of SAC (NPWS, 2020)

To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

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

3.2.2 Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC (Site Code: 000627)

This large coastal site extends from Cullamore in the north-west to Killaspug in the south-west, and from Sligo town in the south-east to Drumcliff village in the north-east. It encompasses two large, shallow bays, Drumcliff Bay and Sligo Harbour, and both Ardboline and Horse Island. Sand dunes and sand hills at Rosses Point, Killaspug, Yellow Strand and Coney Island are included, as are grasslands at Ballintemple and Ballygilgan (Lissadell), along with a variety of other habitats such as woodland, saltmarsh, sandy beaches, boulder beaches, shingle, fen, freshwater marshes, rocky sea cliffs and lakes. The site is largely underlain by Carboniferous limestone, but acidic rocks are also found on the Rosses Point peninsula. At Serpent Rock in the north-western section of the site the most complete section of the north western Carboniferous strata is exposed. Here are found an excellent series of fossilised corals which, in some strata, stand out from the rock matrix (NPWS, 2016a).

Qualifying Interests of SAC

- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Embryonic shifting dunes [2110]
- Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]
- Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]
- *Juniperus communis* formations on heaths or calcareous grasslands [5130]
- Semi-natural dry grasslands and scrubland facies on calcareous substrates *(Festuco-Brometalia)* (*important orchid sites) [6210]
- Petrifying springs with tufa formation (*Cratoneurion*) [7220]
- *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Phoca vitulina* (Harbour Seal) [1365]

Conservation Objectives for the Qualifying Interests of SAC (NPWS, 2013a)

- To maintain the permanent habitats and conserve the community types within the Estuaries
- To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide
- To restore the favourable conservation condition of Sea Lamprey
- To maintain the favourable conservation condition of River Lamprey

3.2.3 Cummeen Strand SPA (Site Code: 004035)

Cummeen Strand is a large shallow bay stretching from Sligo Town westwards to Coney Island. It is one of three estuarine bays within Sligo Bay and is situated between Drumcliff Bay to the north and Ballysadare Bay to the south. The Garavogue River flows into the bay and forms a permanent channel (NPWS, 2014).

Qualifying Interests of SPA

- Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]
- Oystercatcher (*Haematopus ostralegus*) [A130]

- Redshank (*Tringa totanus*) [A162]
- Wetland and Waterbirds [A999]

Conservation Objectives for the Qualifying Interests of SPA (NPWS, 2013b)

- To maintain the long-term population trend and distribution conservation condition of the Light-bellied Brent Goose
- To maintain the long-term population trend and distribution conservation condition of the Oystercatcher
- To maintain the long-term population trend and distribution conservation condition of the Redshank
- To maintain the favourable conservation condition of the permanent Wetland habitat

3.3 Screening Matrix

Table 2 below shows the screening matrix for European Sites and site Qualifying Interest features that fall within the potential Zone of Influence (as detailed in Table 1 above). At this stage a potential significant effect can only be ruled out if there is considered to be no risk. Any uncertainty must result in potential significant effect being assumed.

For the purposes of impact assessment all three lamprey species (sea lamprey, brook lamprey and river lamprey) are considered together as the potential impacts associated with the proposal apply equally to all lamprey species.

Table 2 Significance of Impact Matrix

European Site and connectivity	Features of Interest *Qualifying Interests (QI's)* *Special Conservation Interests (SCI;s)* * = A priority habitat – habitats which are in danger of disappearing within the EU territory, are highlighted with an asterisk.	Potential impact / cause	Potential for significant effects?
Lough Gill SAC [001976] Proposal lies within this SAC. The footprint of the Proposal lies within 5-8m of water's edge at its closest point, on an area o higher, hard-cored ground.	• Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation [3150]	Limited potential, as proposal lies downstream of Lough Gill (on slow flowing river section). Potential for hydrocarbon or chemical pollution during construction, or operational pollution event.	Yes – Potential for Significant Effect.
	• Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* * [91E0]	Potential for hydrocarbon or chemical pollution during construction, or operational pollution event. Potential for effect is limited as the habitat comprises a downstream habitat in woodland that is regularly inundated during the winter time, and it is considered that there could only be a low likelihood of hydrological connectivity if during extremely high water levels (extreme flooding) as the Application Site lies within drier woodland and is not inundated.	Yes - Potential Significant Effect, though unlikely, cannot be ruled out.
	• *Austropotamobius pallipes* (White-clawed Crayfish) [1092]	Potential for toxicity impacts hydrocarbon / chemical / silt pollution during construction, or operational pollution event.	Yes - Potential Significant Effect.
	• *Petromyzon marinus* (Sea Lamprey) [1095] • *Lampetra planeri* (Brook Lamprey) [1096] • *Lampetra fluviatilis* (River Lamprey) [1099]	Potential for toxicity impacts hydrocarbon / chemical / silt pollution during construction, or operational pollution event. Potential disturbance during construction.	Yes - Potential Significant Effect.
	• *Salmo salar* (Salmon) [1106]	Potential for toxicity impacts hydrocarbon / chemical / silt pollution during construction, or operational pollution event. Potential disturbance during construction.	Yes - Potential Significant Effect.
	• *Lutra lutra* (Otter) [1355]	Potential for toxicity impacts hydrocarbon / chemical / silt pollution during construction, or operational pollution event, potentially impacting on prey species. Potential disturbance during construction and operation.	Yes - Potential Significant Effect.

European Site and connectivity	Features of Interest *Qualifying Interests (QI's)* *Special Conservation Interests (SCI;s)* * = A priority habitat – habitats which are in danger of disappearing within the EU territory, are highlighted with an asterisk.	Potential impact / cause	Potential for significant effects?
Cummeen Strand / Drumcliffe Bay (Sligo Bay) SAC [000627] *c.* 1.99 km west of the proposal. Connected by water course distance of *c.* 2.14 km.	• Estuaries [1130]	Limited potential taking account of the size and nature of the proposal and the distance downstream. However, potential for hydrocarbon or chemical pollution during construction, has the potential to result in an impact in the case of an extreme event.	Yes - Potential Significant Effect, though unlikely, cannot be ruled out.
	• Mudflats and sandflats not covered by seawater at low tide [1140]		
	• *Petromyzon marinus* (Sea Lamprey) [1095] • *Lampetra fluviatilis* (River Lamprey) [1099]		
	• *Phoca vitulina* (Harbour Seal) [1365]		
Cummeen Strand SPA [004075] *c.* 2.35 km west of the proposal. Connected by water course distance of *c.* 2.59 km.	• Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]	Limited potential taking account of the size and nature of the proposal and the distance downstream. However, potential for hydrocarbon or chemical pollution during construction, has the potential to result in an indirect impact in the case of an extreme event (particularly through adverse impacts on associated habitats or prey species).	Yes - Potential Significant Effect, though unlikely, cannot be ruled out.
	• Oystercatcher (*Haematopus ostralegus*) [A130]		
	• Redshank (*Tringa totanus*) [A162]		
	• Wetland and Waterbirds [A999]		

3.4 Conclusion of Screening Assessment

On the basis of the screening assessment and application of the precautionary principle, indicators of significance show that there is potential for significant effects on the Lough Gill SAC and, to a lesser extent, the Cummeen Strand / Drumcliff Bay (Sligo Bay) SAC and the Cummeen Strand SPA. The chief risks are the potential for degradation of water quality, resulting in possible adverse impacts on water dependent species and habitats, as well as the potential for associated disturbance of certain species during the construction and operational phases of the proposal.

Therefore, the above impacts are required to be considered in greater detail in order to ascertain the impact of the proposed development on the integrity of the Lough Gill SAC, Cummeen Strand / Drumcliff Bay (Sligo Bay) SAC and Cummeen Strand SPA. The potential for impacts as a result of the Proposed Development will be considered either alone and / or in combination with other plans or projects, with respect to the site's structure and function and its conservation objectives in the form of an Appropriate Assessment.

Sections 4 to 8 below provide the information necessary to undertake an Appropriate Assessment and where adverse impacts are found to exist, to incorporate required mitigation in order to avoid or reduce those impacts so that they are no longer significant, and will not result in any residual adverse impacts which could adversely affect the integrity of any European Sites.

4 Surveys undertaken and Results

4.1 Aquatic Species Surveys

White-clawed crayfish Survey

A white-clawed crayfish survey was conducted on 19 September 2019 within the aquatic zone directly adjacent the proposed site boundary within the upper Garavogue river at Doorly park, under a NPWS licence (No. C135/2019).

This survey followed the survey techniques outlined in *"A technical manual for monitoring white-clawed crayfish Austropotamobius pallipes in Irish lakes"* (Reynolds, *et al*. 2010) and *"Monitoring of white-clawed crayfish Austropotamobius pallipes in Irish lakes in 2007"* (O'Connor*, et al.* 2009). The survey was also conducted giving cognisance to Life in UK Rivers document *"Monitoring the White-clawed Crayfish Austropotamobius pallipes."* (Peay, 2003) and "*Conservation Management of the White-Clawed Crayfish Austropotamobius pallipes* (Reynolds, 1998). Surveys of refugia were undertaken using a bathyscope.

Salmonid suitability

Suitability surveys for Atlantic salmon were carried out within the aquatic zone directly adjacent to the Application Site boundary within the upper Garavogue river at Doorly park on 19 September 2019. Salmonid suitability surveys were carried out using the Life Cycle Unit (LCU) approach devised by the Loughs Agency. This method evaluates habitat into units and grades depending on the substrate available, water depths and flow velocities.

Lamprey suitability

Suitability surveys for Lamprey were carried out within the aquatic zone directly adjacent the proposed Application Site boundary within the upper Garavogue river at Doorly park on 19 September 2019. Lamprey habitat assessments followed guidance from Maitland (2003) with reference to substrate requirements for adults to spawn and silt beds for juveniles to exist within.

4.1.1 Results of Aquatic Surveys

White-clawed crayfish *Austropotamobius pallipes*

A white-clawed crayfish survey was conducted on 19 September 2019 within the aquatic zone directly adjacent the proposed site boundary within the upper Garavogue river at Doorly park, under a NPWS licence (No. C135/2019). During the survey it was identified that the substrates consisted of silt deposits with small stones within and some large boulders within the vicinity of the proposed works. Parts of the Garavogue river offer suitable refuge and foraging habitat for white-clawed crayfish, and they have been recorded within a few hundred metres of the Application Site.

This species requires hard water, with a high calcium content, which is suitable for hardening their exoskeletons following moulting. They are not typically found to occupy mud or silt, although they may cross such habitat while foraging (Holdich, 2003). Also, the absence of undercut and vertical banks makes the Application Site more unfavourable for crayfish to inhabit. Within suitable habitat in larger lakes in Ireland, this species tends to be found at the mouths of inflowing rivers (Reynolds, 1982).

A survey of the proposed Application Site using the methods outlined above resulted in no individuals being found within the survey area. Plate 4 shows the bay adjacent to the proposal that formed the area of search and Plate 5 shows typical substrate recorded there.

Plate 4: Aquatic invertebrate and fish habitat survey area

Plate 5: Typical substrate found within survey area

Atlantic Salmon

Atlantic Salmon *Salmo salar* frequent the Garavogue river, Co. Sligo. Suitability surveys suggest that this watercourse has the ability to hold adult and juvenile Atlantic salmon in the vicinity of the proposed works and so it is important that consideration is to be given to any impacts that the proposed development may have on Atlantic salmon, and that these are fully mitigated. There is suitable habitat for adult and juvenile salmon to exist, and also adult salmonids use this part of the river for holding and on passage to spawning grounds. During spring, smolts will be descending the river on passage to the sea, and so will also pass this location on migration to sea.

Lamprey species

All three species of lamprey that exist in Ireland are listed under Annex II of the European Habitats Directive. Lampreys play an important part in river ecosystems due to their processing of nutrients, storage and nutrient cycling in rivers and streams (O'Connor, 2004). Suitability surveys determined that no suitable spawning habitat for lamprey exists within the area of the proposed works site, however ammocoetes may exist within the silt deposits, also transformers and adults would use this area on passage throughout the catchment. According to the NBDC an (undated) record of Sea Lamprey (*Petromyzon marinus*) was submitted for the lower part of the Garavogue river close to the town of Sligo. This site is approximately 1km downstream from the proposed works location.

4.1.2 Invasive Alien Species (IAS) - Aquatic Invertebrate

During the surveys, zebra mussel *Dreissena polymorpha* were recorded in the bay immediately adjacent to the proposal. The species is common through this area of the Garavogue River. Plate 6 shows the species as recorded in the shallow bay adjacent to the site.

Plate 6: Zebra mussels found within survey area

4.2 Otter surveys

An otter survey was conducted at the site for a distance of 200m both upstream and downstream beyond the proposed site boundary on 30 January and 23 June during 2019. The main focus of the otter survey was to identify the presence of otter *Lutra lutra,* and/or their resting places (such as layups or holts) (Reid, *et al.* 2013). The survey approach included the identification of suitable habitat, detection of field signs such as holt, tracks and scat as well as by direct observation. The surveys were undertaken in line with guidelines referenced by CIEEM and giving cognisance to Irish survey guidelines, such as those produced by Transport Infrastructure Ireland (TII).

No signs of otter were recorded, although the species is known to occur in the vicinity and significant suitable habitat for the species occurs in the area.

4.3 Habitat Surveys

An Extended Phase 1 Habitat Assessment survey was carried out across the Application Site (Woodrow, 2020). The survey was carried out in line with 'Best Practice Guidance for Habitat Survey and Mapping' (Smith *et al.*, 2011) and adhering to habitat descriptions provided in 'A Guide to Habitats in Ireland' (Fossitt, 2000).

For the Phase 1 habitat survey, the proposed works site and surrounds was walked, ecological features of interest were noted, and habitats were classified into recognised communities as outlined

by Fossitt 2000. Potential correspondence to the Annex I Habitat Classification system of the Habitats Directive was also noted and cross referenced using appropriate interpretation guidelines, including the 'Interpretation Manual of European Union Habitats – EUR28' (European Commission, 2013), *The Status of EU Protected Habitats and Species in Ireland* (NPWS, 2019), and other habitat descriptions as described within National Surveys such as those conducted to inform the NPWS Irish Wildlife Manuals. The location of habitat types was noted and, during the survey, consideration was given to identifying important and / or protected habitats, and habitats that could support protected species. Along with the terrestrial habitat survey, any areas of Alien Invasive Species (IAS) were recorded and mapped onsite.

Buildings and Artificial Surfaces (BL3)

Within the footprint of the Application Site this category applies to three large shipping containers which are located in the centre of the site (see Plate 7 below). These are currently used to store equipment associated with Sligo Rowing Club. This habitat category also applies to surrounding tarmacadam and pedestrian walkways and kerbing, offering negligible ecological value. Plants such as Annual Meadow-grass *Poa annua* and Groundsel *Senecio vulgaris* were recorded in these urbanised areas. A flower bed, WS3 Ornamental/non-native shrub, supporting *fuschia* and *agapanthus* exists to the north of the application site exists within the BL3 habitat.

Plate 7 – Buildings and Artificial Surfaces (BL3)

Amenity Grassland (Improved) (GA2)

This habitat occurs in areas of managed and improved grassland surrounding the car park and between the copses of woodland. The habitat is dominated by grasses such as perennial ryegrass, smooth meadow-grass *Poa pratensis*, dandelion *Taraxacum agg.* and daisy *Bellis perennis*. These areas were low in species diversity, generally managed and closely mown (see Plate 8 below).

Plate 8 – Amenity Grassland (Improved) (GA2)

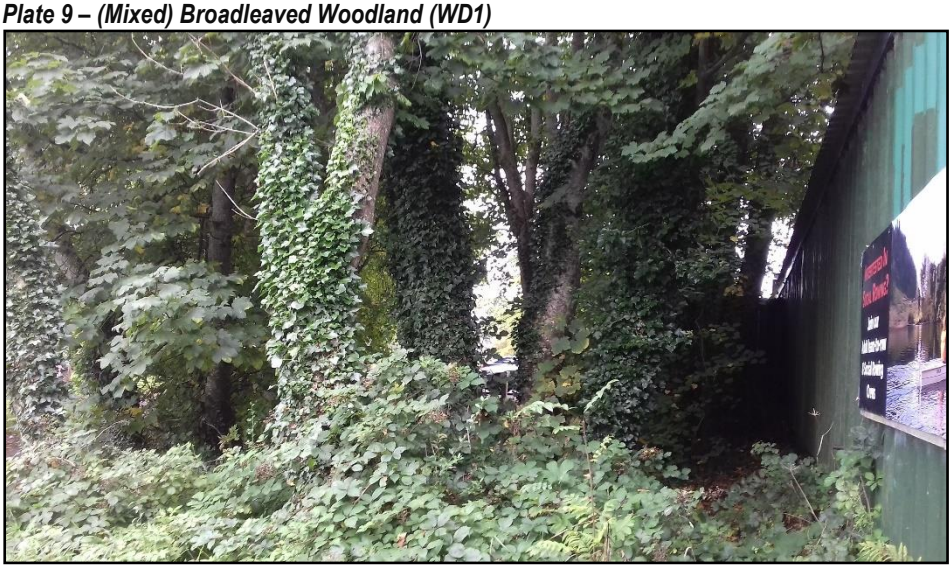
(Mixed) Broadleaved Woodland (WD1)

This is the dominant vegetated habitat within the boundary of the Application Site. The woodlands which surround the shipping containers supports a variety of broadleaved trees, many of which are non-native. These included ash *Fraxinus excelsior* and sycamore *Acer pseudoplatanus* (dominant), small-leaved lime *Tilia cordata*.

The understory within the WD1 woodland which surrounded the shipping containers was notably less biodiverse than more naturalised areas of woodland as you move north-west (outside of the Application Site) (see Plate 6). This was dominated by ivy *Hedera hibernica*, and bramble *Rubus fructicosus agg.*with occasional wych elm *Ulmus glabra*. Groundflora within the mixed woodland included grasses and sedges such as wood false-brome *Brachypodium sylvaticum* (rare), cocksfoot *Dactylis glomerata* (abundant) and wood sedge *Carex sylvatica* (occasional). Herbaceous plants recorded here included herb Robert *Geranium robertianum*, broad-leaved dock *Rumex obtusifolius*, lords and ladies *Arum maculatum*.

Within more naturalised areas of woodland, ferns such as male fern *Dryopteris filix-mas*, scaly male fern *Dryopteris affinis* and hard fern *Blechnum spicant* were recorded. Woodland shrubs and small trees included spindle *Euonymus europaeus*, holly *Ilex aquifolium* and hazel *Corylus avellana.*

Plate 9 – (Mixed) Broadleaved Woodland (WD1)



Wet Willow-Alder-Ash Woodland (WN6) [OUTSIDE OF APPLICATION SITE]

This habitat aligns to the priority (*) EU Annex I habitat which is declining within its range across Europe *'Alluvial forests with* Alnus glutinosa *and* Fraxinus excelsior *(Alno-padion, Alnion incanae, Salicion albae) (91E0) *'*. This is a Qualifying Interest habitat of Lough Gill SAC, however, it lies outside of the Application Site boundary. According to the 'Restoring Priority Woodland Habitats in Ireland' (Coillte, 2010) *"Priority habitats (*) are recognised under the EU Habitats Directive as being critically rare. These woodlands are restricted in their distribution, not just in Ireland, but also across the entire EU. Under Annex I of the Habitats Directive, these woodlands are given "priority" status. Priority woodlands are woods of extremely high nature conservation value and provide habitat, shelter and food to many native plant and animal species. In some cases, these species are now, themselves, extremely rare and rely on priority woodland habitats to survive."*

The alluvial woodland at Lough Gill lies to the north-west, outside of the Application Site. This area undergoes inundation, particularly over winter, with notably hummus rich damp soils in summer. It supported alder *Alnus glutinosa*, ash and grey willow *Salix cinerea subsp. oleifolia* trees, and ground flora typically included nettle *Urtica dioica*, meadowsweet *Filipendula ulmaria*, bramble, field horsetail *Equisetum arvense*, yellow iris *Iris pseudacorus*, creeping buttercup *Ranunculus repens,* creeping bent *Agrostis stolonifera* and Yorkshire fog *Holcus lanatus*. Bryophytes and lichens were present within the canopy, ground-flora and on the trunks of trees (See Plate 10).

Plate 10 – Wet Willow-Alder-Ash Woodland (WN6)

Dry Meadows and Grassy Verges (GS2)

Areas of rank, unmown grassland exist within the Application Site which include species such as false oat grass, Yorkshire fog, cocksfoot, herbaceous flora includes hogweed, creeping buttercup and meadow buttercup.

Plate 11 – GS2 Dry Meadows and Grassy Verges

Scrub (WS1)

The understory within the woodland supported scrub in places, and willow, dogwood *Cornus sanguinea* and sycamore scrub was also recorded along the banks of Lough Gill, adjacent to the Application Site. The flora tended to be dominated by bramble *Rubus fructicosus agg.* and ivy. (See Plate 12).

Plate 12 – Scrub (WS1)

Depositing Lowland Rivers (FW2) / Reed and Large Sedge Swamps (FS1)

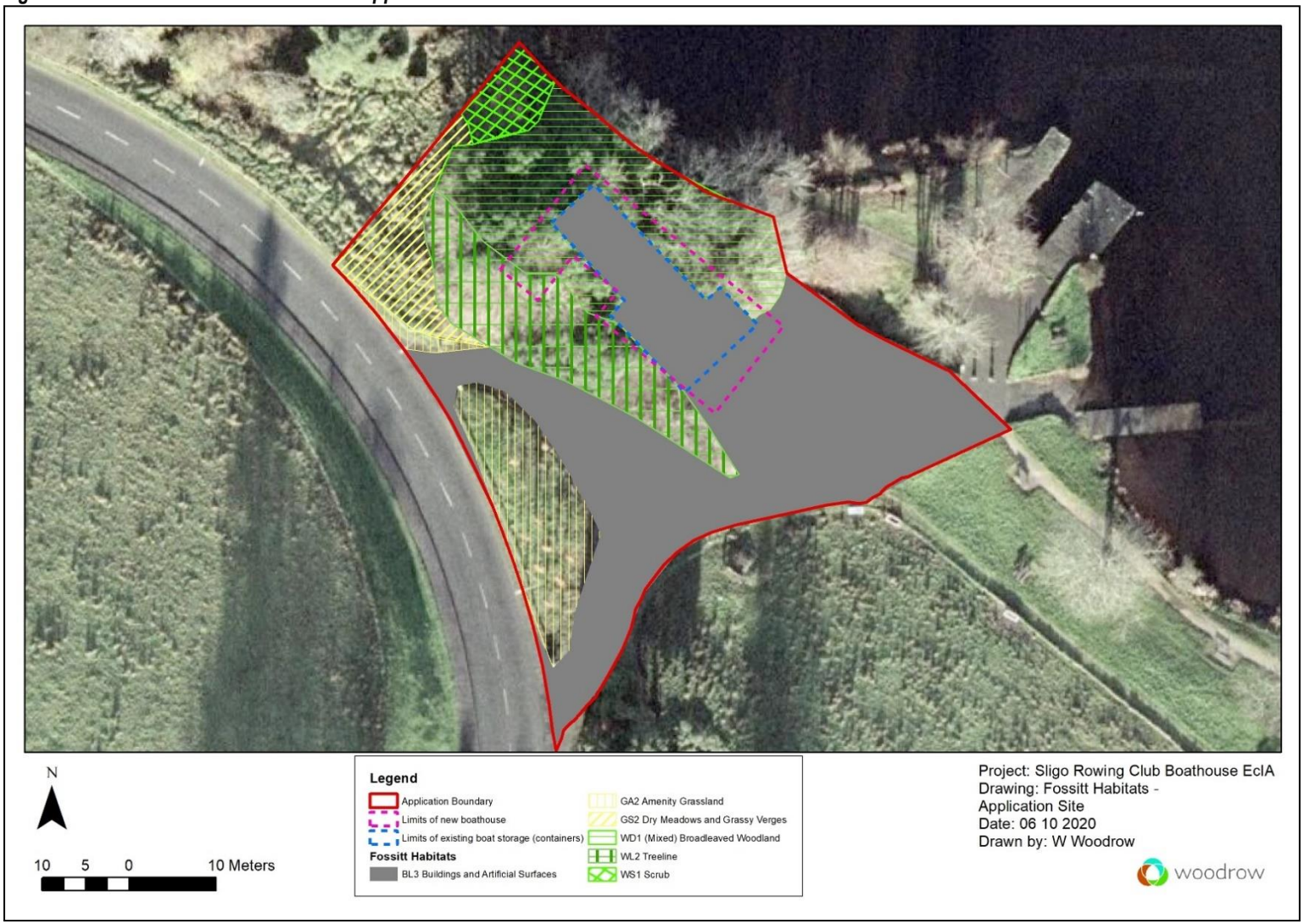
Adjacent to the Application Site, the banks of Lough Gill occasionally support common reed *Phragmites australis,* crack willow *Salix fragilis*.

Plate 13 – Common reed and willow growing along banks of Lough Gill SAC

Invasive Alien Species (IAS) - Terrestrial Plant

While there were no scheduled invasive species found on the Application Site, the non-scheduled invasive garden escapes such as cherry laurel *Prunus laurocerasus,* Montbretia *Crocosmia* × *crocosmiiflora,* and snowberry *Symphoricarpos albus* were regularly noted within the ground flora of the mixed woodland habitat. Furthermore, while not listed as scheduled invasive plants, the trees sycamore and holm oak are both listed as 'Amber' by Invasive Species Ireland, and under the right environmental conditions, may have an impact on the conservation goals of a site, such as Lough Gill SAC / pNHA. These were noted to be commonly occurring within the woodland copse, particularly surrounding the existing Rowing Club facilities, somewhat reducing its biodiversity value as a woodland habitat.

Figure 10 – Habitats recorded within the Application Site



5 ASSESSMENT OF POTENTIAL IMPACTS

This section explores the potential impacts relating to the different site selection features in turn, and examines the significance of the impacts on them, taking account of the nature of the proposed boat house and the sensitivity of the features in the immediate vicinity of the site. Where a likely impact is identified, the need for appropriate mitigation is highlighted and this has been provided within Section 7 of this NIS.

In order to determine the potential impact of the proposal on the receiving habitats and species, detailed ecological surveys were undertaken to assess the potential extent and usage of the site by site selection features (and other important ecological receptors). This included instream field surveys for white-clawed crayfish under licence and lamprey / Atlantic salmon suitability, as well as Annex I habitat surveys and signs surveys for otter.

5.1 Overview of potential impacts arising from the proposal

The proposed boathouse has a number of elements that have been outlined in Section 2.1 above. Potential sources of impacts associated with these different elements include:

- Potential mobilisation of suspended solids and run off / spillage into the Garavogue River during construction (exposure of bare soils on the ground works adjacent to river).
- Release of hydrocarbons and other pollutants into the watercourse (notably potential spillage during re-fuelling and emptying of waste water tanks).
- Vibration and noise associated with construction (adjacent to river).
- Disturbance to current tarmac area within the SAC in order to install drainage and footpath entrances.

The general impacts of these sources on ecological features, including the site selection features are discussed further below.

5.2 Potential impacts on Qualifying Interest features in Lough Gill SAC (Site Code: 001976)

Potential impacts on *Austropotamobius pallipes* (White-clawed Crayfish) [1092]

The potential impacts on white-clawed crayfish are considered to be limited to the occurrence of significant pollution events which might reach habitats which support this species. As detailed in section 4.1, the area adjacent to the proposed works is of limited value for white-clawed crayfish, but they are known to occur further downstream and are likely to occur in the wider area around the Application Site, within suitable habitat.

White-clawed crayfish generally occur in clean water areas, and are susceptible to pollution. Impacts of pollutants and pollution events on white-clawed crayfish can be significant at a population level since the species has a relatively slow reproduction rate and populations can be slow to recover (Peay, 2000). Peay also cites silt, pollution from oil, fuel and spill chemicals from construction activities as indirect threats to white-clawed crayfish. Holdich (2003) cites sediment as a significant impact on white-clawed crayfish, resulting in clogging of gills and reduced oxygen levels.

Impacts on white-clawed crayfish are therefore most likely to be related to any contaminated surface water run-off from the construction process. Re-fuelling of plant machinery will increase the risk of spillage, and the risk that a potential hydrocarbon pollution event could occur within the river.

Uncontrolled ground works and inappropriate storage of excavated materials have the potential to mobilise sediments. These have the potential to result in both loss of suitable habitat, and direct mortality.

However, there is also some potential for impacts during the operational phase, notably in the event of a hydrocarbon spillage within the car park are (though this may not be associated with the current proposal, since the area is used significantly for recreation already).

Potential impacts on lamprey species *Petromyzon marinus* (Sea Lamprey) [1095], *Lampetra planeri* (Brook Lamprey) [1096], *Lampetra fluviatilis* (River Lamprey) [1099]

Lamprey species use a variety of substrates for spawning. The larger Sea lamprey prefer cobbles and pebbles for spawning, where they spawn in pairs or small groups. River lamprey prefer sandy or gravelly sediment where they also spawn in pairs. Brook lamprey spawn in smaller, slower flowing tributaries preferring spawning substrate similar to that used by the river lamprey where they spawn in groups of ten and over. The juvenile or ammocoete stage of all species spend a number of years in river detritus and fine sediment habitat, prior to migration to the sea.

Maitland (2003) cites pollution (including pollution 'barriers', significant pollution events and siltation) as significant factors affecting lamprey species, but also states that limited details are available on specific aspects of this.

Mickle, *et al* (2018) found sea lamprey to increase swimming and decrease resting time with increased noise levels. There is a concern therefore, that sufficiently high intensity sounds during construction could negatively impact lamprey in the locality.

The main potential impact of the proposed works on the species are considered to be the potential direct loss of suitable spawning habitat, potential for disturbance during construction operations, siltation of downstream habitats, and deterioration in water quality associated with potential spillage of hydrocarbons or surface run-off associated with construction and operational activities. Although there is some potential for noise disturbance during construction to have a limited impact on the use of habitat in the vicinity of the works by lamprey species.

Potential impacts on *Salmo salar* (Salmon) [1106]

The Lough Gill catchment (including the River Bonet) holds a population of Atlantic salmon. The proposal is located at a point in the Garavogue River where almost all salmon will pass on migration from the sea. Some salmon spawning beds occur downstream of the proposal, although the majority of spawning habitat occurs upstream within the Bonet River and related tributaries.

The main threats to the species associated with the proposed works are considered to be the potential for disturbance during construction operations due to noise and vibration, siltation of downstream habitats, and deterioration in water quality associated with potential spillage of hydrocarbons associated with construction and operational activities.

Densities of different life stages of salmon, particularly fry and parr, vary within a river catchment, limited often by the availability of suitable substrates. Young parr are territorial and defend small sections of the river channel used for intercepting edible particles within the current (Kalleberg, 1958). Habitat availability and quality is intrinsically linked with survival rates and recruitment to smolt stages.

Therefore, small amounts of debris entering a section of river important for vulnerable life stages of salmon can have deleterious impacts, even in the short-term on juvenile survival and habitat utility. Although, a significant release of suspended solids would be required to impact on downstream spawning habitat, it is likely that juvenile salmonids occur in the area. Surface water run-off from the proposed work site that may enter the watercourse has the potential to cause the production of high levels of suspended solids (though only over a limited area within proximity of the run off location at the points where it enters a watercourse).

Release of hydrocarbons as a result of events such as fuel spills have the potential to impact on water quality as a result of reduced oxygen, thereby affecting the salmon populations that required good oxygen supplies. Hydrocarbons are known to bioaccumulate in *Salmonids* (e.g. McCain *et al.,* 1990), with Atlantic salmon known to be physically affected by short term exposure, leading to loss of condition. Salmon are also known to avoid areas with hydrocarbons (e.g. Weber *et al.,* 1981) leading to the effective loss of habitat or migration routes for the species. The release of even small amounts of hydrocarbons into the watercourses adjacent to the Application Site, has the potential to result in a significant impact on the downstream populations of Atlantic salmon within this SAC.

The susceptibility of salmonids to noise and vibration is also relevant, sine the foundations of the proposed boathouse will be piled in order to retain the surrounding trees. Nedwell (2006) found that Atlantic salmon had a notable but limited response to piling operations but that brown trout were less sensitive. Studies conducted by Hawkins and Johnston (1978) found that Salmon has a peak sensitivity to underwater sound vibration at a frequency of 160Hz. Nedwell *et al.* (2007) showed that fish displayed an avoidance reaction at sound levels of +90 dB hearing threshold. Works taking place at the proposed construction site suggests that the significance of potential impacts associated with noise and vibration is likely to be limited, as works are not taking place directly within the water course. However, given that the site is in close proximity of the Garavogue River, potential impacts are possible, in the absence of appropriate mitigation measures.

Potential impacts on *Lutra lutra* (Otter) [1355]

Otters are species that are typically crepuscular in nature and susceptible to disturbance. Although otters often occur within urban areas and are occasionally observed in such areas during the day (in Sligo Town for example). The most likely impacts on otter relate to potential from noise disturbance (notably during construction) and light disturbance during operational phase of the proposal.

There will be unavoidable levels of noise during the construction phase. Notably, noise levels during any earthworks, and, particularly, piling activities for the foundations, will result in significant, although localised and temporary, noise levels. There were no otter holts on the south side of the river found within 200m of the proposal. There will therefore be no likely impacts on otters within holts, and particularly breeding otter. The nature of the wider area is that it provides many suitable laying up areas for otter (for example within the alluvial woodland habitats, although such areas exists at a significant separation distance away from the proposal (*c.* 150m to the north-west of the site), in areas that have less public access. Disturbance is most likely to be associated with foraging otters. Such an impact is unlikely to be significant during the day, when the species is unlikely to be particularly active in the area. However, heavy construction activity after dusk has the potential to make a significant change to the current noise baseline at a time when otters may be foraging in the wider area.

The occurrence of a significant pollution event during construction would have the potential to impact on the prey species (such as amphibians, fish and freshwater crayfish) that the otters feed on in the wider area.

There will be no increase in capacity for boats on the water as a result of the proposal, the existing level of use will remain the same. Subsequently, the proposal is not considered likely to increase the potential for disturbance within the water environment. It is also worth noting that, although construction phase disturbance has been considered above, Bailey and Rochford (2006) suggested that there is a growing body of evidence that otters can be fairly oblivious to even fairly high levels of non-confrontational disturbance.

It may, however, result in more activity around the car park by people using the gym and will result in windows (that, although intended to provide for daylight into the building, are a potential source of light pollution after dark). The gym is on the first floor of the building. Details on windows are shown in the north-east side elevation in Figure 6 above. The ground floor also holds windows facing the river. However, the impact from these is likely to be less, since they are closer to the ground (reducing the potential for light spillage) and are located within the boat storage room, which is likely to be used / lit only to a limited extent after dark, for example for boat maintenance. Although less, the potential for the windows on the ground floor to produce light spillage still exists.

Trees will be retained as far as possible between the building and the river. This has been part of the design from the outset, and foundations will be piled specifically to ensure that the tree roots are not impacted. This will reduce the potential for light spillage particularly in respect to the eastern section of windows facing the river, where there are trees already existing between the proposed building location and the river. There are no proposed external lights associated with the proposal (existing street lights occur at the roadside to the south of the Application Site.

Potential impacts on Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150]

Lough Gill itself qualifies as this Annex I feature, although the SAC also includes river systems and terrestrial habitat holding the site selection features. O'Connor (2015) cites diffuse and point source pollution (from a number of sources, including agriculture, forestry, industry, households, and other sources) as the highest ranked pressures to the habitat in Ireland. Lesser threats include diffuse pollution via storm overflows or urban run-off, surface water abstractions and invasive non-native species.
As detailed previously, the proposal lies at a point on the Garavogue River where the lake drains towards the sea, although the River is wide, and slow moving, at this location. As such, the proposal has a very limited potential to impact on this habitat, since the flow is away from this feature. Potential impacts relate to pollution, notably the risk of unmitigated, contaminated runoff occurring during the construction phase. Potential pollution sources are the same as those detailed for the other QI features above and mitigation needs to be implemented in these respects from a precautionary perspective.

Potential impacts on *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]

There are areas in the vicinity that comprise Alluvial Woodland falling within this EU Annex I priority habitat. This includes areas adjoining the Garavogue River within around 150m downstream (to the north-west) of the proposal. The habitat qualities of this QI are intrinsically linked to its function as woodland that is regularly inundated (particularly during winter). This habitat classification exists here as the woodland's natural habit is for it to be regularly flooded by waters from the river during high water periods. The potential for impacts to occur on this habitat is considered to currently be low, and is largely limited to a significant pollution event (for example a hydrocarbon or chemical pollutant

spillage) occurring during a period of extremely high water, when the habitat could be inundated by contaminated water from the event. This is highly unlikely and would be limited in extent, but cannot be ruled out.

In addition, section 4.3 has outlined that there are terrestrial Invasive Alien Species (IAS) occurring at the Application Site. All of the IAS noted within, and in close proximity to, the Application Site are **not** listed on the *'Third Schedule: Part 1 of the European Communities (Birds and Natural Habitats) Regulation 2011'* but a number of these are considered to be 'medium' impact invasive species according to Invasive Species Ireland[8].The potential for these to be spread into this habitat is limited, however measures to ensure that there is categorically no potential for this, and to reduce the potential spread of the species in the wider area in the future, are appropriate.

5.3 Potential impacts on Qualifying Interest features in Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC (Site Code: 000627)

As stated in Table 2, there is Limited potential for any impact on this site, taking account of the size and nature of the proposal and the distance downstream. However, the risk of releasing hydrocarbon or chemical pollution during construction has the potential to result in an impact if an extreme event occurred. This, in turn, has the potential to impact on the following QI features:

- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Phoca vitulina* (Harbour Seal) [1365]

The potential impacts on these QI features includes contamination of habitats with hydrocarbons, and consequent impacts on the substrates and organisms that combine to maintain the habitats in favourable conservation condition, as well as direct toxicity impacts on lamprey species and potential impacts on the prey species of harbour seal.

5.4 Potential impacts on Qualifying Interest features in Cummeen Strand SPA (Site Code: 004035)

As stated in Table 2, there is Limited potential for any impact on this site, taking account of the size and nature of the proposal and the distance downstream. However, the risk of releasing hydrocarbon or chemical pollution during construction does have the potential to result in an impact in the case of an extreme event. This, in turn, has the potential to impact on the following QI features:

- Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]
- Oystercatcher (*Haematopus ostralegus*) [A130]
- Redshank (*Tringa totanus*) [A162]
- Wetland and Waterbirds [A999]

The potential impacts on these QI features is generally likely to be limited to impacts on the organisms and plant species that they feed on within the intertidal communities in the SPA.

[8] Further information on 'High Impact' and 'Medium Impact' Invasive Alien Species is available at: https://www.biodiversityireland.ie/projects/invasive-species/species-lists/

5.5 Potential Impacts Associated with the spread of Invasive Alien Species (IAS)

As detailed in section 4.3 above, there are no 'Third schedule' invasive species found within the Application Site. However, the non-scheduled invasive garden escapes, cherry laurel *Prunus laurocerasus,* montbretia *Crocosmia* × *crocosmiiflora,* and snowberry *Symphoricarpos albus,* were regularly noted within the ground flora of the mixed woodland habitat. In addition, while not listed as scheduled invasive plants, the trees sycamore and holm oak are both listed as 'Amber' by Invasive Species Ireland, and under the right environmental conditions, may have an impact on the conservation goals of a site, such as Lough Gill SAC.

It is considered that the potential for spread of these species as a result of the proposal is limited. However, the importance of some of the surrounding habitats, and the susceptibility of some of these habitats to adverse impacts caused by the aforementioned IAS, means that there is a significant concern relating to the potential impacts of causing their spread during the construction or operation of the proposed works.

Although the water environment holds zebra mussel, there are no proposed works within the aquatic zone and no potential to cause its spread. There are, however, opportunities to improve awareness around the potential spread of zebra mussels by visiting kayakers, rowers or people using boats at the proposed facility.

5.6 In-combination effects with other plans and projects

Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location (CIEEM, 2019). Different types of actions can cause cumulative impacts and effects, with cumulative impacts potentially falling into the 'Additive/Incremental' or 'Associated/Connected' categories.

This proposal relates to the provision of a new boathouse for the Sligo Rowing Club and Kayak Club at Doorly Park on the Garavogue River. There are no 'Associated/Connected' proposals related to the proposal. Cumulative impacts are considered likely to be those falling into the 'Additive/Incremental' category, i.e. Those projects which may contribute to any impacts that may arise from this proposal. Considering that potential impacts relating to this project generally relate to those on the aquatic habitats and species and also those relating to habitats and species that fringe the river, this is particularly relevant with respect to water quality impacts.

There are a number of Planning Applications within 2km which have the potential for cumulative impacts upon water quality and potential disturbance. These are listed in Table 3 below.

Table 3 - Plans or projects within 2 km of the proposed development.

Planning Reference	Approx. distance from development	Details	Potential In-Combination Impacts
19111	0.3km	4 floating angling strands along existing riverside walk.	Impacts during the construction phase without the correct mitigation measures put in place. Disturbance during operational phase.
0870033	0.7km	Administrative, residential buildings with utilities, public lighting, road access	Little significant connection to SAC, the possibility of more people using the woodland area
08231	0.8km	Residential buildings including administrative building, creche and retail units	Little significant connection to SAC, the possibility of more people using the woodland area
15219	0.9km	Floating pontoon and access ramp within the Garavogue river. Rebuilding of quay wall	Impacts during construction phase; in aquatic works (piling) and operational phase; limited increase in boating traffic
20127	1.17km	Construction of 2-storey of residential housing.	Little significant connection to SAC, the possibility of more people using the woodland area
20180	1.34km	Construction of sprinkle water and spillage run off retention pond associated with drainage, pump kiosk.	Little significant connection to SAC
18412	1.34km	Changes to previously permitted development; to onsite waste water treatment plant, changes to cooling water supply for new pump and use of water from River.	Potential impacts during operational phase from run off/ spillage and during constructional phase from run/off
1820	1.51km	Conversions of three living spaces into three bedrooms to increase bedroom capacity in the Riverside hotel	Little significant connection to SAC
1270077	1.42km	Replacement of fencing, resurfacing existing all weather pitch and court with synthetic surface and new flood lighting for courts and pitch	Little significant connection to SAC
17406	1.26km	Demolition of existing storage building and creation of new road access to tie in with future eastern Garavogue bridge and approach road schemes.	Potential impacts in demolition phase; increased risk of run off, vibrations/ noise levels (in and out of water course). Pollution risks during operational phase.

Potential cumulative impacts are considered to include:

- Localised water quality impacts during construction;
- Combined noise / disturbance impacts during construction;
- Potential ongoing water quality impacts; and,
- Potential ongoing disturbance.

The above potential impacts are all being considered within this assessment.

With respect to localised water quality impacts during construction, there are not considered to be any other significant construction projects occurring at the same time as the proposal (although it is noted that some proposals within Sligo Town may occur – these will have been subject to an NIS if they have the potential to result in a pollution event that could affect downstream European Sites). Temporary impacts such as a potential pollution event, are therefore not considered likely to be increased when considered in-combination with other projects. There may be concern that localised siltation along the banks of the Garavogue River could result from a number of the projects, notably the works at the new Doorly Park boat pontoon and the fishing pontoons. As such, the proposal could result in a cumulative impact on white-clawed crayfish habitat suitability for example. All of these have undergone an NIS and specific construction approaches are required. The potential for cumulative impacts is considered highly limited. However, it does highlight the need to ensure that all appropriate measures are taken to reduce any potential for silt loss into the Garavogue River to an absolutely minimal level as part of the mitigation for construction and operation of this project.

With respect to noise / disturbance impacts during construction, the Doorly Park boat pontoon has been completed, and the fishing pontoons are either completed or are expected to be completed shortly. There is therefore considered to be no potential for cumulative impact in this respect.

With respect to potential ongoing water quality impacts, this relates particularly to potential impacts from hydrocarbons. As detailed in section 2.2, a bypass hydrocarbon interceptor will be fitted to the stormwater outflow at the site prior to the stormwater discharging to the Garavogue River. This will reduce the likelihood that the proposal could result in a cumulative impact relating to the release of any hydrocarbon pollution here. The proposal is connected to the main Sligo Waste Water Treatment plant (WWTP). This plant is within capacity (designed for 50,000 PE) and lies downstream of Lough Gill SAC, but upstream of Cummeen Strand/ Drumcliffe Bay SAC, and Cummeen Strand SPA.

With respect to the potential for ongoing disturbance, the proposal will not result in an increased capacity for boat storage or access to the river. However, it is a new permanent building adjacent to the river, with potential use in the evening, and associated potential for light spillage from windows. It will be the only building in the vicinity and, although the potential for ongoing disturbance is important (and highlighted above with respect otter, and within the Woodrow 2020 EcIA for other species such as bats for example) this potential for cumulative impact associated with other development projects adjacent to Lough Gill SAC in particular, must be fully considered and mitigated for within the design of this Proposed Development. Subsequently, with appropriate mitigation in place, the potential for cumulative impacts will be reduced to an imperceptible level.

6 MITIGATION OF EFFECTS

Potential impacts of the proposal have already been described in Sections 5.1 to 5.6 above. In the absence of mitigation, worst-case impacts are considered to be limited to the following:

- Potential loss of 78m^2 of existing open habitat within the Lough Gill SAC.
- Potential pollution during the construction phase resulting from a fuel or chemical spill. This has the potential to impact on aquatic ecological receptors, including species and habits downstream of the proposal. This includes species and habitats that are Qualifying Interests of Lough Gill SAC [001976], Cummeen Strand / Drumcliffe Bay (Sligo Bay) SAC [000627] and Cummeen Strand SPA [004075] (or the habitats and prey items that QI species rely on):
    - Lough Gill SAC:
        - Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150]
        - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* [91E0]
        - *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
        - *Petromyzon marinus* (Sea Lamprey) [1095]
        - *Lampetra planeri* (Brook Lamprey) [1096]
        - *Lampetra fluviatilis* (River Lamprey) [1099]
        - *Salmo salar* (Salmon) [1106]
    - Cummeen Strand / Drumcliffe Bay (Sligo Bay) SAC:
        - Estuaries [1130]
        - Mudflats and sandflats not covered by seawater at low tide [1140]
        - *Petromyzon marinus* (Sea Lamprey) [1095]
        - *Lampetra fluviatilis* (River Lamprey) [1099]
        - *Phoca vitulina* (Harbour Seal) [1365]
    - Cummeen Strand SPA:
        - Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]
        - Oystercatcher (*Haematopus ostralegus*) [A130]
        - Redshank (*Tringa totanus*) [A162]
        - Wetland and Waterbirds [A999]
- Potential pollution during the construction phase resulting from overland flow of sediments from excavations and the working site. This has the potential to impact on ecological receptors at the nearest location within the Lough Gill SAC [001976]:
    - *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
    - *Petromyzon marinus* (Sea Lamprey) [1095]
    - *Lampetra planeri* (Brook Lamprey) [1096]
    - *Lampetra fluviatilis* (River Lamprey) [1099]
    - *Salmo salar* (Salmon) [1106]
- Potential pollution during the operational phase resulting from failure of the pumped effluent system to the mains foul sewer that links to the Sligo Town WWTP. This has the potential to impact on ecological receptors at the nearest location within the Lough Gill SAC [001976]:
    - *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
    - *Petromyzon marinus* (Sea Lamprey) [1095]
    - *Lampetra planeri* (Brook Lamprey) [1096]
    - *Lampetra fluviatilis* (River Lamprey) [1099]
    - *Salmo salar* (Salmon) [1106]
- Potential disturbance of otter, within the Lough Gill SAC during construction, if carried out after dusk.
- The potential for disturbance / disruption to migrating fish species, notably Atlantic salmon, but also lamprey species within Lough Gill SAC during heavy machinery work associated with the construction phase, such as piling.
- Potential spread of Invasive Alien Species (IAS) into surrounding terrestrial habitats, including into EU Annex I habitats within the Lough Gill SAC.

6.1 Mitigation for Potential Impacts as a Result of Direct Loss of open area within Lough Gill SAC

The proposal will result in the permanent loss of an area within the Lough Gill SAC. However, the area to be lost is minimal, comprising 235.3m^2 of BL3 Buildings and Artificial Surfaces and 77.9m^2 of WD1 (Mixed) Broadleaved woodland within the Lough Gill SAC. This is due to the use of the hard-cored area currently holding the storage containers as the main footprint of the proposed boathouse. None of the areas to be lost comprise Qualifying Interest habitats for the SAC, or EU Annex I habitats under the Habitats Directive. The habitats to be lost do not comprise native habitats of any significant conservation value, with tree species at the Application Site comprising largely non-native species and having little woodland understorey of note (with some parts of the understorey comprising Alien Invasive species, notably montbretia, as well as garden escapes such as Solomon's Seal *Polygonatum odoratum* which was recorded at the Application Site during the habitat survey.

The loss of the habitats described above are not considered to result in an impact on the integrity of the Lough Gill SAC and mitigation is therefore not required. However, noting the extent of non-native trees in the area (including a fairly recently planted holm oak to replace one that was damaged by winds) it is considered that there are opportunities to improve the area by planting with native species, such as sessile oak *Quercus petraea* and pedunculate oak *Quercus robur* where new planting is required (other native species can be advised upon within any planting proposals and should first be agreed with Sligo County Council).

It is therefore recommended that any screening planting which is required in the future, or any intended replacement of trees that are lost at the Application Site, are replaced with native woodland species in keeping with Lough Gill SAC, and in consultation with Sligo County Council and NPWS.

6.2 Mitigation for Potential Impacts as a Result of Water Quality Changes

Construction phase mitigation

To avoid adverse impacts on water quality (which could impact on the Qualifying Interest species and habitats of Lough Gill SAC, Cummeen Strand / Drumcliffe Bay (Sligo Bay) SAC and Cummeen Strand SPA) due to hydrocarbon release from machinery/vehicles, and sediment release from the works site, the works shall be carried out in adherence with a strict working methodology. A site Construction Environmental Management Plan (CEMP) shall be devised which will outline the pollution prevention measures which are to be incorporated during the works, and will be submitted to the Planning Authority and Inland Fisheries Ireland prior to the commencement of works. This will include the following minimum requirements to avoid any potential impact on these European Sites:

- Prior to the commencement of works, silt fences will be put in place on the downslope side of any areas to be opened up / excavated as part of the construction works.
- The extent of excavated / open spoil areas within the site at any one time will be minimised in order to reduce the potential for the creation of sediment-laden water during adverse weather conditions.
- All fuels, lubricants and hydraulic fluids shall be kept in a secure bunded area at a minimum of 50 m from the Garavogue River. This will necessitate the storage area being outside the Application Site, which is considered too close to the Garavogue River and too constrained to avoid potential for a pollution incident in the event of a spillage. The bunded area shall

accommodate 110% of the total capacity of the containers within it. Containers must be properly secured to prevent unauthorised access and misuse.

- Re-fuelling will only be undertaken within a designated, secure and bunded re-fuelling station at a minimum of 50 m from the Garavogue River. This will necessitate the re-fuelling area being outside the Application Site, which is considered too close to the Garavogue River and too constrained to avoid potential for a pollution incident in the event of a spillage.
- An effective spillage procedure must be put in place with all staff properly briefed. Any waste oils or hydraulic fluids shall be collected, stored in appropriate containers and disposed of offsite in an appropriate manner.
- Spill kits with an appropriate capacity for the contaminants used on site and the nature of the site must be kept on site and available throughout the construction process.
- Run off from hard surface areas and concrete mixing areas must not enter the watercourse so as to reduce the potential for contaminants entering the waterbody.
- Any dewatering of excavations or arisings from piling activities will be removed from the site.
- There will be no discharge of any water from excavations or piling operations to any local watercourses at any time.
- All construction operations must adhere to recommendations detailed in Inland Fisheries Ireland *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI 2016).

Operational phase mitigation

As detailed in section 5, the potential for water quality impacts during the operational phase of the proposal is considered to be limited to:

- A failure of the pumped effluent system or flood waters resulting in flooding of the pump area; and / or,
- Contamination of the surface water discharge to the river from the roof to the Garavogue River.

In the case of the pumped effluent system, the project incorporates embedded mitigation in the form of an amended location of the effluent pump, to an area on the southern side of the proposed boathouse (on the opposite side from the Garavogue River) to avoid any potential flood area. This location is shown in Figure 3. In addition, Figure 11 shows the proposed pump to be used at the Application Site. This includes an integrated non-return valve from the main foul sewer. In addition, the following mitigation is required:

- The pump must be fully enclosed to contain any effluent in the event of a failure within the pump, and appropriately alarmed to indicate any failure.
- The pump will be maintained on a regular basis as required by the specifications and will be monitored in order to rectify any such failures immediately.

In the case of the potential for Contamination of the surface water discharge to the river from the roof to the Garavogue River, an alarmed petrol interceptor is proposed to be in place between the boathouse and the discharge location, as shown in Figure 12. In addition, the following mitigation is required:

- Downpipes from the roof will be enclosed at the entrance to the ground so as not to allow the disposal of washing water, detergents or other potential pollutants into the roof water discharge system.

Figure 11 – Proposed effluent pump system

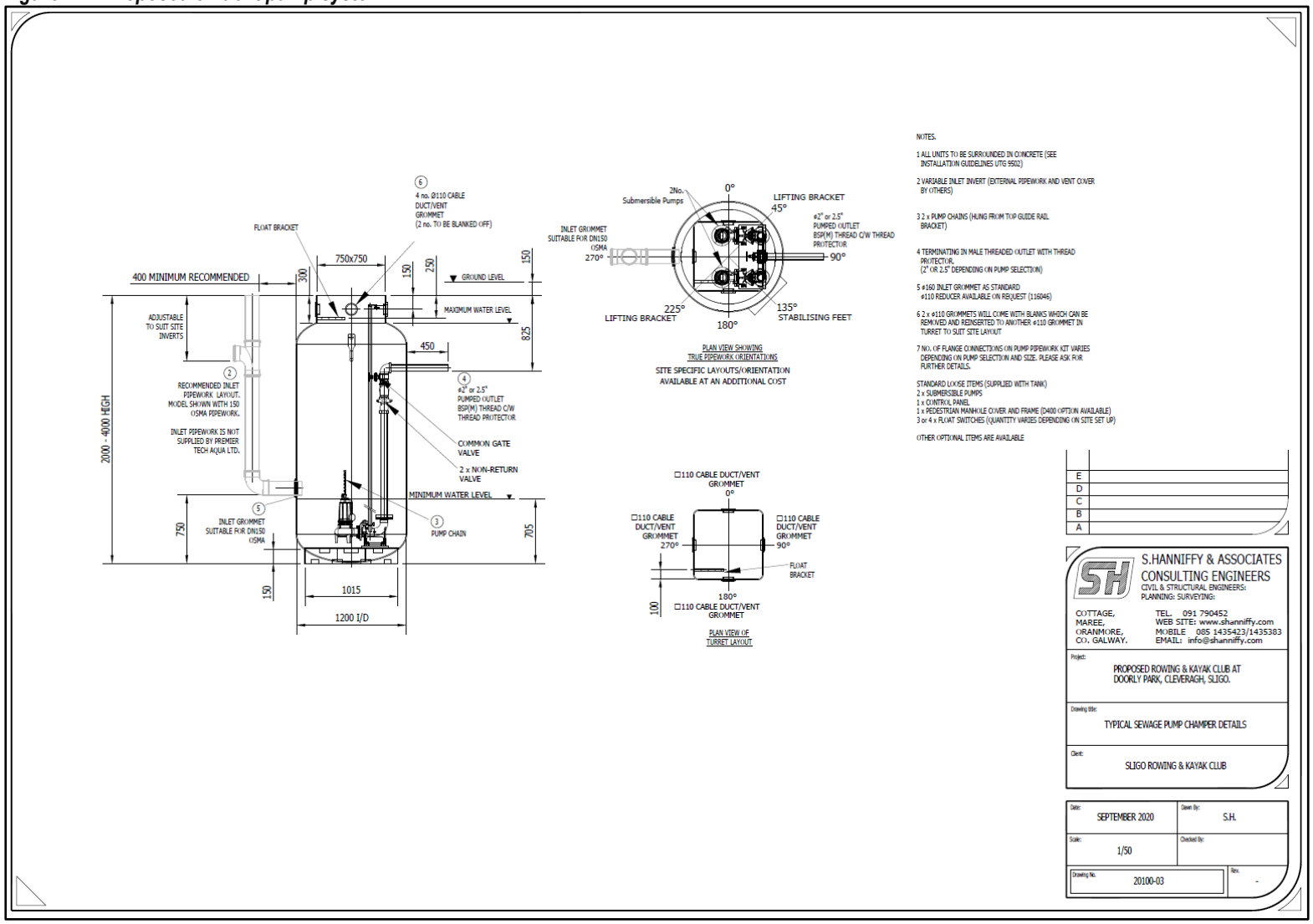


Figure 12 – Proposed layout showing petrol interceptor circled in blue

6.3 Mitigation/Compensation for Potential Disturbance Impacts on QI species within Lough Gill SAC

Mitigation for Potential Impacts upon Species during construction

The proposal has the potential to result in disturbance on otter during the construction phase, if the more disruptive elements of work are undertaken at or after dusk. To avoid these impacts, the following mitigation is required:

- There will be no significantly disruptive construction elements undertake after dusk. This includes all groundworks, piling and main external structure works, including external cladding and roofing, and any works requiring external lighting. This excludes internal works where these are undertaken without the use of temporary external lighting rigs.

As detailed in section 5, the proposal has the potential to result in water pollution as a result of a potential spillage or release of sediment-laden water into the river during construction. Such events could impact on lough Gill SAC QI species otter, Atlantic salmon, lamprey species, and white-clawed crayfish.

To avoid these impacts, the following mitigation is required:

- All mitigation detailed in section 6.2 in respect to the construction phase.

As detailed in section 5.2, the most significant construction operations (in terms of noise and vibration) have the potential to result in some temporary adverse reaction responses from Atlantic salmon and, potential lamprey species. To avoid these impacts, the following mitigation is required:

- There will be no noise-emitting plant operating within 8m of the Garavogue River shoreline.
- Any operations that have the potential to result in a noise level exceeding +120dB at source within the Application Site will require mitigation approaches (such as acoustic barriers), on the basis that the area considered to be likely to be used by most fish species (beyond the shallow bay adjacent to the site) lies a minimum of 20 metres north of the proposed boathouse footprint, allowing for a noise decay to below 90db at that location as shown in figure 13 below.

Figure 13 – Overview of utilisation and the standard distance decay rates for noise (Cutts, N., Hemingway, K. & Spencer, J., 2013)

Note: Increasing disturbance levels graduate from dark green to red.

Metres from Source	dB(A)										
0.67	120	110	100	95	90	85	80	75	70	65	60
1.33	114	104	94	89	84	79	74	69	64	59	54
2.67	108	98	88	83	78	73	68	63	58	53	48
5.33	102	92	82	77	72	67	62	57	52	47	42
10.67	96	86	76	71	66	61	56	51	46	41	36
20.67	90	80	70	65	60	55	50	45	40	35	30
42.67	84	74	64	59	54	49	44	39	34	29	24
85.33	78	68	58	53	48	43	38	33	28	23	
170.67	72	62	52	47	42	37	32	27	22		
341.33	66	56	46	41	36	31	26	21			
682.66	60	50	40	35	30	25	20				
1365.32	54	44	34	49	24						

Mitigation for Potential Impacts on Qualifying Interest Species during Operation of the Site

The proposal includes windows within the north-east façade which have the potential to result in light spillage to the north. This, in turn, has the potential to impact on species susceptible to light disturbance, notably otter. To avoid these impacts, the following mitigation is required:

- The windows along the north-east facing façade on the first floor will be fitted with light-sensitive ('black-out' or similar) blinds that automatically close during the hours of darkness.
- The boat storage rooms on the ground floor will be fitted with timer switches that will automatically shut off the light after a period not exceeding 5 minutes.
- Any trees between the proposed boathouse and the river that die or have to be removed for any safety reasons will be replaced using appropriate native species in keeping with Lough Gill SAC.

6.4 Mitigation for Potential Spread of Invasive Species.

The Application Site holds Invasive Alien Species (IAS) that, although not considered to be of high impact, have the potential to result in significant impact because of the conservation importance of the Lough Gill SAC, if caused to spread. To avoid such impacts, the following mitigation is required:

- The contractor will be required to formulate an IAS Management Plan (IASMP) to be incorporated into the CEMP for the site. This must include, but is not limited to:
    - An updated map of terrestrial IAS plant species at the site;

- Full details of measures to be taken during construction to avoid any potential for the spread of IAS during all construction activities at the site; and,
- Measures that can be undertaken during the construction phase to control / eradicate terrestrial plant IAS at the site, taking account of the sensitive nature of the location.

6.5 Proposed Enhancement Measures

Awareness-raising

Given that this area is already a significantly used public waterway within an urban environment (and is well-used for recreational and boating activities). There is already significant information available on the wildlife of the area. However, there are still opportunities to improve awareness of the wildlife and importance of the area and threats to it. It is therefore recommended that the potential for information to users of the area is provided (potentially in the form of information boards) on:

- The conservation importance of the area and measures that water users can take to reduce disturbance impact in the wider area; and,
- The risk that aquatic Invasive Alien Species pose to the area (including zebra mussels) and measures that can be taken to minimise the risk of spread.

Measures for Biodiversity Enhancement

Although the size of the Application Site is limited, there are measures that can be undertaken for biodiversity enhancement. Notably, opportunities exist for promoting more native tree species on the Application Site and for enhancing the area for roosting bats and nesting birds. It is therefore recommended that:

- Any opportunities for planting trees are taken and appropriate native species, that are in keeping with Lough Gill SAC, are specified;
- Nest boxes for birds (a minimum of 3) are put in appropriate locations (specified within the CEMP by an Ecologist) around the site. These should include boxes for hole nesting species and can also include half open nest boxes (in suitable locations) as well as specialist boxes such as house martin nest boxes on the building itself;
- Bat boxes are put in appropriate locations (specified within the CEMP by an Ecologist) around the site. Ideally this can include integration of both maternity- and hibernation-suitable features within the architecture of the building itself (as self-contained bat bricks and access vents can be incorporated into the structural design), but can also include suitable woodcrete bat boxes (a minimum of 3 e.g. General Purpose Bat Boxes) on trees within the Application Site; and,
- There are opportunities for local groups (such as water-based sports clubs which will utilise this facility and/or Sligo Sports & Recreation Partnership) to organise and undertake volunteer habitat conservation work at the Application Site. This could include small events such as assisting in IAS control (only where this is advised upon by an experienced specialist) and litter picking. This could be carried out in liaison with Sligo County Council, NPWS and An Táisce. The latter organisation will often support local groups in litter picking events by issuing groups with the appropriate equipment (e.g. litter pickers, bags and gloves can often be obtained through CleanCoasts in support of such work).

The above measures should be undertaken on the basis of advice from a suitably qualified ecologist.

6.6 Summary of Effects and Residual Impacts

Table 4 - Residual Impacts of the Proposed Development

European Site	Feature	Origin of impact	Potential Impact	Significance and duration of Impact	Probability	Proposed Mitigation	Residual Impact on Integrity of Site?
Lough Gill SAC [001976]	Whole site	Construction phase fuel or chemical spill Operational Phase effluent pump failure	Water quality impacts and resultant degradation in aquatic habitats and potential mortality of QI aquatic species	Significant Temporary	Unlikely	Construction phase pollution prevention and site management measures to be incorporated into a CEMP. Operational phase mitigation in the form of effluent pump containment safeguards and stormwater system oil interceptor.	No
		Loss of area under footprint of development	Loss of 77.9m^2 of non-Annex, largely non-native habitat within SAC.	Negligible significance Permanent (but reversible)	Certain	Embedded mitigation to minimise impact through use of piled foundations.	No
		Excavation of soil and use of machinery / equipment in an aquatic environment	Inadvertent spread of invasive species	Significant at the local scale, and potentially at a higher scale dependent upon the vector type and species being spread.	Possible	Contractor to formulate an IAS Management Plan to be agreed with the Planning Authority prior to commencement of construction, to include: • An updated map of terrestrial IAS plant species at the site; • Full details of measures to be taken during construction to avoid any potential for the spread of IAS during all construction activities at the site;	No

European Site	Feature	Origin of impact	Potential Impact	Significance and duration of Impact	Probability	Proposed Mitigation	Residual Impact on Integrity of Site?
						• Measures that can be undertaken during the construction phase to control / eradicate terrestrial plant IAS at the site, taking account of the sensitive nature of the location.	
	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation [3150]	Construction phase fuel or chemical spill Operational Phase effluent pump failure	Water quality impacts and resultant impact on inundation woodland	Significant Temporary	Very unlikely	Construction phase pollution prevention and site management measures to be incorporated into a CEMP. Operational phase mitigation in the form of effluent pump containment safeguards and stormwater system oil interceptor.	No
	*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	Construction phase fuel or chemical spill Operational Phase effluent pump failure	Water quality impacts and resultant impact on inundation woodland	Significant Temporary	Very unlikely	Construction phase pollution prevention and site management measures to be incorporated into a CEMP. Operational phase mitigation in the form of effluent pump containment safeguards and stormwater system oil interceptor.	No
	Austropotamobius pallipes (White-clawed Crayfish) [1092]	Construction phase fuel or chemical spill. Operational Phase effluent pump failure	Direct toxic impact from fuel or chemical spill. Localised impacts are limited because of limited habitat suitability close to the Application Site.	Significant Temporary and reversible during construction	Unlikely	Construction phase pollution prevention and site management measures to be incorporated into a CEMP. Operational phase mitigation in the form of effluent pump.	No

European Site	Feature	Origin of impact	Potential Impact	Significance and duration of Impact	Probability	Proposed Mitigation	Residual Impact on Integrity of Site?
				Temporary and reversible during operation			
	Lamprey species: • *Petromyzon marinus* (Sea Lamprey) [1095] • *Lampetra planeri* (Brook Lamprey) [1096] • *Lampetra fluviatilis* (River Lamprey) [1099]	Construction phase fuel or chemical spill and noise disturbance. Operational Phase effluent pump failure	Direct toxic impact from fuel or chemical spill. Potential behavioural aversion responses from very high construction noise levels.	Significant Temporary and reversible during construction Temporary and reversible during operation	Unlikely	Construction phase pollution prevention and site management measures to be incorporated into a CEMP. Construction noise minimised in intensity and duration. Operational phase mitigation in the form of effluent pump.	No
	• *Salmo salar* (Salmon) [1106]	Construction phase fuel or chemical spill and noise disturbance. Operational Phase effluent pump failure	Direct toxic impact from fuel or chemical spill. Adverse impact on prey availability through water quality deterioration. Behavioural aversion responses from very high construction noise levels.	Significant Temporary and reversible during construction Temporary and reversible during operation	Unlikely	Construction phase pollution prevention and site management measures to be incorporated into a CEMP. Construction noise minimised in intensity and duration. Operational phase mitigation in the form of effluent pump.	No

European Site	Feature	Origin of impact	Potential Impact	Significance and duration of Impact	Probability	Proposed Mitigation	Residual Impact on Integrity of Site?
	• *Lutra lutra* (Otter) [1355]	Construction phase fuel or chemical spill and noise disturbance Operational Phase effluent pump failure Light spillage from windows	Adverse impact on prey availability through water quality deterioration. Disturbance of foraging patterns / use of the area	Significant Temporary and reversible during construction Ongoing and reversible during operation	Unlikely	Embedded mitigation to minimise tree loss between proposed boathouse and the Garavogue River to retain screening. Construction phase pollution prevention and site management measures to be incorporated into a CEMP. Construction noise minimised in intensity and duration (no significantly disruptive works after dusk). Operational phase mitigation in the form of effluent pump. Operational phase measures to avoid / minimise light spillage (timed switches and light sensitive 'black-out' blinds.	No – potential slight residual impact in terms of light disturbance
Cummeen Strand / Drumcliffe Bay (Sligo Bay) SAC [000627]	Whole site, including: • Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • *Petromyzon marinus* (Sea Lamprey) [1095]	Construction phase fuel or chemical spill Operational Phase effluent pump failure	Water quality impacts and resultant degradation in aquatic habitats and potential mortality of QI aquatic species	Significant Temporary	Very unlikely	Construction phase pollution prevention and site management measures to be incorporated into a CEMP. Operational phase mitigation in the form of effluent pump containment safeguards and stormwater system oil interceptor.	None

European Site	Feature	Origin of impact	Potential Impact	Significance and duration of Impact	Probability	Proposed Mitigation	Residual Impact on Integrity of Site?
	• *Lampetra fluviatilis* (River Lamprey) [1099] • *Phoca vitulina* (Harbour Seal) [1365]						
Cummeen Strand SPA [004075]	Whole site, including: • Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] • Oystercatcher (*Haematopus ostralegus*) [A130] • Redshank (*Tringa totanus*) [A162] • Wetland and Waterbirds [A999]	Construction phase fuel or chemical spill Operational Phase effluent pump failure	Water quality impacts and resultant degradation in aquatic habitats and potential mortality of QI aquatic species	Significant Temporary	Very unlikely	Construction phase pollution prevention and site management measures to be incorporated into a CEMP. Operational phase mitigation in the form of effluent pump containment safeguards and stormwater system oil interceptor.	None

7 CONCLUSIONS OF NATURA IMPACT STATEMENT

This Natura Impact Statement has identified the particular types of effect that have potential for adverse impact on the integrity of the Lough Gill SAC in the vicinity of the proposal. The statement identifies mitigation measures to avoid and minimise these effects so that the structure and functions of the SAC are not affected, thus demonstrating that the proposal can be mitigated to avoid adverse impact. These mitigation measures have been set out in Section 6 of this report. The incorporation of these measures in full into the proposal, and their subsequent implementation on Application Site, will ensure that there will be no significant effects, either individually or in combination with other plans or projects affecting the conservation interests or conservation objectives of the Lough Gill SAC, i.e. the integrity of the Natura 2000 site. It is therefore concluded that the proposal will not, beyond reasonable scientific doubt, adversely affect the integrity of any European Site (Natura 2000 site) either directly or indirectly.

The Development potentially affects three European Sites: it occurs largely within the boundary of the Lough Gill SAC [001976] (but none of the Qualifying Interest habitats and/or species lie within the footprint of the proposed works, or within the boundary of the Application Site); it lies upstream of the Cummeen Strand / Drumcliff Bay (Sligo Bay) SAC [000627] and Cummeen Strand SPA [004075]. Subsequently, there is the potential for the Proposed Development to result in direct impacts on the Lough Gill SAC. These European Sites have QIs / SCI's which are also sensitive to disturbance and / or adverse impacts upon water quality, to varying degrees and so are susceptible to indirect impacts.

A suite of ecological surveys has been undertaken from 2019 to 2020 to inform the potential for adverse impacts upon sensitive ecological features, including the potential for any impacts upon European Sites.

Detailed mitigation has been put forward within this Natura Impact Statement to ensure that the Proposed Development does not result in adverse impacts upon the integrity of any European Sites or their listed QI / SCI habitats and species. These mitigation measures have been set out in **Section 6**. These include measures to control any potential for pollution during the construction and operational phases, measures to control disturbance during the construction and operational phases and measures to avoid the potential spread on IAS.

This Natura Impact Statement has been undertaken in the light of best scientific knowledge and concludes that the incorporation of the mitigation measures specified for this specific development in full, and their subsequent implementation on site, will mean that the Proposed new boathouse at Doorly Park will not, beyond reasonable scientific doubt, adversely affect the integrity of any European Site, taking account of their ecological structure and function, either alone or in combination with any other plans or projects.

REFERENCES

Bailey, M. and Rochford J. (2006) Otter Survey of Ireland 2004/2005. Irish Wildlife Manuals, No. 23. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

European Commission (2013) Interpretation of European Habitats. EUR 28. European Commission DG Environment. Nature Env B3.

Foster J (1993). The relationship between refuge size and body size in the crayfish Austropotamobius pallipes. Freshwater Crayfish 9, 345–349.

Hendry K & Cragg-Hine D (2003). Ecology of the Atlantic Salmon. Conserving Natura 2000 Rivers Ecology Series No. 7. English Nature, Peterborough.

Holdich, D. (2003). Ecology of the White-clawed Crayfish. Conserving Natura 2000 Rivers Ecology Series No. 1. English Nature, Peterborough.

Kalleberg H (1958). Observations in a stream tank of territoriality and competition in juvenile salmon and trout (Salmo salar L and S. trutta). Report of the Institute of Freshwater Research, Drottningholm 39, 55–98.

O Connor, Á. (2015) Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.

Maitland PS (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

Maynard, D. J. and D. D. Weber. 1981. “Avoidance Reactions of Juvenile Coho Salmon (Oncorhynchus kisutch) to Monocyclic Aromatics.” Can. J. Fish. Aquat. Sci. 38:772-778.

McCain BB, Malins DC, Krahn MM, Brown DW, Gronlund WD, Moore LK, Chan SL., 1990, Uptake of aromatic and chlorinated hydrocarbons by juvenile chinook salmon (Oncorhynchus tshawytscha) in an urban estuary. Arch Environ Contam Toxicol. 1990;19:10–16. [PubMed]

Mickle, Megan & Miehls, Scott & Johnson, Nicholas & Higgs, Dennis. (2018). Hearing capabilities and behavioural response of sea lamprey (Petromyzon marinus) to low frequency sounds. Canadian Journal of Fisheries and Aquatic Sciences. 76. 10.1139/cjfas-2018-0359.

Murphy, D (2004) Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. Fisheries Protection Guidelines. Eastern Regional Fisheries Board, Dublin

NPWS (2013a) Conservation Objectives: Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC 000627. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013b) Conservation Objectives: Cummeen Strand SPA 004035. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2014) Site Synopsis for Cummeen Strand SPA [004035]. Department of Culture, Heritage and the Gaeltacht

NPWS (2016a) Site Synopsis for Lough Gill SAC [001976]. 001976_Rev16. Department of Culture, Heritage and the Gaeltacht

NPWS (2016b) Site Synopsis for Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC [000627]. 000627_Rev16. Department of Culture, Heritage and the Gaeltacht

NPWS (2019a). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill

NPWS (2019b). The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill

NPWS (2020) Conservation objectives for Lough Gill SAC [001976]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht

Nedwell, J. R., Turnpenny, A. W. H., Lovell, J., Langworthy, J., Howell, D. & Edwards, E. 2003. The effects of underwater noise from coastal piling on Salmon (Salmo salar) and brown trout (Salmo trutta). Subacoustech Report to the Environment Agency, Reference 576R0112.

Nedwell, J. R, Lovell, J. M. & Turnpenny, A. W. H. 2005. Experimental validation of a species-specific behavioural impact metric for underwater noise. Proceedings of the 50th Meeting of the Acoustical Society of America/NOISE-CON 2005, 17--21 October 2005, Minneapolis.

Nedwell, J. R., Lovell, J. & Turnpenny, A. 2007. Experimental validation of a species-specific behavioural impact metric for underwater noise. Report by Subacoustic Research Consultancy. United Kingdom.

O'Connor, W (2004) A survey of juvenile lamprey populations in the Moy catchment. Irish Wildlife Manuals, No. 15. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Natura Impact Statement – Proposed Floating Pontoon, Doorly Park, Sligo.

O'Connor, W., Hayes G., O'Keeffe, C. & Lynn, D. (2009) Monitoring of white-clawed crayfish Austropotamobius pallipes in Irish lakes in 2007. Irish Wildlife Manuals, No 37. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Peay, S., 2000, Guidance on works affecting white-clawed crayfish, Scott Wilson Resource Report for English Nature Species Recovery Programme. http://www.devon.gov.uk/guidancewccrayfish.pdf

Peay, S., 2002, Guidance on Habitat for White-clawed Crayfish and its Restoration, Environment Agency Technical Report W1-067/TR

Reynolds, J.D., 1982 Notes on the Irish distribution of the freshwater crayfish. Bulletin of the Irish Biogeographical Society, 6, 18-24.

Reynolds, J.D. (1998) Conservation management of the white-clawed crayfish, Austropotamobius pallipes. Part 1. Irish Wildlife Manuals, No. 1.

Reynolds, J.D., O'Connor, W., O'Keeffe, C. & Lynn, D. (2010) A technical manual for monitoring white-clawed crayfish Austropotamobius pallipes in Irish lakes. Irish Wildlife Manuals, No 45, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Riley, W D, Bendal, B, Ives, M J, Edmonds, N J, Maxwell D L (2012) Street lighting disrupts the diel migratory pattern of wild Atlantic salmon, Salmo Salar, smolts leaving their natal stream. Aquaculture, V 330-333. PP 74-81.

Rondorf, D. W. Rutz, G. L. and Charrier, J. C. (2010) Minimizing Effects of Over-Water Docks on Federally Listed Fish Stocks in McNary Reservoir: A Literature Review for Criteria. U. S. Geological Survey, Western Fisheries Research Center report to U. S. Army Corps of Engineers

Weber D., Maynard, D., Gronlund, W., and Konchin, V. (1981) *Avoidance Reactions of Migrating Adult Salmon to Petroleum Hydrocarbons*. Canadian Journal of Fisheries and Aquatic Sciences, Volume 38

Woodrow (2020) Provision of a New Boathouse at Doorly Park. Report for Planning Submission.