Limerick City Greenway Aquatic Ecological Appraisal – 2025 Update

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COMMERCIAL IN CONFIDENCE

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Revision and Amendment Register

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1.0	21/11/2023	All	All	First draft for client comment	LV
1.1	12/12/2023	All	All	Addressing client comments	LV
1.2	12/04/2025	All	All	Update drawings and description	LV

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1. Introduction

1.1 Purpose and Brief

APEM Ltd (APEM) were commissioned by Ryan Hanley (RH) in 2021 to provide information on the possible environmental constraints associated with construction activities required for the proposed upgrade of an existing cycleway (the 'Limerick City Greenway') on the south bank of the River Shannon, near Limerick. APEM undertook an aquatic habitat-focused ecological walkover, which informed delivery of two reports – an Aquatic Ecological Appraisal (AEA) (APEM, 2021a) and a Water Framework Directive Assessment (APEM, 2021b).

In October 2023, APEM were instructed by RH to undertake a repeat walkover in light of proposed changes to the route of the Limerick City Greenway, and to provide an update to the AEA produced in 2021. In April 2025, minor amendments were made to this report.

As this assessment is restricted to aquatic species of interest (similar to the 2021 report), species groups under consideration are fish, macroinvertebrates, macrophytes, white-clawed crayfish (*Austropotamobius pallipes*) and invasive non-native species (INNS).

1.2 Site Description

The initial and updated routes for the Limerick City Greenway are presented in Figure 1. Whereas the previous route followed the Shannon River, turning south-east to follow the Mulkear River at the confluence between the two, the revised route now starts further downstream on the Shannon River (approximate NGR R 60328 57796), and deviates away from the watercourse to the south-east to follow existing road infrastructure (approximate NGR R 62723 58588) (Figure 1).

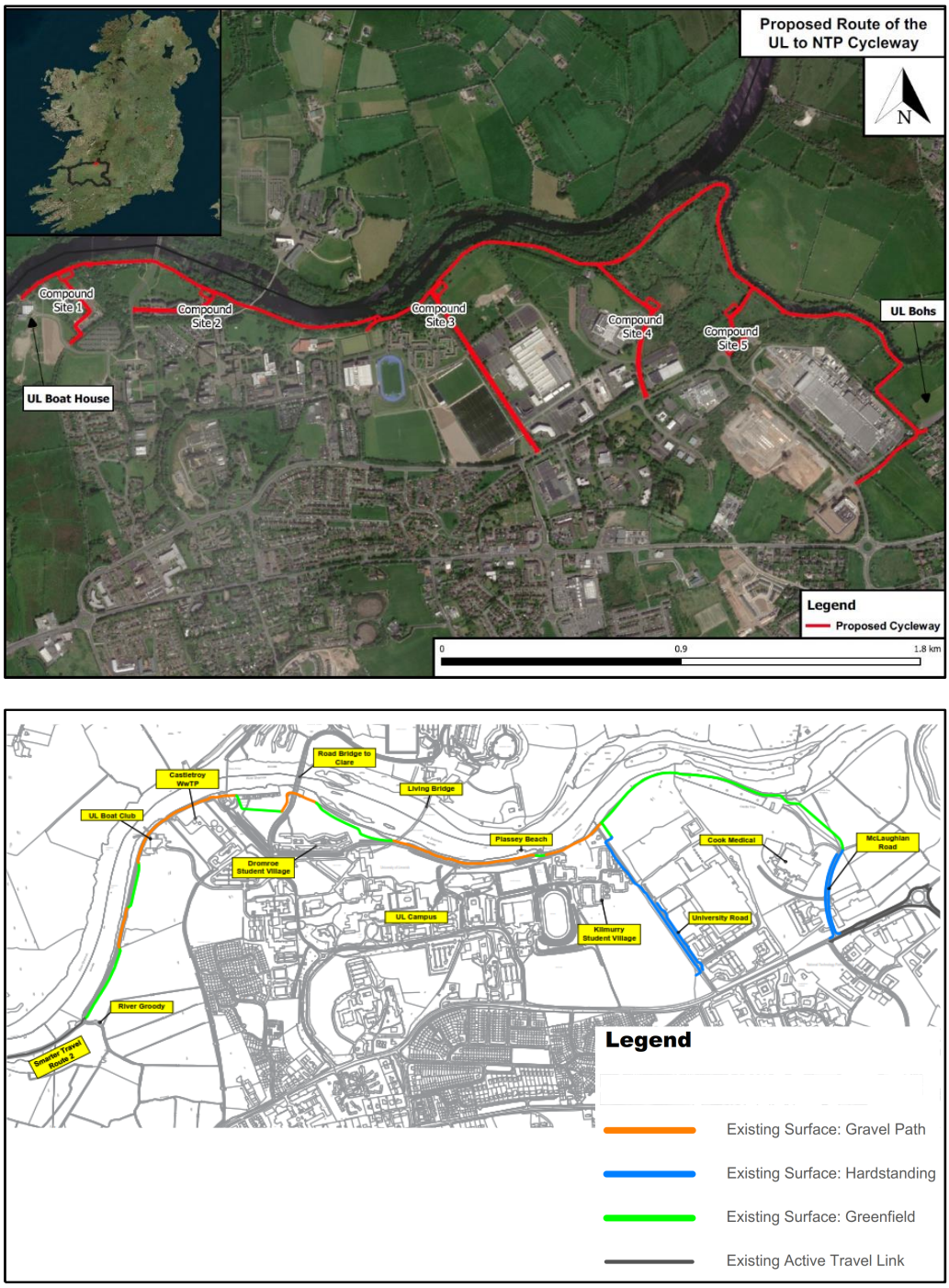

Figure 1 **The location of the original (2021, top) and revised (2025, bottom) Limerick City Greenway routes. Source: Ryan Hanley.**

1.3 Legislation and Policy

The following specific European Directives and Regulations apply when considering the proposed works outlined in Section 1.1.

1.3.1 The Wildlife Acts 1976 to 2018

The Wildlife Acts 1976 to 2018 provide a collective citation for the following:

- Wildlife Act 1976 (no. 39 of 1976)
- Wildlife (Amendment) Act 2000 (no. 38 of 2000)
- Wildlife (Amendment) Act 2010 (no. 19 of 2010)
- Wildlife (Amendment) Act 2012 (no. 29 of 2012)
- Heritage Act 2018 (no. 15 of 2018), Part 3

The Wildlife Act 1976 provided a legislative base for natural conservation, presenting species protection provisions, but with limited habitat/ site protection, even in the case of outstanding habitats or sites. The original 1976 legislation has therefore been amended several times and was updated by the Wildlife (Amendment) Act 2000 to provide statutory protection for Natural Heritage Areas, as well as legislation relating to the management and conservation of forests.

1.3.2 The European Communities (Birds and Natural Habitats) Regulations

The European Communities (Birds and Natural Habitats Regulations 2011 (S.I. No. 477 of 2011) transpose the Habitats Directive and the Birds Directive, described below.

1.3.2.1 The Birds Directive 2009

The EU Directive on the Conservation of Wild Birds (2009/147/EC) (hereafter called the 'Birds Directive') provides a framework for the conservation and management of wild birds in Europe. The relevant provisions of the Directive are the identification and classification of Special Protection Areas (SPAs) for rare or vulnerable species listed in Annex I of the Directive and for all regularly occurring migratory species (required by Article 4). The Directive required national Governments to establish SPAs and to have in place mechanisms to protect and manage them. The SPA protection procedures originally set out in Article 4 of the Birds Directive were replaced by the Article 6 provisions of the Habitats Directive.

1.3.2.2 The Habitats Directive 1992

The EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) provides a framework for the conservation and management of natural habitats, wild fauna (except birds) and flora in Europe. Its aim is to maintain or restore natural habitats and wild species at a favourable conservation status. The relevant provisions of the Directive are the identification and classification of Special Areas of Conservation (SACs) (Article 4) and

procedures for the protection of SACs and SPAs (Article 6). SACs are identified based on the presence of natural habitat types listed in Annex I and populations of the species listed in Annex II. The Directive required national Governments to establish SACs and to have in place mechanisms to protect and manage them.

1.3.3 The Flora (Protection) Order 2015

The Flora (Protection) Order 2015 lists the plant species afforded protection by Section 21 of the Wildlife Act 1976. The Flora Protection Order makes it illegal to cut, uproot or damage a listed species in any way. It is illegal to alter, damage or interfere in any way with their habitats. This protection applies wherever the plants are found.

1.3.4 The European Union (Invasive Alien Species) (Freshwater Crayfish) Regulations 2018

The European Union (Invasive Alien Species) (Freshwater Crayfish) Regulations 2018 (SI 354/18) provide measures to combat the threat of disease spread from several species of non-native crayfish. Ireland represents one of the largest surviving populations of the white-clawed crayfish, the only freshwater crayfish species found in Ireland.

1.3.5 Water Framework Directive

The Water Framework Directive (WFD) applies to rivers, lakes, groundwater and transitional coastal waters. Given legal effect in Ireland in 2003, it requires all member states to protect and improve water quality in all waters, with the aim of achieving 'Good' ecological status by 2015, or by 2027 at the latest.

2. Introduction

2.1 Desk Study

As part of the update to the original AEA, the desk study undertaken in 2021 was repeated to check the continued validity of the original data, and to provide any additional species or site data made available between 2021 and 2023. The National Parks and Wildlife Service (NPWS) and European Environment Agency (EEA) were consulted to identify European sites within 2 km of the proposed cycleway upgrade. However, as potential impacts on transient populations (e.g. disruption of fish migration) could affect sites considerably further afield than 2 km, potential impact pathways to all European sites within the Lower Shannon catchment designated for migratory fish were also included in this assessment.

Data was obtained from multiple sources, as follows:

- The National Biodiversity Data Centre – a search was undertaken for protected or priority aquatic species within 2 km of the site. Data was obtained from the last ten years.
- Inland Fisheries Ireland (IFI) – a search was undertaken for all fisheries records available within the last ten years. Reference is also made to older records where more recent survey data was unavailable.
- The Environmental Protection Agency – a data request was submitted for any relevant fish, macroinvertebrate or macrophyte data within the Lower Shannon catchment, limited to the last ten years.

Across all data searches, the most recent (i.e. within the last ten years) data has been used where possible.

2.2 Field Survey

The walkover survey was undertaken on the 8th of November 2023 by Adon McFarlane (Senior Fisheries Consultant).

A visual assessment of the watercourse was undertaken along the revised route of the cycleway upgrade, with particular attention paid to aquatic species or habitats which may pose ecological constraints on the work, as well as a general assessment of the watercourse and aquatic habitat for the various aquatic species associated with the Shannon River.

2.3 Limitations

The results presented in this report represent those at the time of survey and reporting, and data collected from available sources. Conclusions and mitigation advice provided in this AEA are indicative, in the absence of a Construction Environmental Management Plan (CEMP), and do not constitute an Environmental Impact Assessment Report under the Environmental

Protection Agency guidelines (2022). Mitigation advice provided in Section 4.4 may need to be revised once a final construction plan is agreed upon.

3. Results and Discussion

3.1 Designated Sites

Designated sites located within 2 km of the revised cycleway route are presented in Table 1. Designated site information was obtained from the NPWS, IFI and the National Biodiversity Data Centre.

Two sites are located either within 2 km of the proposed cycle path or have been included based on their overlap with other designated sites. The 'zone of influence' (CIEEM, 2018) for any non-statutory sites is likely to be restricted to those located on or adjacent to the Site.

Table 1 Summary of designated sites within the Zone of Influence.

Site name	Designation	Distance (km) and direction from site
Lower River Shannon SAC[1]	Special Area of Conservation (SAC)	On site
River Shannon and River Fergus Estuaries SPA[2]	Special Protection Area (SPA)	8 km south-west

The revised cycleway is located within the Lower River Shannon SAC, which stretches along the Shannon valley from Killaloe in County Clare to Loop Head/ Kerry Head – a distance of approximately 120 km. The Lower River Shannon SAC is designated for a variety of habitats including tidal mudflats and sandflats, floating river vegetation, and *Salicornia*, as well as a number of migratory fish species, including Atlantic salmon (*Salmo salar*) and all three Irish lamprey species (brook lamprey, *Lampetra planeri*; river lamprey, *Lampetra fluviatilis*; sea lamprey, *Petromyzon marinus*). Although not afforded specific protection in Ireland, the European eel (*Anguilla anguilla*) is listed as critically endangered on the IUCN Red List of Threatened Species[3].

Whilst the upper extent of the River Shannon and River Fergus Estuaries SPA is approximately 8 km downstream from the western-most end of the proposed cycle path, this SPA overlaps with the Lower River Shannon SAC, which entirely encompasses the section of the River Shannon along which the proposed cycleway would be constructed. This SPA has therefore been included within the desktop study.

[1] https://www.npws.ie/protected-sites/sac/002165

[2] https://www.npws.ie/protected-sites/spa/004077

[3] https://www.iucnredlist.org/species/60344/152845178

3.2 Habitats

3.2.1 The Lower River Shannon SAC

The Lower River Shannon SAC is selected for the following habitats listed on Annex I/ II of the EU Habitats Directive (* denotes a priority habitat):

- [1110] Sandbanks
- [1130] Estuaries
- [1140] Tidal Mudflats and Sandflats
- [1150] Coastal Lagoons*
- [1160] Large Shallow Inlets and Bays
- [1170] Reefs
- [1220] Perennial Vegetation of Stony Banks
- [1230] Vegetated Sea Cliffs
- [1310] *Salicornia* Mud
- [1330] Atlantic Salt Meadows
- [1410] Mediterranean Salt Meadows
- [3260] Floating River Vegetation
- [6410] *Molinia* Meadows
- [91E0] Alluvial Forests*

The majority of these habitat types are confined to the estuarine environment and are not present within the reach of the River Shannon that is adjacent to the revised cycleway route. However, habitat type 3260 'Floating River Vegetation' is known to be present throughout most major rivers in the Lower Shannon River SAC and is therefore highly likely to be present in the vicinity of the proposed works.

Throughout the walkover reach, the watercourse is interspersed with areas of riffle and glide, characteristic of moderate flow conditions and with a heterogeneous substrate composition. Banks are predominantly vegetated, with some areas given over to amenity use (e.g. pedestrian walkways) and agricultural land (including cattle grazing and associated poaching).

3.2.1 River Shannon and River Fergus Estuaries SPA

The River Shannon and River Fergus Estuaries SPA is primarily designated for its bird species, due to the important coastal wetland habitat it provides. This is partly due to the vast expanses of intertidal flats with associated salt marsh vegetation, which support a diverse macroinvertebrate community and provide important high tide roost areas for wintering birds.

3.2.1.1 The Arterial Drainage Act 1945

In 1945, the Arterial Drainage Act was passed to alleviate land in Ireland from 'periodic or prolonged flood damage'. The act involves a statutory requirement to maintain the drainage

works on any given channel, with approximately one fifth of watercourses being maintained in any given year (OPW, 2012).

As part of the act, the Mulkear River (Ballymakeogh) Flood Relief Scheme provides protection for properties in Newport against flooding from the Mulkear river (OPW, 2018), and covers the river down to its confluence with the River Shannon at Castletroy. However, drainage operations can eliminate desirable, natural habitats in rivers, such as meanders, holding pools and spawning beds. This is of concern given the number of migratory fish species that form part of the Lower Shannon River SAC.

3.3 Species

Species data within the vicinity of the site have been refined within the scope of an AEA to include fish (Table 2), macroinvertebrates (Table 3), macrophytes (Table 4) and white-clawed crayfish (Table 5).

3.3.1 Fish

Whilst electric fishing survey data were available for the Shannon River (IFI, 2022), these were from sites located over 100 km upstream from the proposed cycleway location, and were therefore not considered relevant to this assessment.

No further fish survey data were available for the Shannon (Lower)_060 waterbody (Waterbody ID IE_SH_25S012600). However, data were obtained from the 2017 survey of transitional waters in the Shannon International River Basin District (Coyne *et al*, 2017), in conjunction with records from the NBDC (NBDC, 2023a). These data are presented in Table 2.

Table 2 Fish species recorded in the vicinity of the proposed works.

Species	Latin name	Distance	Years
National Biodiversity Data Centre			
European eel	*Anguilla anguilla*	On site	2021 - 2023
Brook lamprey	*Lampetra planeri*	> 2km	2011 - 2021
Sea lamprey	*Petromyzon marinus*	On site	2021 - 2023
IFI Transitional Waters Report 2017 – Shannon and Fergus Estuaries (Coyne *et al*, 2017)			
Ballan wrasse	*Labrus bergylta*	> 2km	2017
Brill	*Scophthalmus rhombus*	> 2km	2017
Brown trout	*Salmo trutta*	> 2km	2017
Common dragonet	*Callionymus lyra*	> 2km	2017
Common goby	*Pomatoschistus microps*	> 2km	2017
Common sole	*Solea solea*	> 2km	2017
Conger eel	*Conger conger*	> 2km	2017
Corkwing wrasse	*Symphodus melops*	> 2km	2017

Dab	*Limanda limanda*	> 2km	2017
Dace	*Leuciscus leuciscus*	> 2km	2017
European eel	*Anguilla anguilla*	> 2km	2017
European seabass	*Dicentrarchus labrax*	> 2km	2017
Fifteen spined stickleback	*Spinachia spinachia*	> 2km	2017
Five bearded rockling	*Ciliata mustela*	> 2km	2017
Flounder	*Platichthys flesus*	> 2km	2017
Grey gurnard	*Eutrigla gurnardus*	> 2km	2017
Lesser sandeel	*Ammodytes tobianus*	> 2km	2017
Lesser spotted dogfish	*Scyliorhinus canicula*	> 2km	2017
Lumpsucker	*Cyclopterus lumpus*	> 2km	2017
Nilsson's pipefish	*Syngnathus rostellatus*	> 2km	2017
Painted goby	*Pomatoschistus pictus*	> 2km	2017
Perch	*Perca fluviatilis*	> 2km	2017
Plaice	*Pleuronectes platessa*	> 2km	2017
Pogge	*Agonus cataphractus*	> 2km	2017
Pollack	*Pollachius pollachius*	> 2km	2017
Poor cod	*Trisopterus minutus*	> 2km	2017
Pouting	*Trisopterus luscus*	> 2km	2017
Roach	*Rutilus rutilus*	> 2km	2017
Sand goby	*Pomatoschistus minutus*	> 2km	2017
Sand smelt	*Atherina presbyter*	> 2km	2017
Scad	*Trachurus trachurus*	> 2km	2017
Short spined sea scorpion	*Myoxocephalus scorpius*	> 2km	2017
Smelt	*Osmerus eperlanus*	> 2km	2017
Sprat	*Sprattus sprattus*	> 2km	2017
Thick lipped grey mullet	*Chelon labrosus*	> 2km	2017
Thornback ray	*Raja clavata*	> 2km	2017
Three spined stickleback	*Gasterosteus aculeatus*	> 2km	2017
Two spotted goby	*Gobiusculus flavescens*	> 2km	2017
Whiting	*Merlangius merlangus*	> 2km	2017
Worm pipefish	*Nerophis lumbriciformis*	> 2km	2017

Numerous records of species which undertake migratory movements through and / or take residency in freshwater habitats were found, including brook lamprey, sea lamprey, Atlantic salmon and European eel . The Atlantic salmon is protected under Annex II and V of the EU Habitats directive, whilst brook lamprey and sea lamprey are protected under Annex II of the same legislation.

It is assumed that the proposed works are temporary, and therefore no long-term impacts on these species are anticipated. However, these species may be present on site, and direct impacts to these species (such as deterioration in habitat quality due to sediment ingress and

/ or pollution incidents) are possible (and should be considered in line with best practice guidance in any construction plans).

3.3.2 Macroinvertebrates

Macroinvertebrate data were obtained from the NBDC (NBDC, 2023a) and from the National River Macroinvertebrate Surveys in Ireland, 2007 – 2018 (Feeley *et al*, 2020). Whilst data were not available for the Shannon (Lower)_060 waterbody in the immediate vicinity of the proposed cycle path, data were available immediately upstream for the Shannon (Lower)_050 waterbody (Waterbody ID IE_SH_25S012500), as well as the Mulkear (Limerick)_050 waterbody. Whilst the revised cycleway route no longer follows the Mulkear River, data from this waterbody have been included below for completeness (Table 3).

Table 3 Macroinvertebrate species recorded in the vicinity of the proposed works.

Waterbody ID	Distance	Years	Order	Family	Genus / Species
National Biodiversity Data Centre					
*	*	2021 - 2023	Unionida	Margaritiferidae	Freshwater pearl mussel (*Margaritifera margaritifera*)
National River Macroinvertebrate Surveys in Ireland, 2007 – 2018 (Feeley *et al*, 2020)					
Shannon (Lower)_050	~ 7 km	2018	Rhynchobdellida	Glossiphoniidae	*Helobdella* sp.
			Acari	-	*Acari* sp.
			Amphipoda	Corophiidae	*Corophium* sp.
				Gammaridae	*Gammarus* sp.
			Diptera	Chironomidae	-
			Ephemeroptera	Caenidae	*Canis* sp.
				Ephemerellidae	*Serratella ignita*
				Heptageniidae	*Heptagenia* sp.
			Trichoptera	Ecnomidae	*Ecnomus tenellus*
				Hydropsychidae	*Hydropsyche* sp.
				Polycentropodidae	*Polycentropus* sp.
			Myida	Dreissenidae	*Dreissena polymorpha*
			Ectobranchia	Valvatidae	*Valvata (Cincinna) piscinalis*
			Littorinimorpha	Bithyniidae	*Bithynia* sp.
			Neotaenioglossa	Hydrobiidae	*Potamopyrgus antipodarum*
			Neritopsina	Neritidae	*Theodoxus* sp.
	On site	2018	Lubriculida	Lumbriculidae	-

			Acari	-	*Acari* sp.
			Amphipoda	Gammaridae	*Gammarus duebeni*
					Gammarus zaddachi
			Coleoptera	Elmidae	*Elmis aenea*
					Limnius volckmari
			Diptera	Chironomidae	-
				Pediciidae	*Dicranota* sp.
			Ephemeroptera	Baetidae	*Alainites muticus*
				Ephemerellidae	*Baetis rhodani/atlanticus*
					Serratella ignita
				Heptageniidae	*Ecdyonurus* sp.
					Heptagenia sp.
			Plecoptera	Leuctridae	*Leuctra* sp.
				Perlidae	*Perla bipunctata*
			Trichoptera	Hydropsychidae	*Hydropsyche* sp.
			Neotaenioglossa	Hydrobiidae	*Potamopyrgus antipodarum*
			Neritopsina	Neritidae	*Theodoxus* sp.

**Sensitive species; location data not publicly available.*

Numerous aquatic macroinvertebrate taxa were identified that are known to be sensitive to reductions in water quality, including Plecoptera (stonefly) and Trichoptera (caddisfly) species. However, no species on this list are considered to be protected or threatened in Ireland (Nelson *et al*., 2019), with the exception of the freshwater pearl mussel (*Margaritifera margaritifera*).

It is assumed that the proposed works are temporary, and no long-term impacts on these species are anticipated. However, numerous macroinvertebrate taxa that are sensitive to reductions in habitat or water quality may be present on site, and direct impacts to these species (such as deterioration in habitat quality due to sediment ingress and /or pollution incidents) are possible (and should be considered in line with best practice guidance in any construction plans). Bankside works are planned at the Mill Race (approximate NGR R 61892 58401). This avoidance is important on the River Shannon which was assigned a Q-Value of 3-4, WFD Moderate; slightly polluted (Feeley et al, 2020). Avoiding degradation (or further degradation) of this river habitat would therefore be important when considering future impacts on macroinvertebrate communities.

3.3.3 Macrophytes

No historic macrophyte survey data was found for the River Shannon. However, an Ecological Impact Assessment (EIA) was carried out by Ecofact in 2014 and identified no protected macrophyte species along the existing cycle path route.

A review of the NBDC identified records of nine protected plant species between 2021 and 2023, of which three may be found in aquatic environments (Table 4).

Table 4 Protected macrophyte records in the vicinity of the proposed works.

Species	Latin name	Distance	Years
National Biodiversity Data Centre			
Irish St John's-wort	*Hypericum canadense*	> 2km	2021 - 2023
Opposte-leaved pondweed	*Groenlandia densa*	> 2km	2021 - 2023
Chickweed willowherb	*Epilobium alsinifolium*	> 2km	2021 - 2023

The Lower River Shannon SAC is designated in part for the presence of EU habitat type habitat type 3260 'Floating River Vegetation', which is known to be present throughout most major rivers in the catchment. Given the functional complexity of this habitat type, as well as the multiple ecosystem services it provides within the watercourse, any impacts of the proposed works on this habitat type may also cause knock-on effects to local habitat and species. Direct impacts to this habitat (such as through increased sediment erosion and sediment ingress into the watercourse) should be avoided in line with best practice guidance including sheet piling, dry docks, and silt curtains.

3.3.4 White-clawed crayfish

Although no survey records of white-clawed crayfish were found on the River Shannon, , a single record < 2 km upstream from the end of the proposed cycle path upgrade route on the River Mulkear was obtained, indicating that the River Mulkear (and potentially the River Shannon) offer habitat to support populations of white-clawed crayfish. Although no occurrences of non-native crayfish species have been reported in Ireland, multiple occurrences of crayfish plague have been reported in a number of Irish rivers since 2015, though no records have been reported on the River Shannon (NBDC, 2023b).

Table 5 White-clawed crayfish records in the vicinity of the proposed works.

Species	Latin name	Distance	Years
National Biodiversity Data Centre			
White-clawed crayfish	*Austropotamobius pallipes*	> 2km	2011 - 2021

3.4 Walkover

The proposed greenway will require two new bridges and deck replacements for three bridges along the banks of the Shannon River (Appendix A). New concrete abutments will be required for the two new bridges. The deck replacements will utilize the existing abutments. The walkover survey focused predominantly on aquatic habitat, with particular attention to habitat in the vicinity of the five proposed bridge locations.

At the start of the revised cycleway route, the Shannon River is very wide (approximately 90 m), characterised by glide flow typology, and with evidence of invasive non-native species present on the banks (Himalayan balsam, *Impatiens glandulifera*) (Figure 2).

Figure 2 Shannon River walkover start (left, R6032757777) and Himalayan balsam (right, R6032957781).

Small drainage ditches (Figure 3) were identified adjacent to the existing path though aquatic habitat here appeared to be characterised by stagnant flow with heavy leaf litter input. The slow flows and large amount of decaying organic matter in these ditches may offer suitable habitat for lamprey ammocoetes (depending on their connectivity with the main Shannon River channel), though this was not immediately apparent during the walkover.

Figure 3 Drainage ditches adjacent to the Shannon River (left, R6033557794; right, R6043657993).

At the proposed location for Bridge 1 (Appendix A), the Shannon River is characterised by deep glide, with shallow banks populated with grass / scrub and sporadic tree cover. Whilst water depth precluded observations of substrate, the slow-flowing aquatic habitat with marginal tree cover, undercut banks and shelter from the main channel may provide suitable refugia for salmonids, whilst marginal deposition of silt may offer habitat for lamprey ammocoetes (providing such habitat remains wetted) (Figure 4).

Figure 4 Shannon River near proposed Bridge 1, showing glide flow typology (left) and marginal silt depositions (right).

The proposed locations for Bridge 2, Bridge 3 and Bridge 4 are within a 100 m stretch between the Limerick County Council Waste Water Treatment Plant (approximate NGR R 60771 58589) and Plassey Mills (approximate NGR R 60871 58600). The new Bridge 2 will cross a very narrow stream which likely provides only ephemeral habitat, but which is hydrologically linked to the Shannon River (Figure 5, left). Bridge 3 passes over a larger stream (approximately 1 m wide and > 30 cm deep) which flows directly into the Shannon River (Figure 5, right), and may offer suitable lamprey ammocoete habitat due to its

connectivity with the Shannon River, its comparatively slower flows, and the presence of detritus and marginal sediment. There will be no abutment construction at Bridge 3.

Figure 5 Two streams beneath the proposed Bridge 2 (left) and Bridge 3 (right) locations.

Just downstream of The Living Bridge, an island network splits the main Shannon River, and a small channel (approximately 3 m wide) breaks off and follows the left-hand bank for approximately 350 m (Figure 6). This channel is characterised by faster-flowing run flow typology (estimated at 0.4 ms^{-1} at the time of survey) and is therefore unlikely to provide suitable lamprey ammocoete habitat. However, as this channel is connected to the main Shannon River at both ends, it may offer suitable habitat for salmonids due to the presence of cobble and gravel substrate with boulders, offering both refugia and foraging habitat for juvenile salmon and trout, and potentially offering suitable spawning habitat for adults. The proposed greenway path diverts away from the river edge at this location.

Figure 6 Fast-flowing run habitat downstream of The Living Bridge.

The proposed location for Bridge 5 is at the upstream end of the Mill Race, just south of Plassey Beach (approximate NGR R 61850 58383). The Mill Race is a narrow channel running parallel to the Shannon River from Plassey Beach down to the now disused Plassey Mill (approximate NGR R 60871 58600). Lamprey ammocoete habitat was identified both at the

upstream end of the Mill Race (i.e. in the vicinity of the proposed location for Bridge 5) and further downstream towards the middle of the Mill Race (Figure 7). The main Shannon River at this location is characterised by faster-flowing run and riffle habitat, supported by cobble and boulder substrate (Figure 8). Running adjacent to the Mill Race, this habitat in the main Shannon River may offer suitable spawning habitat for both river and sea lamprey. New reinforced concrete abutments for Bridge 5 will be constructed in the riverbank by utilising sheet piles, a dry dock, and a silt curtain upstream and downstream of the dry dock.

Figure 7 **Lamprey ammocoete habitat in The Mill Race (upstream, left; mid-channel, right).**

Figure 8 **Riffle and run habitat in the Shannon River, adjacent to the Mill Race (upstream).**

Approximately 500 m upstream of the Mill Race, the revised cycleway route follows existing infrastructure south, away from the Shannon River. Between this point and the Mill Race, the in-stream habitat of the Shannon River returns to slower, deeper flowing glide habitat, with dense riparian tree cover on the right-hand bank, but comparatively less cover on the left-hand bank (Figure 9).

Figure 9 End of the walkover reach, showing deeper glide flow typology upstream of the Mill Race.

4. Conclusions

The proposed greenway route is located within the Lower River Shannon SAC. Whilst the upper boundary of the River Shannon and River Fergus Estuaries SPA is a significant distance downstream of the proposed site, it overlaps with the lower boundary of the Lower River Shannon SAC.

The 2023 walkover and update to the 2021 AEA is based on a draft scheme for the upgrade of the current greenway, but it is understood that this will largely consist of upgrades to the surface of the current cycle path, with two key areas requiring new reinforced concrete abutments for new bridges (refer to Bridge 2 and Bridge 5 in Appendix A).

It is recommended that target lamprey surveys should undertaken within the Mill Race, prior to any site investigation or construction works that could disturb the stream. Should lamprey be recorded, a fish rescue is recommended prior to any instream works commencing. It is also recommended that white-clawed crayfish surveys are undertaken in the vicinity of any proposed riverbank works, prior to works commencing.

The site investigation and construction works have the potential to impact aquatic species and habitats (e.g. through sediment ingress or via noise and disturbance). This activity therefore has the potential to cause direct impacts to the Lower River Shannon SAC during the construction phase, whilst the installation of bridge abutment walls may result in permanent loss of habitat, particularly where this is required to take place within a riverbank (e.g. the Mill Race). Fish rescue, amongst other remedial ecological surveys, will be required prior to the commencement of any dry dock works. However, due to the small scale and temporary nature of the works, any impacts to the SAC are likely to be short-term in nature.

4.1 Habitats

Whilst the majority of qualifying habitats for the Lower River Shannon SAC are estuarine (e.g. 'Sandbanks', 'Estuaries', 'Coastal Lagoons'), the habitat type 'Floating River Vegetation' is present throughout the River Shannon and was identified during the preliminary walkover conducted in June 2021 (but not during November 2023, likely due to seasonality). This habitat type is particularly important to river habitats, as it promotes flow heterogeneity, fine sediment deposition, and shelter and food for fish and macroinvertebrates.

The proposed riverbank works may promote sediment erosion and ingress into the watercourse, which may negatively impact this habitat, with the potential to alter local sediment dynamics and modify the availability of habitat for fish and macroinvertebrates. However, a silt curtain will be deployed in the River Shannon before any sheets are piled into the riverbank, and dewatering will use a bowser to settle out silt before river water is returned to the Shannon. Impacts relating to construction activities are considered to be short-term and temporary in nature, in line with the scale and duration of the proposed works. An impact assessment of the proposed permanent structural changes (i.e. installation of new structures and associated foundations) will be undertaken separately. Impacts relating to operation of the new cycleway are uncertain in the absence of a construction plan, however, it is assumed that operation of the cycleway

will observe best practice guidance (e.g. relating to artificial lighting, pollution and drainage (Section 3.2.1.1).

4.2 Species

The Shannon River provides habitat for a number of qualifying species within the Lower River Shannon SAC, including brook lamprey, river lamprey, sea lamprey, freshwater pearl mussel and Atlantic salmon. Depending on the timing of the proposed works, different life stages of migratory fish species may be impacted by factors such as noise and disturbance associated with installation of sheet piles, or increased sediment ingress into the watercourse.

If possible, works near to the watercourse should not be carried out during periods of sensitivity for these migratory species (Table 6). If avoiding these key timings is not feasible there may be direct impacts on migratory movements and / or spawning activity, whilst impacts on the relatively immobile lamprey ammocoete life stages may occur year-round.

Table 6 Key timings of migratory fish species within the Lower River Shannon SAC. Shaded cells indicate key seasonal periods for a given species / life stage.

Species	Life stage	J	F	M	A	M	J	J	A	S	O	N	D
Atlantic salmon	Spawning & egg incubation	■	■								■	■	■
	Juveniles	■	■	■	■	■	■	■	■	■	■	■	■
	Adult U/S migration	■	■							■	■	■	■
	Smolt D/S migration			■	■	■							
Brook lamprey	Spawning & egg incubation			■	■	■	■						
	Ammocoetes	■	■	■	■	■	■	■	■	■	■	■	■
River lamprey	Spawning & egg incubation				■	■							
	Ammocoetes	■	■	■	■	■	■	■	■	■	■	■	■
	U/S migration										■	■	■
	D/S migration			■	■	■							
Sea lamprey	Spawning & egg incubation					■	■	■					
	Ammocoetes	■	■	■	■	■	■	■	■	■	■	■	■
	U/S migration			■	■	■	■						
	D/S migration	■	■	■	■	■					■	■	■

Lamprey ammocoete habitat was recorded at numerous locations throughout the walkover, including at several locations throughout the Mill Race. It is therefore possible that these works could negatively impact this habitat, and there is potential for a direct impact on lamprey ammocetes if the proposed works do take place (requiring consideration of mitigation options).

4.3 Additional Surveys Required

Although sheet piling will not be required within the river or Mill Race stream, such work adjacent to the watercourses can have impacts on aquatic species and habitats. Bankside and bank channel surveys of areas where riverbank works are proposed are recommended unless a Construction Environmental Management Plan (CEMP) is prepared to ensure no direct or indirect impacts to the watercourses. Remedial ecological surveys (e.g. fish rescue, white-clawed crayfish surveys) may also be required prior to the commencement of any works, and / or following works to assess any local impacts.

4.4 Mitigation Recommendations

Recommendations regarding protected and priority species and habitats are shown in Table 7.

Table 7 Mitigation Recommendations.

Species	Recommendations
Habitats	Where bankside works are to take place, excessive ingress of sediment into the watercourse should be prevented where possible. Where necessary, sediment netting / fences should be used to temporarily trap sediment during the works. It is assumed that any habitat loss as a result of operation of the cycleway would be minimal; however, this has not been critically assessed as part of this report.
Fish	Where possible, works should be timed to avoid the key periods of sensitivity (see Table 6). Works / construction activities should also be confined to standard daylight hours. To reduce disturbance to fish, areas where bank side works are required should be accessed from the bank / existing cycle path. Whilst a Construction Environmental Management Plan (CEMP) has not been provided, it is assumed that the following mitigation would be incorporated: • No disturbance of the river bed; • Use of silt curtains to prevent silt running into the river from bankside works; • Works to be completed in dry conditions to reduce sediment mobilisation; • Heavy plant and oils / fuel to be stored outside of the floodplain to minimise water quality issues; • Appropriate best practice / action plans to cover incidents such as fuel spills.

	Operational impacts of the new cycleway on fish are likely to be limited to disturbance and water quality impacts due to run-off. However, it is assumed that any such impacts would be negligible if best practice guidelines are observed.
Macroinvertebrates	Where riverbank works are to take place, excessive ingress of sediment into the watercourse should be prevented where possible. Where necessary, sediment netting / fences should be used to temporarily trap sediment during stabilisation works. It is assumed that recommended mitigation detailed for fish (for both construction and operational phases) will also apply to macroinvertebrates in the CEMP.
Macrophytes	Whilst some macrophyte species form the 'Floating River Vegetation' habitat type are found throughout the Shannon River, it is not anticipated that significant loss of this habitat will occur during construction works. However, appropriate mitigation should include keeping large construction equipment / machinery out of the watercourse. Operational impacts on macrophyte species are anticipated to be negligible given the short-term nature of the works. However, specialised surveys may be required to assess the presence of any designated macrophyte species in the vicinity of the proposed works.
White-clawed crayfish	Where riverbank works are to take place, excessive ingress of sediment into the watercourse should be prevented where possible. Where necessary, sediment netting / fences should be used to temporarily trap sediment during stabilisation works. Standard 'Check, Clean, Dry' procedures should be followed to minimise the risk of invasive non-native species introduction into the site. It is recommended that white-clawed crayfish surveys are undertaken in the vicinity of any proposed bank works, prior to works commencing. Providing no white-clawed crayfish habitat is removed during the construction phase, it is assumed that any operational impacts on white-clawed crayfish would be negligible. However, given the protected status of this species, it is assumed that specialist surveys will be undertaken to confirm the presence / absence of this species in proximity to the proposed works site(s), and suitable mitigation and best practice guidance will be followed.
INNS	An INNS Management Plan is required to reduce the spread of all INNS plant species during the movement of personnel and equipment into and out of the construction area.

5. References

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Appendix A Key Plan for Bridge locations (Ryan Hanley, Draft Drawing No. RHA-XX-DR-S-SKP001, April 2025)