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**Appendix E**  
**Biodiversity - Supporting**  
**Information**

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# 1. Biodiversity – Supporting Information

## 1.1. Field Survey

### 1.1.1. Habitats and Flora

#### 1.1.1.1. Preliminary Walkover Surveys

Preliminary walkover surveys were completed in August and November 2020. The development envelope includes both online (active railway land) and offline areas. The purpose of the walkover survey was to broadly categorise and describe the habitats present and to identify any suitability for those habitats to support notable or protected species. In addition, a search for third schedule Invasive Alien Plant Species (IAPS) was also completed. ‘Target Notes’ were also recorded as necessary on maps in the field to identify the location of additional ecological features.

#### 1.1.1.2. Terrestrial Habitats

The habitat survey was carried out in: August and November 2020; May, June, August, and September 2021; and May 2022. The Heritage Council’s habitat classification system (Fossitt, 2000) was used for the identification and detailing of habitats encountered. The mapping of habitats had cognisance of the Heritage Council’s mapping methodology (Smith *et al.*, 2011). The habitat surveys recorded species using an ordinal abundance scale, the DAFOR scale (i.e. dominant, abundant, frequent, occasional, and rare), as detailed in Smith *et al.* (2011). Indicator species for different habitat types or conditions and rare or declining species identified on relevant red lists (Wyse Jackson *et al.*, 2016; Lockhart *et al.*, 2012) will also be noted. Target notes were also recorded as necessary on maps in the field to identify the location of additional ecological features.

Vascular plant nomenclature follows that of the Botanical Society of Britain and Ireland (BSBI) ‘*Complete list of taxon names from the BSBI’s database*’<sup>1</sup>. As such, any name changes, including those outlined in Stace (2019), may not be included. Bryophyte nomenclature follows the British Bryological Society (Atherton *et al.*, 2010).

#### 1.1.1.3. Freshwater Aquatic Habitats

The aquatic habitat assessments were carried out in August 2021, and included surveys for a general river habitat survey, crayfish/lamprey/salmonid habitat potential, and invasive aquatic species. The general physical characteristics and hydro-morphological features of each site were recorded including substrate, flow types and aquatic vegetation during surveys. All sites were assessed in terms of:

- Stream width and depth;
- Substrate type, listing substrate fractions in order of dominance;
- Flow type, listing prevalence of flow types in the area;

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<sup>1</sup> Botanical Society of Britain and Ireland (BSBI) taxonomy resource, published 02/10/2018. Available online at: <https://bsbi.org/taxon-lists>. Accessed January 2022.

- Instream vegetation, listing plant species occurring and their percentage coverage of the stream bottom at the sampled area;
- Dominant bankside vegetation, listing the main species overhanging the watercourse;
- Estimated cover by bankside vegetation, and estimated shading of the sampling site; and
- The degree of siltation was recorded on a scale of clean, slight, moderate, and heavy, prior to kick sampling.

The rating of habitat for salmonids, crayfish and lamprey is on a scale of *None/Poor/Fair/Good/Very Good/Excellent*. This rating assesses the physical suitability of the habitat; the presence/absence/density of the species in question will also depend on present and historical water quality and accessibility of the section to these species.

A rating of;

‘**None**’ indicates that the ecologist carrying out the assessment regards it as impossible that the watercourse could support the species in question in the relevant life stage.

‘**None – Poor**’ indicates that it is regarded as possible but extremely unlikely that the stream could support the species in the relevant life stage.

‘**Fair**’ indicates that it is possible that the stream section could support the species in question.

‘**Good**’ indicates that the ecologist considers it possible and likely that the stream could support the species in question.

‘**Very Good**’ indicates that the stream certainly could support the species.

‘**Excellent**’ indicates that the ecologist regards the stream as the ideal habitat for the species in question.

#### 1.1.1.4. Invasive Alien Plant Species

Habitat surveys recorded the presence and location of any IAPS. For the purpose of this assessment, IAPS are those contained within the third schedule to the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

### 1.1.2. Fauna Species

#### 1.1.2.1. Invertebrates

##### Terrestrial

During walkover and habitat surveys of the proposed Project site the potential was also noted for habitats of protected invertebrate species to occur, including marsh fritillary (*Euphydryas aurinia*) and small blue (*Cupido minimus*). In the case of these two butterfly species, searches were made of suitable habitats for the larval food plants of marsh fritillary (devil’s bit scabious (*Succisa pratensis*)), and small blue (kidney vetch (*Anthyllis vulneraria*)).

## Freshwater Aquatic

Freshwater pearl mussel (*Margaritifera margaritifera* and *M. durrovensis*) surveys were not conducted as there are no records of this species from within the same catchment management unit (Liffey and Dublin Bay).

Assessment of the quality of white-clawed crayfish (*Austropotamobius pallipes*) habitat was completed on the 9<sup>th</sup> August 2021 and was based on published information on the habitat criteria for crayfish (Holdich, 2003; Peay, 2002; and Peay, 2003).

The Small Streams Risk Score (SSRS), a biological risk assessment system for identifying rivers that are definitely ‘at risk’ of failing to achieve the ‘good’ water quality status goals of the Water Framework Directive (WFD), was carried out in October 2019. The SSRS methods were developed by the Environmental Protection Agency (EPA) in association with the Western River Basin District (WRBD) in 2006.

Macroinvertebrates were collected using a 2-minute ‘kick’ sampling method in the fast flowing (riffle) areas of the streams/rivers using a standard hand net (250mm width, mesh size 1mm). The survey technique adhered to the ISO Standard (10870:2012) for kick sampling, NRA Survey Guidelines (NRA, 2008) and utilised the EPA standard protocol and recording sheet (Ryan *et al.*, 2015). Stone washing was undertaken to ensure that species that cling to stone surfaces – e.g., leeches and gastropods, were adequately collected. Macroinvertebrate were identified at the stream bank and returned to the stream on completion of analysis. The optimal survey period for macroinvertebrates is between March and end of September, however Irish research has shown that Q values remain largely consistent across seasons (spring, summer and autumn) with few sites moving between status classes (Kelly-Quinn *et al.*, 2005).

The macroinvertebrate survey was conducted on the 9th August 2021. In summer/autumn anthropogenic pressures are greatest on macroinvertebrates due to lower flows and higher temperature. The number of sensitive species expected in winter is higher due to a combination of flow and species life cycles and therefore the SSRS score may be higher in winter compared to summer/autumn samples. The SSRS scores are categorised as follows:

- >7.25 – stream ‘probably not at risk’;
- 6.5 to 7.25 – stream ‘probably at risk’; and
- <6.5 stream ‘at risk’.

The Biotic Index of Water Quality (BIWQ), better known as the Q-value, was developed in Ireland by the EPA. Q-values and water quality classes are assigned using a combination of habitat characteristics and structure of the macroinvertebrate community within the water body. Individual macroinvertebrates are ranked for their sensitivity to organic pollution and the Q-value is assessed based, primarily, on their relative abundance within a biological sample. Individual macroinvertebrate taxa are ranked for their sensitivity to organic pollution and the Q-value is determined based on their relative abundance within sample and reflects the average water quality at a location (see macroinvertebrate indicator groups in Table 1-1).

**Table 1-1: Macroinvertebrate Indicator Groups**

Group	Indicator
Group A	Very Pollution Sensitive
Group B	Moderately Pollution Sensitive
Group C	Moderately Pollution Tolerant
Group D	Very Pollution Tolerant
Group E	Most Pollution Tolerant

The Q-value is usually applied in summer/autumn when anthropogenic pressures are greatest on macroinvertebrates due to lower flows and higher temperature. The number of sensitive species expected in winter is higher due to a combination of flow and species life cycles and therefore the Q-value may be higher in winter compared to summer/autumn samples.

The Environmental Quality Ratio (EQR) represents the relationship between the values of the biological parameters observed for a body of surface water and the values for these parameters in the reference conditions applicable to that body. The ratio is expressed as a value between zero and one, with high ecological status represented by values close to one and bad ecological status by values close to zero. In Ireland it is calculated as Observed Q-value/Reference Q-value (i.e., Q5). The EQR allows comparison of water quality status across the European Union as each Member State has an EQR value for 'High'; 'Good' etc., based on an intercalibration of boundaries between water quality categories e.g., 'High-Good'.

The Q-value is assigned on a scale of 1 to 5 with a Q5 representing high quality pristine conditions and a Q1 representing bad seriously polluted conditions. The intermediate values (Q1-2, 2-3, 3-4 etc.) denote transitional conditions. The scheme mainly reflects the effects of organic pollution (i.e., deoxygenation and eutrophication) but where a toxic effect is apparent or suspected the suffix '0' is added to the biotic index (e.g., Q1/0, 2/0 or 3/0). An asterisk after the Q value (e.g., Q3\*) indicates heavy siltation of the substratum. EPA indices, EPA water quality status and WFD status are interpreted in Table 1-2.

**Table 1-2: EPA Biotic Index (Q-value) and Equivalent WFD Water Quality Status Classes**

Biotic Index	Environmental Quality Ratio (Observed/Reference)	EPA Quality Status	Water Framework Directive (EPA, 2006) Status
Q5	1.0	Unpolluted	High
Q4-5	0.9	Unpolluted	High
Q4	0.8	Unpolluted	Good
Q3-4	0.7	Slightly Polluted	Moderate
Q3	0.6	Moderately Polluted	Poor
Q2-3	0.5	Moderately Polluted	Poor
Q2	0.4	Seriously Polluted	Bad
Q1-2	0.3	Seriously Polluted	Bad
Q1	0.2	Seriously Polluted	Bad

### 1.1.2.2. Fish

On the 9<sup>th</sup> August 2021 each surveyed site was rated for its quality to support the three lamprey species that occur in Ireland: river lamprey (*Lampetra fluviatilis*), brook lamprey (*Lampetra planeri*), and sea lamprey (*Petromyzon marinus*). Assessment of the quality of lamprey habitat is based on published information on the habitat criteria for lamprey (Maitland, 2003). Lamprey habitat preferences change with the stages of their life cycle. They show a preference for gravel-dominated substratum for spawning similar to salmonids. After hatching, lamprey larvae (ammocoetes) swim or are washed downstream by the current to areas of sandy silt in still or slow flowing water where they burrow and spend the next few years in tunnels. Lampreys therefore require mainly silt and sand dominated substratum for nursery habitat. Other important environmental characteristics for optimal ammocoete habitat are shallow waters with low velocity, and the presence of organic detritus.

Suboptimal habitat supporting only a few individuals may consist of a few square centimetres of suitable silt in an open, comparatively high-velocity, boulder-strewn streambed. The following summarises the ecological requirements assessed for lamprey:

- Spawning habitat is broadly similar to that favoured by salmonids. Usually occurs at the tails of pools where the gravels have been deposited from upstream and the scouring of pools, but the current is still reasonably fast with some water flow through the substrate;
- Larval nursery beds are at the edges of streams and rivers, well away from the main current, and that the current over them is often not only very slow, but is actually a backwater in reverse of the main current;
- Water depth in nursery areas is typically 0.1 to 0.5 m with silty/sandy substrate;
- Channelization can be damaging to lampreys, mainly through destruction of their habitat. The removal of areas of riffle and associated spawning gravels, and the dredging of essential nursery silt beds, may entirely eliminate lampreys from a river; and
- Dams/weirs can be obstacles to upstream migration of sea lamprey.

Assessment of the quality of salmonid (salmon and trout) spawning, nursery and adult habitat is based on published information on the habitat criteria of salmonids (Bjorn & Reiser 1991, Hendry & Cragg-Hine 2003), water quality criteria listed in the Salmonid Regulations (S.I. 293/1988). Habitat features important to the lifecycle of salmonids include: stream width, depth, flow type, substrate type, vegetation cover, gradient, and altitude. These habitat requirements can vary during the life stages of salmonids and the proximity of juvenile habitat to spawning gravels may be significant to their utilisation. The more diverse the stream habitat in terms of substrate, flow rate, depth, riparian vegetation, light conditions etc., the richer the biological community is likely to be, and the more suitable it is likely to be for salmonids.

The presence of overturned gravels lighter in colour compared to the rest of surrounding substrate is used to indicate the presence of salmonid redds. Excessive fine sediment can be detrimental to the survival of eggs by limiting the amount of dissolved oxygen to diffuse across the egg membrane. The presence of 10% fine sediment can reduce egg survival to hatching to 43% (Cocchiglia *et al.*, 2012).

Fine sediment content of substrate is assessed visually, and high levels present indicate reduce spawning habitat quality.

The habitat rating assigned applies to the salmonid species salmon (*Salmo salar*) which is considered to be more sensitive and less tolerant of pollution than trout (*Salmo trutta*). Optimal habitat for brown trout is noted. The following summarises ecological requirement assessed for salmonids:

- Salmon spawning is likely to occur where the gradient of a river is 3% or less;
- Typical spawning sites are the transitional areas between pool and riffle where flow is accelerating and depth decreasing, where gravel of suitable coarseness is present, and interstices are kept clean by up-welling flow;
- Salmon fry and parr occupy shallow, fast-flowing water with a moderately coarse substrate with cover;
- Deep or slow-moving water, particularly when associated with a sand or silt substrate, does not support resident juvenile salmonids;
- Suitable cover for juveniles includes areas of deep water, surface turbulence, loose substrate, large rocks, and other submerged obstructions, undercut banks, overhanging vegetation, woody debris lodged in the channel, and aquatic vegetation;
- Adults require holding pools immediately downstream of spawning gravels in which they can congregate prior to spawning;
- Cover for adult salmon waiting to migrate or spawn can be provided by overhanging vegetation, undercut banks, submerged vegetation, submerged objects such as logs and rocks, floating debris, deep water, and surface turbulence; and
- EPA Q-value of Q4 or higher.

Water Quality Criteria within the Salmonid Regulations S.I. 293/1988.

- pH  $\geq 6 \leq 9$ ;
- Dissolved Oxygen  $\geq 9$  mg/l (50% off the time);
- Temperature downstream of point thermal discharge does not exceed (a) 21.5°C or (b) 10°C from 1st Nov to 30th Apr during reproductive season; and
- Sediment  $\leq 25$  mg/l (annual average).

### 1.1.2.3. Invasive Alien Animal Species

Habitat surveys recorded any evidence or presence of IAAS. For the purpose of this assessment, IAAS are those contained within the third schedule to the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).



## 1.2. Results

### 1.2.1. Field Study

#### 1.2.1.1. Habitats

Habitats detailed during the field study within the Zol of the proposed Project are presented in Volume 3A of the EIAR, which includes the relevant habitat codes from Fossitt (2000).

##### 1.2.1.1.1. Zone A: Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station

#### Cultivated Land

##### BC1 Arable crop

This habitat includes cultivated land currently outside the proposed Development Boundary. Noted only within Zone A along the western end of corridor. Arable crop habitat frequently occurred surrounding Clondalkin and Hazelhatch station. During times of dereliction or after crops have been harvested, pioneer species can develop. Although the occurrence of this habitat was adjoining this Zone of the railway corridor, it was outside the proposed Development Boundary it has not been mapped.

#### Built Land

##### BL1 Stone walls and other stonework

This habitat was found throughout this Zone, occurring as part of retaining walls (e.g. against earth banks and buildings) and bridges. This habitat was characterised by historical masonry bridges or retained abutments. Although these structures had a bonding agent, mortar, between the stonework, there were areas where gaps were noted and where some pioneer plant species were noted including: red valerian (*Centrathus ruber*), ivy (*Hedera helix*), navelwort (*Umbellicus rupstris*), and buddleja (*Buddleja davidii*), in areas where mortar is breaking down. Ferns noted included wall rue (*Asplenium ruta-muraria*), wall spleenwort (*Asplenium trichomanes*), and polypody ferns (*Polypodium* spp.). Owing to the frequent occurrence and narrow extent of this habitat throughout the railway corridor, stone walls and other stonework have not been mapped.

##### BL2 Earth banks

This was not an abundant habitat feature, and they are typically ephemeral features depending on trackside management operations. Left undisturbed or chemically treated, vegetation can quickly recolonise (see Recolonising Bare ground ED3). Owing to marginal extent of this habitat throughout the railway corridor, earth banks have not mapped.

##### BL3 Buildings and artificial surfaces

This built land habitat includes buildings, concrete/metal bridges of modern construction, and paved surfaces (roads, paths, and steps).. Vegetation is not a characteristic feature of this habitat unless where dereliction/lack of management over time and an accumulation of sediment enables the seed bank to develop. Buildings and artificial surfaces have not been mapped.

## Disturbed Ground

### ED1 Exposed gravel

Exposed gravel is abundant in the form of stone track ballast which forms the track bed of the railway corridor. These loose fragments (ballast) provide limited space for any vegetated growth. Where ballast transitions from the cess into the verge, some GS2 dry meadows and grassy verges, and WS1 scrub vegetation was present. Owing to the abundant occurrence of this habitat throughout the proposed Development Boundary, exposed gravel habitats have not been mapped.

### ED3 Recolonising bare ground

This habitat regularly occurs across this Zone. It was characterised by discrete areas where works/operations have recently been completed, where chemical treatment of trackside vegetation results in the temporary dieback of vegetation, areas where cess transitions into grassland and grassy verge, and at Hazelhatch where abandoned residential structures occur.

Re-establishing flora typically reflected the surrounding flora and the seedbank in the bare ground, where they have been newly exposed or deposited. This habitat was not dominated by any particular species but consisted of abundant red valerian, broad leaf dock (*Rumex obtusifolius*), spear thistle (*Cirsium vulgare*) and perennial sow thistle (*Sonchus arvensis*), with occasional herb-Robert (*Geranium robertianum*), buttercup (*Ranunculus repens*), dandelion (*Taraxacum* agg.) and bramble (*Rubus fruticosus* agg.) and rare assemblages of mugwort (*Artemisia vulgaris*), common poppy (*Papaver rhoeas*), common ragwort (*Jacobaea vulgaris*), creeping cinquefoil (*Potentilla reptans*), pineapple weed (*Matricaria discoidea*) and stinging nettle (*Urtica dioica*). Japanese knotweed (*Fallopia japonica*) a third schedule invasive alien plant species was also noted. Fumitory (such as *Fumaria officinalis*) were also noted, as was silverweed (*Potentilla anserina*) in damper areas and buddleja, as locally abundant.

## Improved Grassland

### GA1 Improved agricultural grassland

This agricultural habitat occurs largely outside but adjoining the proposed Development Boundary, particularly to the west of the zone. However, this habitat does occur at one location, where the southwest corner of Celbridge Elm Hall Golf Club intersects with the proposed Development Boundary. As the primary purpose of this habitat is for amenity purposes (i.e. golfing), the habitat reflects a grassland monoculture which is intensively managed.

## Semi-Natural Grassland

### GS1 Dry calcareous and neutral grassland

This habitat is rare throughout this zone. It occurs alongside ED3 recolonising bare ground habitat in an area at Hazelhatch. This habitat contained sweet vernal grass (*Anthoxanthum odoratum*), Yorkshire fog (*Holcus lanatus*), perennial ryegrass (*Lolium perenne*), pendulous sedge (*Carex pendula*), meadow buttercup (*Ranunculus acris*), Italian alder (*Alnus cordata*), lady's mantle (*Alchemilla vulgaris*) and clover (*Trifolium* sp.).

## GS2 Dry meadows and grassy verges

This habitat is not as prominent throughout this Zone when compared to Zone B, C, and D of the railway corridor. It occurs predominantly alongside WS1 scrub habitat in pockets throughout this Zone. Commonly occurring species within this habitat were a subset of those described under GS2 of Zone B and C (section 1.2.1.1.2).

## Linear Woodland/ Scrub

### WL1 Hedgerows

Linear features were typically recorded along the fence line of the proposed Development Boundary. Hedgerow management was minimal, with the rail side of the majority of hedgerows consisted of a mosaic of scrub (WS1) and neutral grassland (GS2) which were heavily managed. In general, hedgerows were located on top of berms/banks and showed variation in height, thickness and species composition.

Hedgerow habitat contained various abundances of hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), sycamore (*Acer pseudoplatanus*), grey willow (*Salix cinerea*), and gorse (*Ulex europaeus*). The majority of the hedgerows also contained bramble, guelder rose (*Viburnum opulus*), bush vetch (*Vicia sepium*) and ivy. In damper situations occasional alder (*Alnus glutinosa*) were recorded but rarely as a dominant component of the hedge. Occasional long stretches of blackthorn (*Prunus spinosa*) dominated hedge line was noted as was well maintained hazel hedge.

### WL2 Treelines

Discrete treelines were not commonly recorded within this Zone, although some were noted offline where planted Leyland cypress (*Cupressus x leylandii*) screened a private house. Elsewhere linear clusters of mature trees occurred as a feature of hedgerows. Typically, these comprises screening/boundary vegetation such as sycamore, alder, ash (*Fraxinus excelsior*) and beech (*Fagus* sp.).

### WS1 Scrub

A common feature of this habitat was the presence of bramble. A range of plants were noted depending on the surrounding vegetation and/or intensity of management. Species composition include a subset of those listed under WS1 scrub in Zone B and C (see section 1.2.1.1.2) with an abundant presence of brambles, stinging nettle, frequent ivy and buddleja, and occasional grey willow and hedge bindweed (*Calystegia sepium*). Frequently occurring species include field horsetail (*Equisetum arvense*) and red osier dogwood (*Cornus sericea*).

Additional species included elder (*Sambucus nigra*), young sycamore, cherry laurel (*Prunus laurocerasus*), willow, birch (*Betula* sp.), and hazel. Large areas of scrub were rarely noted within the proposed Development Boundary. They were usually confined to adjoining lands.

### WS2 Immature woodland

This habitat consists of scattered immature trees. It occurs in a pocket in an area at Hazelhatch, where the tree species are in early succession. This habitat is comprised of areas of exposed bare ground

near a residential structure, with frequently occurring herb species. Species noted included ash, alder and willow.

## Mosaic Habitat

### WS1 Scrub; GS2 Dry neutral grassland and grassy verge

As detailed under linear woodland/scrub and grassland, both WS1 scrub and GS2 neutral grassland occurred as a matrix habitat. As the most dominant habitat type within the railway corridor, the species and general habitat description are as per detailed under the WS1 an GS2 heading above.

### WS1 Scrub; GS1 Dry calcareous and neutral grassland

As detailed under linear woodland/scrub and grassland, both WS1 scrub and GS1 dry calcareous and neutral grassland occurred as a matrix habitat in an area at Hazelhatch. The species and general habitat description are as per detailed under section 1.2.1.1.1.

### ED3 Recolonising bare ground; GS1 Dry calcareous and neutral grassland

As detailed under disturbed ground and grassland, both ED3 recolonising bare ground and GS1 dry calcareous and neutral grassland occurred as a matrix habitat in an area at Hazelhatch. The species and general habitat description are as per detailed under section 1.2.1.1.1.

## Watercourses

### FW1 Eroding/upland rivers

Four watercourses intersect this Zone, one of which has been classified as FW1 Eroding/upland rivers, namely the Griffeen River (and it's tributary) (see Table 1-3). This watercourse was culverted under the railway line and flows into the River Liffey and its Estuary. This watercourse is typical of FW1 habitat where there is little deposition of fine sediment and water flow is fast and turbulent.

### FW2 Depositing/lowland rivers

Four watercourses intersect this Zone, three of which have been classified as FW2 Depositing/lowland rivers, namely the Castletown\_09 (and it's tributary), Coneyburrow\_09 and the Lucan stream (see Table 1-3). All were culverted under the railway line and all flow into the River Liffey and its Estuary. These watercourses are typical of FW2 habitat where fine sediments have been deposited on the riverbed. Gradients were low and flow was somewhat sluggish in these watercourses. Where the Lucan stream culverts below the railway line at Adamstown, it was noted during surveys that the stream transitions in drainage ditch, appears to have been redirected.

**Table 1-3: Zone A - Waterbody biotic index, quality status, and description**

Site ID.	Waterbody	Biotic Index	EPA Quality Status	WFD Status (EPA, 2018)	Results Description
1	Griffeen River (IE_EA_09L 012100)	Q3	Moderately Polluted	Moderate	The Griffeen River was accessed via the south entrance (through a housing estate) of the public Griffeen Valley Park. The surrounding area is predominantly urban. The river is 3m wide and approx. 30cm in depth. There were signs of historical dredging and straightening however no erosion was evident. Substrate was cobble and gravel

Site ID.	Waterbody	Biotic Index	EPA Quality Status	WFD Status (EPA, 2018)	Results Description
					<p>dominated with low levels of siltation. There was little riparian vegetation with no evidence of recent management. Riparian vegetation consisted of willow <i>Salix</i> sp., meadowsweet <i>Filipendula ulmaria</i>, bindweed <i>Calystegia sepium</i> and willowherb <i>Epilobium</i> sp., with alder <i>Alnus glutinosa</i> also present. Flow was normal with 1% coverage of <i>Vaucheria</i>.</p> <p>The macroinvertebrate sample recorded 14 taxa altogether with Class C taxa (moderately pollution tolerant) forming most of the sample. Two Class B taxa were recorded all in low numbers (Hydroptilidae and Limnephilidae). No single taxon was dominant, and no Class A taxa were recorded. A Q3 was assigned (moderate) and this corresponds with EPA quality in 2018.</p> <p>Salmonid and Lamprey spawning habitat was rated as Fair due to the presence of gravels and coarse substrates albeit some light siltation.</p> <p>For juvenile salmonids, some overhanging and in-stream vegetation was present along with some coarse substrates (although no sand). Siltation was low and dissolved oxygen levels were high, above the limit for salmonids at 10.2 mg/l. These conditions are somewhat representative of juvenile salmonid habitat and was assigned a rating of Fair.</p> <p>A similar case is true for juvenile lamprey. Slow flow and muddy/silty bed material were available along the river margins in addition to good water depth (30cm).</p> <p>No crayfish were present within the kick sample. With instream boulders and cobbles, aquatic vegetation and detritus there is suitable crayfish habitat available. A habitat rating of Fair was assigned.</p>
1b	Tributary of the Griffeen River (IE_EA_09L 012100)	Q2-3	Moderately Polluted	Moderate	<p>This tributary of the Griffeen River was accessed as described above (see site 1). The river was 1.5m wide and approx. 10cm in depth. There were signs of historical dredging and straightening however no erosion was evident. Substrate was cobble and gravel dominated with low levels of siltation. There was little riparian vegetation with no evidence of recent management. Riparian vegetation consisted of alder <i>Alnus glutinosa</i>, common hogweed <i>Heracleum sphondylium</i>, bramble <i>Rubus fruticosus</i>, greater willowherb <i>Epilobium hirsutum</i>, nettle <i>Urtica dioica</i> and bittersweet <i>Solanum dulcamara</i>. Flow was normal with no evidence of filamentous algal growth.</p> <p>The macroinvertebrate sample recorded 18 taxa altogether with Class C taxa (moderately pollution tolerant) forming most of the sample. Three Class B taxa were recorded all in low numbers (Alainites muticus, Glossosomatidae and Limnephilidae). One Class E was recorded (Tubificidae). No single taxon was dominant, and no Class A taxa were recorded. A Q2-3 was assigned (moderate).</p> <p>Good spawning substrates were not present. Salmonid and lamprey spawning habitat was rated as None due to the presence of siltation, limited riffle/glide habitat and no pool habitat sequence present and only 25% gravels.</p> <p>For juvenile salmonids, some coarse substrate is available in addition to suitable cover such as</p>

Site ID.	Waterbody	Biotic Index	EPA Quality Status	WFD Status (EPA, 2018)	Results Description
					<p>overhanging trees and cobbles/boulders. DO levels were below the recommended limit for salmonids at 8.23mg/l. Lamprey nursery habitat was rated as Poor. There were no areas silted or slow backwater present along the margins of the reach surveyed. Some suitable hiding places were present however water depth was low (10cm).</p> <p>Crayfish were not noted within the kick sample. No soft banks were present for burrowing however suitable rock/boulder habitat was noted in areas however these were silted cobbles at shallow depths. A food source for crayfish was also noted in the form of aquatic vegetation and detritus. A habitat rating of None was assigned.</p>
2	Lucan Stream (IE_EA_09L 012100)	n/a	n/a	Moderate	<p>The Lucan Stream was accessed via a carpark at Adamstown train station. The surrounding area consisted of scrub habitat, rough grassland and urban area. Salmonid and lamprey spawning habitat was rated as None due to high siltation, no riffle/glide/pool habitat sequence present and no gravels.</p> <p>A macroinvertebrate sample was not possible due to the absence of the watercourse. Only a dry drainage ditch remains which was noted as likely a result of land drainage.</p> <p>There is no potential for salmonids, lamprey or crayfish at any life stage at the site surveyed and habitat rating of None was assigned.</p>
3	Coneyburrow_09 (IE_EA_09L 011900)	Q3	Moderately Polluted	Good	<p>The Coneyburrow_09 was accessed via tubber lane road. The river runs through tillage fields where it was sampled along the right-hand bank just north of the dart line and c. 125m west of the Kildare-Dublin county boundary. The river is 2m wide and approx. 15cm in depth. This channel has been straightened. The dominant substrates were silt (58%) and cobble (20%). Siltation was generally low unless kicked in addition to a calcareous coating evident on cobbles. Flow discharge was normal with velocity almost stagnant.</p> <p>Riparian vegetation consisted of greater willowherb <i>Epilobium hirsutum</i>, meadowsweet <i>Filipendula ulmaria</i>, alder <i>Alnus glutinosa</i>, hawthorn <i>Crataegus monogyna</i>, bindweed <i>Calystegia sepium</i>, Ash <i>Fraxinus excelsior</i> and Hazel <i>Corylus avellana</i>. A continuous treeline with heavy shading defined the left bank. No fungus or filamentous algae were noted.</p> <p>The macroinvertebrate sample recorded 17 taxa altogether with Class C taxa (moderately pollution tolerant) forming most of the sample. Three Class B taxa were recorded, two in low numbers (Sericostrimatidae and Alaites muticus) and one common throughout the sample (Glossosomatidae). Baetis Rhodani (Class C) were dominant, and no Class A taxa were recorded. Class D/E were also present but were not dominant. A Q3 was assigned (moderate) which is a dis-improvement from EPA quality in 2018, which assigned the Coneyburrow 'Good' status.</p> <p>Salmonid and lamprey spawning habitat was rated as None due to high siltation in this watercourse, lack of riffle and pool habitat, lack of suitable substrates and barriers</p>

Site ID.	Waterbody	Biotic Index	EPA Quality Status	WFD Status (EPA, 2018)	Results Description
					<p>to migration. Silt is the dominant substrate and a gradient of 1% was noted which is less than ideal.</p> <p>For juvenile salmonids, substrates are not suitable. Although water is shallow, it is not fast flowing and some overhanging vegetation is present to provide suitable cover to juveniles. DO is high at 9.7mg/l.</p> <p>A similar case is true for juvenile lamprey. Silt is the dominant substrate with no sand available for eggs to adhere to. Some areas of slow flow/backwater are present with some small areas of mud/silty bed material in margins for burrowing but not common. Low flows are almost stagnant and not suitable for lamprey.</p> <p>No crayfish were present within the kick sample. Soft banks for burrowing were noted with some coverage and food source available (i.e. aquatic vegetation, submerged trees and detritus). High levels of siltation provide poor conditions. A habitat rating of None was assigned.</p>
4a	Castletown_09 (IE_EA_09C500830)	Q3	Moderately Polluted	Good*	<p>The Castletown_09 was accessed via Loughlinstown road, just north of Hazelhatch train station where a sample was taken along the most eastern hedgerow. The watercourse runs through overgrown scrub and fallow grassland. The river is 3m wide and approx. 20cm in depth which has also evidently been straightened and deepened. The substrate was silt dominated (80%). Siltation was heavy in addition to a calcareous deposits evident coating the cobble substrate.</p> <p>Riparian vegetation was overgrown consisting of scattered trees (1m) causing heavy shading along the Castletown river before transitioning to fallow grassland. Vegetation consisted of bramble <i>Rubus fruticosus</i>, meadowsweet <i>Filipendula ulmaria</i>, common hogweed <i>Heracleum sphondylium</i>, greater willowherb <i>Epilobium hirsutum</i>, Ash <i>Fraxinus excelsior</i>, bindweed <i>Calystegia sepium</i> and willow <i>Salix</i> sp. No fungus or filamentous algae were noted.</p> <p>The macroinvertebrate sample recorded 12 taxa altogether with Class C taxa (moderately pollution tolerant) forming most of the sample. Two Class B taxa were recorded, both in low numbers (Limnephilidae and Baetis muticus). No one taxa was dominant and no Class A taxa were recorded. One Class E was also present but was not dominant (Tubificidae). A Q3 was assigned (moderate). In 2018, the EPA categorised this watercourse as 'unassigned'.</p> <p>Salmonid and Lamprey spawning habitat was rated as None due to high siltation in this watercourse, lack of riffle and pool habitat, lack of suitable substrates/cover and barriers to migration. Silt is the dominant substrate and any spawning gravels present were not suitable.</p> <p>For juvenile salmonids, substrates are not suitable. Although water is shallow and fast flowing there is a lack of suitable cover. Habitat not ideal for juveniles. DO is less than ideal at 8.66mg/l. Owing to the conditions and indications of water quality issues it is unlikely that salmonids may be present. A habitat rating of Poor was assigned.</p> <p>For juvenile lamprey, nursery habitat was identified along the margins such as silty deposits and detritus. However, spawning gravels were highly silted. Areas of slow flow</p>

Site ID.	Waterbody	Biotic Index	EPA Quality Status	WFD Status (EPA, 2018)	Results Description
					are present and the reach surveyed lacks suitable hiding places for adults. A habitat rating of Poor was assigned. No crayfish were present within the kick sample. Soft banks for burrowing were noted with some coverage and food source available (i.e. overhanging banks, and detritus). High levels of siltation provide poor conditions and low turbidity increases when kicked. A habitat rating of None was assigned.
4b	Tributary of the Castletown_09 (IE_EA_09C 500830)	Q3	Moderately Polluted	Good*	<p>This tributary of the Castletown_09 was accessed via Loughlinstown road, just north of Hazelhatch train station where a sample was taken along the most western hedgerow. The watercourse runs through overgrown scrub and fallow grassland. The river is 2m wide and approx. 40cm in depth (deeper than sample 4a) which has also evidently been straightened and deepened. The substrate was silt dominated (60%) and its condition noted as very soft. Siltation was heavy in addition to a calcareous deposits evident coating the cobble substrate.</p> <p>Riparian vegetation was overgrown consisting of scattered trees dominated by willow (1m) causing heavy shading along this tributary of the Castletown river before transitioning to fallow grassland. Vegetation consisted of bulrush <i>Scirpoides holoschoenus</i>, meadowsweet <i>Filipendula ulmaria</i>, bindweed <i>Calystegia sepium</i> (site was bindweed infested), vetch <i>Vicia</i> sp., greater willowherb <i>Epilobium hirsutum</i>, common hogweed <i>Heracleum sphondylium</i>, willow <i>Salix</i> sp., and Hazel <i>Corylus avellana</i>. No fungus or filamentous algae were noted.</p> <p>Water-starwort <i>Callitriche</i>, common cattail <i>Typha latifolia</i> and common duckweed <i>Lemna minor</i> were also found at sampling location.</p> <p>The macroinvertebrate sample recorded 12 taxa altogether, similar to those recorded at site 4a and an overall low species richness. Class C taxa (moderately pollution tolerant) formed most of the sample. Two Class B taxa were recorded, both in low numbers (Limnephilidae and Alainites muticus). No one taxa was dominant and no Class A taxa were recorded. One Class E was also present but was not dominant (Tubificidae). A Q3 was assigned (moderate). As this is an unmapped tributary, no EPA status has been assigned to this watercourse.</p> <p>Salmonid and Lamprey spawning habitat was rated as None due to high siltation in this watercourse, lack of riffle and pool habitat and lack of suitable substrates/cover. Silt is the dominant substrate and any spawning gravels present were not suitable.</p> <p>For juvenile salmonids, substrates are not suitable. Although water is shallow and fast flowing there is a lack of suitable cover. Habitat not ideal for juveniles. Dissolved oxygen levels were high, above the limit for salmonids at 10.6 mg/l.</p> <p>For juvenile lamprey, nursery habitat was identified along the margins due to the high level of silty deposits and detritus. Some sand is available (10%) for eggs to adhere to but is limited. No clean spawning gravels are available and there is limited suitable hiding places. A habitat rating of Poor was assigned.</p>



Site ID.	Waterbody	Biotic Index	EPA Quality Status	WFD Status (EPA, 2018)	Results Description
					A small juvenile crayfish was found during the kick sample (1.5cm in length). Soft banks for burrowing are present, as is suitable cobble substrate albeit heavily silted. Water has no turbidity and is very clear but increases when kicked. Tree roots and aquatic vegetation are also present providing possible cover and food availability. A habitat rating of Fair was assigned.
*Expert judgement (Accessed from: <a href="https://data.gov.ie/dataset/wfd-river-waterbody-status-2013-2018">https://data.gov.ie/dataset/wfd-river-waterbody-status-2013-2018</a> )					

## FW4 Drainage ditches

Drainage ditches are associated with hedgerows and treelines within this zone. The ditches occurring alongside or within the railway were culverted and maintained. Characteristic species included foals water cress (*Apium nodiflorum*), sweet grass (*Glyceria fluitans*) and duckweed (*Lemna spp.*), all of which are characteristic of stagnant or slow moving water.

## Lakes and Ponds

### FL8 Artificial Ponds

One artificial pond was recorded within Zone A, located north of the railway track within Griffeen Valley Park in Adamstown. Bulrush (*Typha latifolia*). was noted as abundant.

### 1.2.1.1.2. Zone B and C: Park West & Cherry Orchard Station to Heuston Station (incorporating Inchicore Works, Heuston Yard & Station, and New Heuston West Station)

## Built Land

### BL1 Stone walls and other stonework

Description as per Zone A (see section 1.2.1.1.1).

### BL2 Earth banks

Description as per Zone A (see section 1.2.1.1.1).

### BL3 Buildings and artificial surfaces

Description as per Zone A (see section 1.2.1.1.1).

## Disturbed Ground

### ED1 Exposed gravel

Description as per Zone A (see section 1.2.1.1.1).

### ED2 Spoil and bare ground

Spoil and bare ground habitats have been identified between Le Fanu Road bridge and Park West/Cherry Orchard station, north of the existing railway track and parallel with Clover Hill Road. There is a degree of overlap between this category and BL2 earth banks. A transient habitat across

the railway corridor, its presence reflected recent management operation, construction or vegetation clearance. Considerable variation was noted across this habitat although commonly recurring species were noted.

This habitat consists of rubble (i.e. waste and ballast) and species which can be described as a subset of those detailed under GS2 dry meadows and grassy verges. Additional species found here that were not detailed under GS2 below, included frequent black medic (*Medicago lupulina*) and hedge bindweed, and occasional ragwort, salad burnet (*Sanguisorba minor*), coltsfoot (*Tussilago farfara*), mallow (*Malva sylvestris*), chickweed (*Cerastium fontanum*), and bird's foot trefoil (*Lotus corniculatus*).

This habitat also occurred within a matrix of grassland and built land habitats, at a scale unsuitable for mapping.

### ED3 Recolonising bare ground

Recolonising bare ground was recorded at two locations within this Zone: Heuston Station and Kishoge Station.

At Heuston station, mustard (*Brassica* sp.) were dominant with frequent teasal (*Dipsacus fullonum*), bramble, buddleja, birds foot trefoil, lady's bedstraw (*Galium verum*), field scabious (*Knautia arvensis*), ribwort plantain (*Plantago lanceolata*), yarrow (*Achillea millefolium*), occasional sycamore, ivy, creeping thistle, rough hawkbit (*Leontodon hispidus*), black knapweed and rare occurrences of Japanese knotweed (*Reynoutria japonica*), foxglove (*Digitalis purpurea*), ragwort, coltsfoot, kidney vetch (*Anthyllis vulneraria*), common spotted orchid (*Dactylorhiza fuchsia*) and red clover.

At Kishoge, this habitat was dominated by oxeye daisy (*Leucanthemum vulgare*) occurring in matrix with GS2 habitat with frequent red clover, occasional teasal, ribwort plantain, curly leaved dock, black knapweed, black medic, creeping cinquefoil, creeping buttercup, creeping thistle and rare assemblages of wild carrot (*Daucus carota*), spear thistle, broad leaf dock, common knapweed, self-heal (*Prunella vulgaris*), colts foot and perennial sow thistle. At Kishoge, this habitat was likely planted with a seed mix.

Recolonising bare ground was additionally identified at two locations at Park West/Cherry Orchard where a compound is proposed. Species included abundant buddleja with frequent oxeye daisy, dandelion, clover sp., and bryophyte cover, occasional teasel, silverweed (*Potentilla anserina*), birds foot trefoil, scarlet pimpernel (*Anagallis arvensis*), bramble, broad leaf dock and colts foot, and rare Italian alder, common vetch and creeping thistle.

## Improved Grassland

### GA2 Amenity grassland (improved)

It is not extensively represented within the rail corridor, although elements were noted offline in and around stations and Inchicore works.. The species noted in GA2 are largely a subset of those listed under GS2. This habitat was regularly mown/managed and comprised mainly of various cut grass species (i.e. *Festuca* spp., *Poa* spp.), daisy (*Bellis perennis*), dandelion, broad leaf dock and clovers (*Trifolium* spp.).

## Semi-Natural Grassland

### GS1 Dry neutral grassland

This habitat varied in species richness depending on the degree of management and environmental conditions, such as soil fertility and drainage. Situated on top of a steep sloping vegetated bank adjacent to South Circular Road, this habitat was dominated by various grass species (i.e. *Festuca* spp., *Poa* spp.), with abundant common vetch (*Vicia sativa*), bush vetch (*Vicia sepium*), cleavers (*Galium aparine*), creeping cinquefoil, frequent broad leaf dock, spear thistle, perennial sow thistle and herb-Robert, occasional dandelion, bramble and ivy, and rare ragwort and stinging nettle.

Dry neutral grassland also occurred at Inchicore (north of Inchicore Parade), again dominated by various grass species including creeping thistle (*Cirsium arvense*), there is a frequent occurrence of creeping buttercup (*Ranunculus repens*), yarrow, dandelion, with occasional ribwort plantain, sweet vernal grass, curled dock (*Rumex crispus*), ragwort, creeping cinquefoil, red clover (*Trifolium pratense*), white clover (*Trifolium repens*), and rare presence of perennial sow thistle, spear thistle, sunflower (*Helianthus annuus*) and stinging nettle. Black medick (*Medicago lupulina*), red bartsia (*Odontites bartsia*), crested dog tail (*Cynosurus cristatus*), Yorkshire fog, and common centaury (*Centaureum erythraea*) were also noted.

### GS2 Dry meadows and grassy verges

Dry meadows and grassy verges were identified either side of the majority of railway corridor occurring both as a matrix (e.g. WS1 scrub, GS2 dry meadow and GA2 amenity grassland) and as a standalone habitat. There are two locations where dry meadows and grassy verges occurred as a standalone habitat (i.e. not a matrix), this includes: Inchicore Works, east of the main car park and along the entrance to the train depot (c. 350m east of Kylemore Road bridge).

These habitats are likely mown at least once a year containing thick tussocky grasses such as cocksfoot (*Dactylis glomeratus*), Yorkshire fog, meadow grasses (*Poa* spp.) as well as fescues (*Festuca* spp.) and false oat grass (*Arrhenatherum elatius*). This habitat also contained various abundances of cleavers, chickweed (*Stellaria media*), snowberry (*Symphoricarpos albus*), elderflower (*Sambucus nigra*), small leaved elm (*Ulmus minor*), buttercups (*Ranunculus* sp.), red valerian, red clover, birds foot trefoil, Spanish bluebell (*Hyacinthoides hispanica*), wall cotoneaster (*Cotoneaster horizontalis*), buddleja, yarrow, creeping cinquefoil, dandelion, creeping thistle, perennial sow thistle, cow parsley (*Anthriscus sylvestris*), wall fumitory (*Fumaria muralis*) stinging nettle, hedge bindweed, daffodils (*Narcissus*), rapeseed (*Brassica napus*), bristly oxtongue (*Helminthotheca echioides*), dogrose (*Rosa canina*), lady's bedstraw, teasel, scarlet pimpernel, cranesbill (*Geranium sanguineum*), fennel (*Foeniculum vulgare*), red campion (*Silene dioica*), doves-foot cranes-bill (*Geranium molle*), black knapweed, mugwort, alexanders (*Smyrniolum olusatrum*), hogweed (*Heracleum sphondylium*), ox-eye daisy (*Lecuanthemum vulgare*), and herb-Robert.

Meadow vetchling (*Lathyrus pratensis*), perforate St John's wort (*Hypericum perforatum*) common hogweed, sedges (*Carex* spp.), winter heliotrope (*Petasites fragrans*), three cornered leek (*Allium triquetrum*), oxeye daisy, willowherb sp., bulbous buttercup (*Ranunculus bulbosus*), field scabrous (*Knautia arvensis*), and false-brome (*Bracipodium sylvatica*) were all noted between Inchicore and Park West/Cherry Orchard.

An area of dry meadow located east of the main car park at Inchicore works also contained mouse-ear cress (*Arabidopsis thaliana*), groundsel (*Senecio vulgaris*), mugwort and poppy. An area of dry meadow along the entrance to the train depot at Inchicore had abundant wild teasel. Where this habitat occurs between Inchicore and Park West/Cherry Orchard, meadow sweet (*Filipendula ulmaria*), cowslip (*Primula veris*), black medic, field horsetail, gorse, and curly leaved dock (*Rumex crispus*) were noted.

In general, cowslip, nettle and field horsetail were more dominant on north facing banks and gorse, field scabious, false-brome (*Bracipodium sylvatica*) were more dominant on south facing banks. An unidentified umbellifer was also noted on north facing banks between Inchicore and Park West/Cherry Orchard. Garden escapes were a common occurrence within this habitat type.

At Park West/Chery Orchard where a compound is proposed, dry meadows and grassy verges occurred along the southern boundary of the field and also covered the majority of open ground. These habitats were unmanaged and dominated by grass species, black knapweed, and coltsfoot. Coltsfoot was particularly dominant along the berm on the southern boundary of this field. This habitat contained an abundance of buddleja, bramble, elderflower, and birds foot trefoil with occasional teasel, ribwort plantain, daisy, dandelion, common vetch, creeping cinquefoil, with occasional cowslip, silverweed, broad leaf dock, clover sp., germander speedwell (*Veronica chamaedrys*), ground ivy (*Glechoma hederacea*), and rare occurrence of cut leaved cranesbill (*Geranium dissectum*) and burdock (*Arctium lappa*).

#### **GS4 Wet grassland**

Linear elements of this habitat associated with ditches at edges of the rail corridor rather than as a discrete sward. Many of the ditches that were noted were dry, but the vegetation assemblage indicated the presence of water and indeed occasional localised waterlogging. These ditches ran alongside the railway or cross underneath it (and are culverted). Floristically, the vegetation is varied and is influenced by presence of adjacent wetland flora. Along with grasses, commonly noted species included creeping bent (*Agrostis stolonifera*), rushes (*Juncus* spp.), silverweed (*Potentilla anserina*), buttercup, and occasional meadowsweet (*Filipendula ulmaria*).

At Park West/Chery Orchard where a compound is proposed, two small pockets of wet habitat were noted within GS2 neutral grassland habitat. Both areas of wet grassland were had hard rush (*Juncus inflexus*) in abundance.

### **Highly Modified/Non-Native Woodland**

#### **WD1 (Mixed) broadleaf woodland**

Mixed broadleaved woodland was identified along the western boundary of the area proposed for a compound at Park West/Chery Orchard. This habitat was associated with planted areas adjoining the M50. The woodland had a canopy dominated by ash and birch with frequent elder, brambles and Italian alder, occasional larch (*Larix decidua*), buddleja and hawthorn and rare occurrences of bird cherry (*Prunus padus*), wild cherry (*Prunus avium*), and sycamore.

## Linear Woodland/Scrub

### WL1 Hedgerows

Hedgerows were recorded extensively within the railway corridor. Hedgerow management was minimal, with the rail side of the majority of hedgerows consisting of a mosaic of heavily managed scrub (WS1) and neutral grassland (GS2). In general, hedgerows were located on top of berms/banks and showed some variation in height, thickness and species composition.

Hedgerow habitat contained various abundances of sycamore, ash, elder, hawthorn, , blackthorn (*Prunus spinosa*), grey willow and hazel. The majority of the hedgerows also contained bramble, guelder rose (*Viburnum opulus*) and ivy. Privet (*Ligustrum ovalifolium*) was noted between Inchicore and Park West/Cherry Orchard.

### WL2 Treelines

Treelines were recorded in several locations within the railway corridor. Treelines were identified adjacent to South Circular Road, west of Sarsfield Road and parallel with Cherry Orchard avenue.

Treelines consisted of horse chestnut (*Aesculus hippocastanum*), witch elm (*Ulmus glabra*), hawthorn, blackthorn, ash, guelder rose and sycamore. A treeline to the rear of Sarsfield Medical Centre also consisted of copper beech (*Fagus sylvatica* 'purpurea'), Mediterranean evergreen oak (*Quercus ilex*), beech (*Fagus sylvatica*), cherry laurel and wild cherry.

### WS1 Scrub

Scrub habitat was recorded throughout the railway corridor, particularly in conjunction with GS2 neutral grassland, occurring as a matrix. Scrub was heavily managed in areas and recently cut back at the time of survey. Scrub habitat varied in height (although no greater than 4m), thickness and management (depending on its proximity to the railway line). Species composition include a subset of those listed under GS2 neutral grassland with an abundant presence of brambles, stinging nettle, frequent ivy and buddleja and occasional grey willow and hedge bindweed.

### WS2 Immature woodland

Immature woodland recorded consisted of areas that were planted (mainly for screening purposes inside the proposed Development Boundary) and had a limited species composition. Areas of immature woodland consisted of sycamore, birch, English elm (*Ulmus minor*), elder, ash and pedunculate oak (*Quercus robur*). Elm's disease was likely present within the immature woodland noted just east of Memorial road bridge. Immature woodland varied from 4-6m in width and 6-10m in height.

## Mosaic Habitat

### WS1 Scrub; GS2 Dry neutral grassland and grassy verge

See section 1.2.1.1.1.

### WS1 Scrub and WD1 (Mixed) broadleaved woodland

At Park West/Chery Orchard where a compound is proposed, scrub and trees occur along the western boundary located in the middle of the two sections of recolonising bare ground. Species included dominant bramble and buddleja with frequent hawthorn, occasional elderflower and elm and rare Italian alder.

### **ED3 Recolonising bare ground; GS2 Dry meadows and grassy verges**

As detailed under disturbed ground and grassland, both ED3 scrub and GS2 neutral grassland occur as matrix. The species and general habitat description are as per detailed under section 1.2.1.1.1.

## **Watercourses**

### **FW4 Drainage ditches**

See section 1.2.1.1.1.

## **Lakes and Ponds**

### **FL8 Artificial Ponds**

One artificial pond was recorded within Zone B and C, located south of the railway track within the Irish Rail Inchicore works depot.

### **1.2.1.1.3. Zone D: River Liffey Bridge to Glasnevin Junction (Phoenix Park Tunnel Branch Line).**

## **Built Land**

### **BL1 Stone walls and other stonework**

Description as per Zone A (see section 1.2.1.1.1).

### **BL2 Earth banks**

Description as per Zone A (see section 1.2.1.1.1).

### **BL3 Buildings and artificial surfaces** Description as per Zone A (see section 1.2.1.1.1).Disturbed Ground

### **ED1 Exposed gravel**

Description as per Zone A (see section 1.2.1.1.1).ED3 Recolonising bare ground

Recolonising bare ground was noted at two location within this Zone: north and south of Fassaugh avenue. South of Fassaugh avenue, this habitat commonly consisted of frequent grey willow, field horsetail and bramble, with occasional buddleja, ragwort, water figwort (*Scrophularia auriculata*) and rare assemblages of red valerian, Autumn hawkbit (*Scorzoneroides autumnalis*), curled dock, yarrow, and hoary willowherb (*Epilobium parviflorum*). North of Fassaugh avenue recolonised ground was comprised of false oat-grass (*Arrhenatherum elatius*) along with cock's foot (*Dactylis glomerata*) and sweet vernal grass. Thistles (*Cirsium* spp.) and nettle were frequent along with field rose (*Rosa arvensis*) and meadowsweet in damper patches.

### **GA2 Amenity grassland (improved)**

Amenity grassland was noted at Glasnevin cemetery car park.

## Semi-Natural Grassland

### GS2 Dry meadows and grassy verges

As detailed for Zone B and C (section 1.2.1.1.2), dry meadows and grassy verges was identified either side of the majority of the railway corridor occurring largely as a matrix (i.e. scrub and dry meadow). This habitat was similar to that as described in Zone B and C and are likely mown at least once a year containing various abundances of Perennial ryegrass, cocksfoot, false oat-grass, bramble, wild carrot, bird's foot trefoil, white clover, creeping thistle, dog rose, Himalayan honeysuckle (*Leycesteria Formosa*), curly leaved dock, broad-leaved dock, common sorrel (*Rumex acetosa*), ribwort plantain, buck's horn plantain (*Plantago coronopus*), greater willowherb, meadow buttercup, red clover, bramble, creeping cinquefoil, teasel, yarrow, red clover, buddleja, black medic, common knotweed, ragwort, hoary willowherb, tufted vetch (*Vicia cracca*), meadow vetchling (*Lathyrus pratensis*), mugwort, spear thistle, hawthorn, Autumn hawkbit, dog rose, field bindweed, hedge bindweed, perforate St John's wort, common mallow, common hogweed, meadow sweet, dandelion, stitchwort (*Stellaria* sp.), , black knapweed, common restharrow (*Ononis repens*), red valerian, tutsan (*Hypericum androsaemum*), , and field horsetail.

## Freshwater Marsh

### GM1 Marsh

No large-scale elements of marsh vegetation were noted within the proposed Development Boundary. However, the presence of limited standing water, often shallow was occasionally noted north of Cabra road within the proposed construction compound. Standing water here was noted over builder's rubble at old 'rail yard'. This was not truly a marsh, nonetheless some plants characteristic of marsh did occur such as: rushes, sedges (*Carex flacca*), yellow sedge (*C. viridula*), unidentified sedges (*Carex* spp.), marsh angelica (*Angelica sylvestris*), marsh pennywort (*Caltha palustris*) and a small patch of bulrush (*Typha latifolia*). This habitat occurs at a scale unsuitable for mapping.

## Linear Woodland/Scrub

### WL1 Hedgerows

Hedgerows were recorded extensively within this zone. Hedgerow management was minimal, with the rail side of the majority of hedgerows consisting of a mosaic of scrub (WS1) and neutral grassland (GS2) which were heavily managed. In general, hedgerows were located on top of berms/banks and showed some variation in height, thickness and species composition. Hedgerow habitat contained various abundances of blackthorn, hazel, hawthorn, ash, willow, fir (*Abies* sp., likely planted or garden escapes), sycamore, and pedunculate oak. Buddleja was also a common species throughout hedgerow habitat.

### WL2 Treelines

Treelines were less common within Zone D when compared to Zone A, with hedgerow and neutral grassland/scrub being the most dominant habitat type. Treelines consisting of lime (*Tilia x europaea*) were noted at Glasnevin cemetery while sycamore, bramble and nettle were noted north of Fassaugh avenue and a black poplar hybrid species noted north of Cabra Road.

## WS1 Scrub

Scrub habitat is similar to that described for Zone B and C (section 1.2.1.1.2), occurred largely in conjunction with GS2 neutral grassland but also occurring as a non-matrix (standalone) habitat at the Royal Canal, and south of Fassagh avenue. Species composition include a subset of those listed under GS2 neutral grassland with an abundant presence of brambles, stinging nettle, ivy, buddleja, great willowherb, meadowsweet, cleavers and several tree species including blackthorn, sycamore, hawthorn, ash, alder, , grey willow, and elder.

## Underground Rock and Caves

### EU2 Artificial underground habitat

This categorises the Phoenix Park Tunnel. Beginning north of the Liffey Bridge near Heuston Station, it runs underneath the Phoenix Park before re-emerging close to the junction of the Infirmary Road and North Circular Road. This habitat provides limited suitability for any vegetated growth owing to the presence loose ballast and absence of natural light. This habitat is not mapped.

## Mosaic Habitat

### WS1 Scrub; GS2 Dry neutral grassland and grassy verge

See section 1.2.1.1.1.

## Watercourses

### FW3 Canals

The Glasnevin spur runs under the Royal Canal bridge (OBO8). The canal contained aquatic vegetation including floating sweet-grass (*Glyceria fluitans*), water-lily (*Nymphaea alba/ Nuphar lutea*) and bur-reed (*Sparganium* spp.). The banks of the canal were vegetated with willowherb, meadowsweet, bramble, ragwort, hedge bindweed, and willow.

## Brackish Waters

### CW2 Tidal rivers

Liffey Estuary intersects the railway corridor at Liffey Railway Bridge. All rivers which intersect the proposed Development Boundary flow into this tidal waterbody. Subject to the tide, the Liffey Estuary consisted of various habitat types largely characterised by the deposition of fine sediments often forming extensive subtidal and intertidal sand and mud flats.

## 1.2.1.2. Invasive Alien Plant Species

Invasive alien plant species recorded during the field study are detailed in Table 1-4 and shown in Volume 3A of the EIAR.



**Table 1-4: Invasive Alien Plant Species**

Species	Location (ITM)	Map Code	Description
Himalayan balsam <i>Impatiens glandulifera</i>	713595, 735781	IAPS-1	Balsam at the bridge over the Old Cabra Road, R805.
	713465, 735373	IAPS-2	Discrete stand on south east side of bridge extending upslope. No obvious management from rail chem. spray train.
	714023, 736762	IAPS-3	Single sapling in centre of railway ballast on south of bridge.
Japanese knotweed <i>Reynoutria japonica</i>	712916, 734211	IAPS-4	Approx. extent of knotweed on Iarnród Éireann lands between apartments and track 10 platform. Extensive, no obvious management.
	712683, 733939	IAPS-5	Japanese knotweed at SCR.
	712871, 734113	IAPS-6	Knotweed from the Liffey bridge to the first bridge at Heuston.
	698692, 731574	IAPS-7	Small stand of JK around Iarnród Éireann junction box. Extends upslope and into private hedge line.
	710519, 733179	IAPS-8	5 m x 5 m patch, c. 7 individuals
	712891, 734145	IAPS-9	Stand located in verge along boundary wall of Clancy Quay.
	712915, 734306	IAPS-10	Located in close proximity to the railway line, southwest of the River Liffey bridge crossing within area of disturbed ground. One of several stands along this stretch.
	712909, 734296	IAPS-11	One of several stands southwest of the River Liffey bridge crossing. This stand is located the furthest from the railway line within scrub/grassland habitat.
	712916, 734295	IAPS-12	Located in close proximity to the railway line, southwest of the River Liffey bridge crossing within area of disturbed ground. One of several stands along this stretch.
	712917, 734259	IAPS-13	One of several stands southwest of the River Liffey bridge crossing. Located to front of large stone stockpiles.
	712900, 734227	IAPS-14	One of several stands southwest of the River Liffey bridge crossing. Located between two large stone stockpiles.
	712893, 734169	IAPS-15	Located at southwest corner of a large stone berm close to Heuston Station Platform 10 and boundary wall with Clancy Quay. One of several stands along this stretch.

Species	Location (ITM)	Map Code	Description
	712852, 734071	IAPS-16	One of several stands southwest of the River Liffey bridge crossing.
Spanish bluebell <i>Hyacinthoides hispanica</i>	712560, 733902	IAPS-17	0.5 m x 0.5 m, located on slope close to the top of berm, c. 35 individuals.
	711994, 733794	IAPS-18	0.25 m x 0.25m, c. 10 individuals.
	711870, 733771	IAPS-19	2 x 1 m extent, c. 25 individuals
	710613, 733357	IAPS-20	0.25 x 0.25 m extent, c. 25 individuals on south bank.
	711721, 733730	IAPS-21	10 x 3 m extent, located alongside three-cornered leek.
Three-cornered leek <i>Allium triquetrum</i>	712589, 733895	IAPS-22	4 x 5 m extent located on slope of soil berm, c. 100 individuals noted.
	711721, 733730	IAPS-23	10x3 m extent. Located alongside Spanish bluebells, c. 100 individuals noted.

### 1.2.1.3. Fauna Species

#### 1.2.1.3.1. Freshwater Aquatic Invertebrates and Fish

A total of six sites within four watercourses were assessed for freshwater aquatic invertebrate potential (Figure 1.1). Field sheets from the freshwater aquatic survey are detailed in Table 1-5 to Table 1-10.

Table 1-5: Freshwater aquatic data sheet for Griffeen River

Griffeen River (IE_EA_09L012100)				Date: 09/08/2021	
Site ID:	Site 1	GPS Location:	53.33643 -6.44680	Site info:	Accessed via Tullygreen estate where surveyors entered Griffeen Park.
DO (%):	106.3%	Bedrock:	-	Flow discharge:	Normal
DO (mg/l):	10.5	Boulder (>250mm):	20%	Velocity:	Moderate
Temp (°C):	15.6	Cobble (65-250mm):	30%	Turbidity:	Moderate
Conductivity (µS/cm):	587	Gravel (17-64mm):	30%	Colour:	Low
pH:	8.24	Fine Gravel (3-16mm):	10%	Siltation:	Low
Bank height (m):	0.5	Sand (<2mm):	-	Sewage Fungus:	0
Bank width (m):	3	Silt (<0.06mm):	10%	Filamentous Algae:	1% <i>Vaucheria</i>
Wet width (m):	4	Main land use US:	Parkland	Shading:	Moderate
Avg depth (cm):	30	Cattle Access US/DS:	None	Substrate condition:	Normal
Comments:	Straightened historically, presence of stoneloach noted, willow dominated continuous treeline along river bank, greyish tinge to water however, no sewage fungus or smell. No crayfish noted during hand search.				
<b>Macroinvertebrate list</b>			<b>EPA Sensitivity Group</b>		<b>Abundance</b>
Gammarus duebeni			C		Numerous
Baetis Rhodani			C		Numerous
Rhyacophilidae			C		Common
Elmis Aenea			C		Common
Potamopygus			C		Common
Seretella ignita			C		Common
Hydracarina			C		Few

Dicronota	C	Few
Assellus aquaticus	D	Few
Chironomidae	C	Few
Lymeia peregra	D	Few
Hydroptilidae	B	Few
Tubificidae	E	Few
Limnephilidae	B	Few
<b>Total No. of Taxa = 14</b>		
<b>Q-value = Q3</b>		
<b>Fisheries Habitat: Summary</b>		
<p><b>Salmonids-</b> dominant substrate is boulder and cobble with diverse habitat present (i.e. riffle, glide, pool). No signs of redds, gravel contains some siltation. High DO measurements (106.3 mg/l). Gradient less than ideal at 1%. Some holding pools present d/s for adults with no barriers to migration visible. Coarse substrate present for juveniles.</p>		
<p><b>Lamprey-</b> no sand available for spawning (i.e. eggs to adhere to) and gravels silted. Slow flow and muddy/silty material present along margins for nursery habitat. No barriers to migration visible or recent dredging or channelisation.</p>		
<p><b>Crayfish-</b> none noted within kick sample. Soft banks present for burrowing in addition to aquatic vegetation, submerged trees and detritus. Suitable rock/boulder habitat in areas however silted substrate.</p>		

Table 1-6: Freshwater aquatic data sheet for Tributary of the Griffeen River

Tributary of the Griffeen River (IE_EA_09L012100)				Date: 09/08/2021	
Site ID:	Site 1b	GPS Location:	53.33548 -6.44516	Site info:	Accessed at Park entrance. Left bank (to the right of the pond)
DO (%):	86.6%	Bedrock:	-	Flow discharge:	Normal
DO (mg/l):	8.23	Boulder (>250mm):	10%	Velocity:	Slow
Temp (°C):	17.2	Cobble (65-250mm):	30%	Turbidity:	None
Conductivity (µS/cm):	581	Gravel (17-64mm):	25%	Colour:	None
pH:	7.84	Fine Gravel (3-16mm):	25%	Siltation:	Low
Bank height (m)	5	Sand (<2mm):	-	Sewage Fungus:	0
Bank width (m):	1.5	Silt (<0.06mm):	10%	Filamentous Algae:	0
Wet width (m):	1.5	Main land use US:	Parkland	Shading:	Moderate/Heavy
Avg depth (cm):	10	Cattle Access US/DS:	None	Substrate condition:	Normal
Comments:	Tributary unmapped, stickleback noted during the kick sample, <i>Apium nodiflorum</i> noted throughout sample area, semi-continuous treeline noted along left bank, right bank steep with bramble, nettle and willowherb. No class A species noted, assellus and tubificidae common with low abundances of the remaining taxa.				
<b>Macroinvertebrate list</b>			<b>EPA Sensitivity Group</b>	<b>Abundance</b>	
Elmis Aenea			C	Few	
Potamopygrus			C	Few	
Hydropsychidae			C	Few	
Seretella ignita			C	Common	
Simuliidae			C	Common	
Hydracarina			C	Few	
Dytiscidae			C	Few	
Veliidae			C	Few	
Alainites muticus			B	Few	
Glossosomatidae			B	Few	
Assellus aquaticus			D	Common	
Chironomidae			C	Common	
Planorbidae			D	Few	
Platyhelminthes			C	Few	
Tubificidae			E	Common	
Limnephilidae			B	Few	
Glossiphoniidae			D	Few	
Baetis rhodani/atlanticus			C	Few	
<b>Total No. of Taxa = 18</b>					
<b>Q-value = Q2-3</b>					
<b>Fisheries Habitat: Summary</b>					
<b>Salmonids-</b> cobble is the dominant substrate, no sign of redds, silted gravels. DO is on low side at 8.23 mg/l. Gradient less than ideal at 1%. No holding pools noted d/s for resting adults. Weir noted at box culvert (1m jump). Some coarse substrate available for juveniles in addition to suitable cover such as overhanging trees and cobbles/boulders.					
<b>Lamprey-</b> no mud/silt/sandy material present along margins, gravels silted, low water depth (c. 15cm at deepest locations). No recent signs of dredging or channelisation. Weir noted at box culvert (1m jump). Suitable hiding place but slow flow velocity.					
<b>Crayfish-</b> none noted within kick sample. No soft banks present for burrowing. In otter spraint found, no evidence of crayfish remains. Food source present in the form of aquatic vegetation and detritus. Suitable rock/boulder habitat in areas however silted cobbles and shallow depths.					

Table 1-7: Freshwater aquatic data sheet for Lucan Stream

Lucan Stream (IE_EA_09L012100)				Date: 09/08/2021	
Site ID:	Site 2	GPS Location:	53.33681 -6.47547	Site info:	Accessed via carpark at Adamstown train station.
Comments:	Dry channel- not sampled.				

Table 1-8: Freshwater aquatic data sheet for Coneyburrow

Coneyburrow_09 (IE_EA_09L011900)				Date: 09/08/2021	
Site ID:	Site 3	GPS Location:	53.33681 -6.49391	Site info:	Accessed via right bank, over fence and walked u/s toward dart line.
DO (%):	94.6%	Bedrock:	-	Flow discharge:	Normal
DO (mg/l):	9.7	Boulder (>250mm):	2%	Velocity:	Stagnant/Slow
Temp (°C):	15	Cobble (65-250mm):	20%	Turbidity:	None
Conductivity (µS/cm):	616	Gravel (17-64mm):	10%	Colour:	None
pH:	8.03	Fine Gravel (3-16mm):	10%	Siltation:	Low
Bank height (m):	0.5	Sand (<2mm):	-	Sewage Fungus:	0
Bank width (m):	2	Silt (<0.06mm):	58%	Filamentous Algae:	0
Wet width (m):	2	Main land use US:	Tillage	Shading:	Heavy
Avg depth (cm):	15	Cattle Access US/DS:	Upstream and downstream.	Substrate condition:	Normal/Calcareous
Comments:	Straightened channel, calcareous coating on cobbles, substrate silt under cobbles, <i>Apium nodiflorum</i> , <i>mentha aquatic</i> and <i>Lemna minor</i> noted within the sample area. Continuous treeline on left bank, <i>Baetis rhodani</i> dominant but no class D/E dominant. Cased caddis present are class B.				
<b>Macroinvertebrate list</b>		<b>EPA Sensitivity Group</b>		<b>Abundance</b>	
Elmis Aenea		C		Common	
Baetis Rhodani		C		Dominant	
Psychomyiidae		C		Common	
Gammarus duebeni		C		Common	
Hydropsychidae		C		Few	
Polycentropodidae		C		Few	
Seretella ignita		C		Common	
Erpobdella octoculata		D		Few	
Simuliidae		C		Few	
Sericostrimatidae		B		Few	
Alainites muticus		B		Few	
Glossosomatidae		B		Common	
Assellus aquaticus		D		Few	
Chironomidae		C		Few	
Platyhelminthes		C		Few	
Oligochaete		E		Few	
Crangonyx		D		Few	
<b>Total No. of Taxa = 17</b>					
<b>Q- value = Q3</b>					
<b>Fisheries Habitat: Summary</b>					
<b>Salmonid-</b> silt is the dominant substrate, lacks riffle and pool habitat (100% glide), no signs of redds and gravel silted. DO is high and gradient less than ideal at 1%. No holding pools noted d/s and flow noted as low (15cm at time of sampling in the summer). Barrier to migration noted where pipe culvert ls located between fields as it reaches the road. Water is shallow but not fast flowing, some overhanging vegetation on left bank (suitable cover for juveniles) with coarse substrate present.					
<b>Lamprey-</b> silt dominant, no sand available for eggs to adhere, no clean spawning gravels, some areas of slow flow/backwater, areas of mud/silty bed material in margins for burrowing but not common. Low and slow water					

depth. Barriers to migration present for adults, river was straightened historically and very low flow (almost stagnant) which is not appropriate for adult lamprey.

**Crayfish**- none noted within kick sample, suitable rock/boulder habitat present, **food source/cover available in the form of overhanging vegetation, aquatic vegetation and detritus**, no crayfish remains found in otter spraint, no turbidity unless kicked.

Table 1-9: Freshwater aquatic data sheet for Castletown\_09

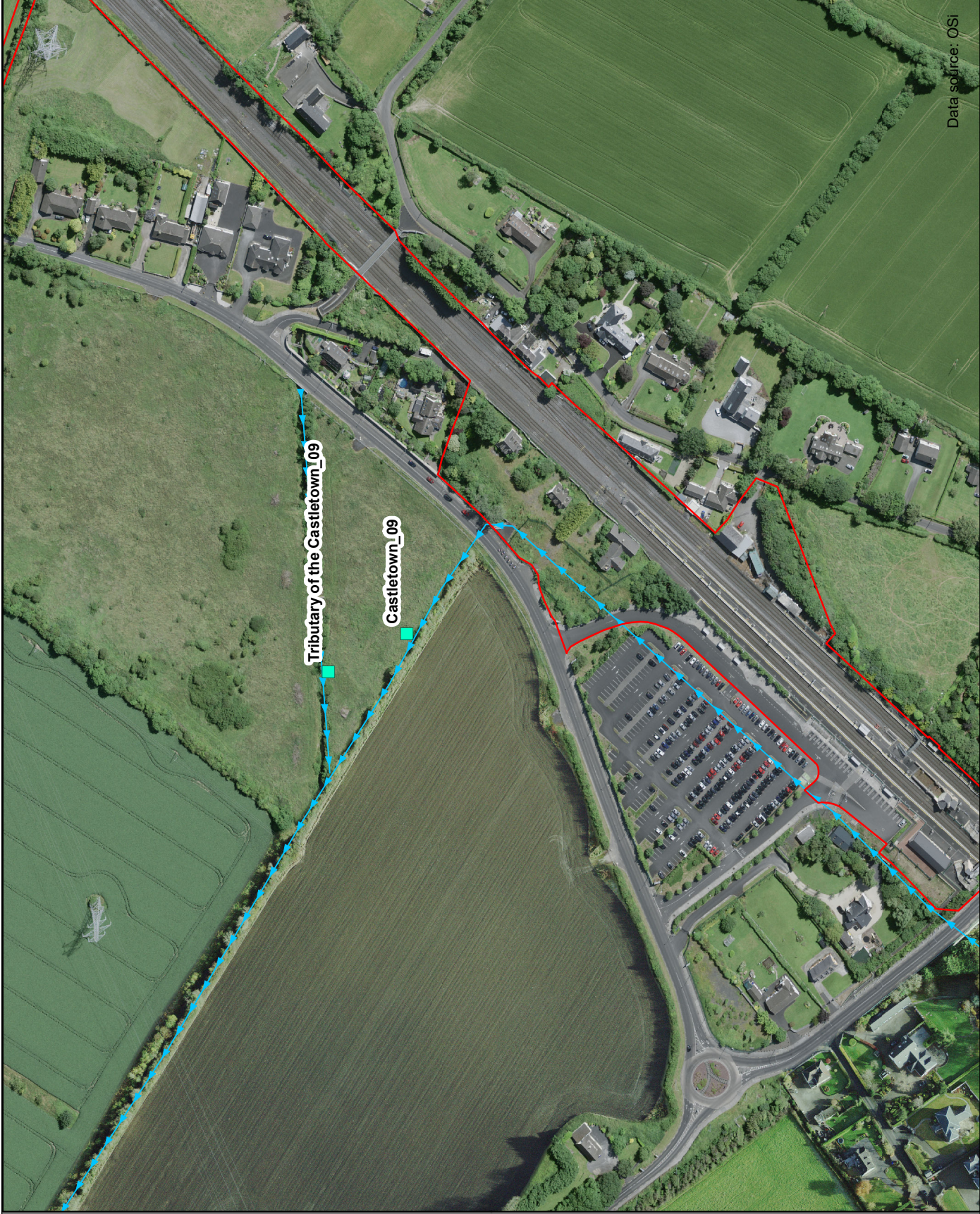
Castletown_09 (IE_EA_09C500830)				Date: 09/08/2021	
Site ID:	Site 4a	GPS Location:	53.32502 -6.52227	Site info:	Located 40m west of site 4b. Accessed from main road north of Hazelhatch train station. Sample taken from eastern bank.
DO (%):	90.4%	Bedrock:	-	Flow discharge:	Normal
DO (mg/l):	8.66	Boulder (>250mm):	-	Velocity:	Slow
Temp (°C):	17.1	Cobble (65-250mm):	2%	Turbidity:	None
Conductivity (µS/cm):	609	Gravel (17-64mm):	8%	Colour:	None
pH:	8.08	Fine Gravel (3-16mm):	10%	Siltation:	Heavy
Bank height (m):	2.5	Sand (<2mm):	-	Sewage Fungus:	0
Bank width (m):	3	Silt (<0.06mm):	80%	Filamentous Algae:	0
Wet width (m):	4.5	Main land use US:	Scrub/Fallow grassland	Shading:	Heavy
Avg depth (cm):	20	Cattle Access US/DS:	None	Substrate condition:	Calcareous
Comments:	Channel straightened and deepened, calcareous deposits on cobbles (soft but not as soft as 4b), steep banks and dense bramble along left bank (1m in width), scattered trees along right bank (1m and then rough pasture), very overgrown, no class A species, no taxa dominant, low species richness.				
Macroinvertebrate list		EPA Sensitivity Group		Abundance	
Elmis Aenea		C		Few	
Gammarus duebeni		C		Common	
Potamopygrus		C		Common	
Rhyacophilidae		C		Few	
Veliidae		C		Few	
Hydropsychidae		C		Few	
Seretella ignita		C		Common	
Simuliidae		C		Common	
Tubificidae		E		Few	
Limnephilidae		B		Few	
Baetis rhodani/atlanticus		C		Few	
Baetis muticus		B			
<b>Total No. of Taxa = 12</b>					
<b>Q- value = Q3</b>					
Fisheries Habitat: Summary					
<b>Salmonids</b> - silt is the dominant substrate, pool and riffle habitat absent, no signs of redds, gravel silted, DO is high, gradient less than ideal at 1%, flow velocity is slow but no extreme low flows, no holding pools found d/s for resting adults, culverted noted under road. Habitat not ideal for juvenile or adult salmonids, lack of suitable cover and shallow fast flowing waters.					
<b>Lamprey</b> - silt is the dominant substrate, spawning gravels silted, nursery habitat present along margins (lots of silty deposits and detritus), areas of slow flow present, culvert noted under road, lacks suitable hiding places for adult lamprey and stronger flows.					
<b>Crayfish</b> - none noted within kick sample however soft banks present for burrowing, lots of detritus, overhanging banks and leaf litter. No crayfish remains found in otter spraint; low turbidity increases when kicked due to high siltation.					

Table 1-10: Freshwater aquatic data sheet for Tributary of Castletown\_09

Tributary of the Castletown_09 (IE_EA_09C500830)				Date: 09/08/2021	
Site ID:	Site 4b	GPS Location:	53.32542 -6.52258	Site info:	Located 40m east of site 4a. Accessed from main road north of Hazelhatch train station. Sample taken from western bank.
DO (%):	110.5%	Bedrock:	-	Flow discharge:	Normal
DO (mg/l):	10.6	Boulder (>250mm):	-	Velocity:	Slow
Temp (°C):	17	Cobble (65-250mm):	10%	Turbidity:	None
Conductivity (µS/cm):	574	Gravel (17-64mm):	10%	Colour:	None
pH:	8.15	Fine Gravel (3-16mm):	10%	Siltation:	Heavy
Bank height (m)	1	Sand (<2mm):	10%	Sewage Fungus:	0
Bank width (m):	2	Silt (<0.06mm):	60%	Filamentous Algae:	0
Wet width (m):	2	Main land use US:	Scrub/Fallow grassland	Shading:	Heavy
Avg depth (cm):	40	Cattle Access US/DS:	None	Substrate condition:	Calcareous
Comments:	Tributary unmapped, , likely straightened and deepened, calcareous deposit on cobbles, very soft substrate, juvenile crayfish found during kick sample (1.5cm in length), bindweed infested, <i>Callitriche</i> , <i>Typha latifolia</i> and <i>Lemna minor</i> found at sampling location. Heavily overgrown and heavily shaded watercourse, willow dominant (1m) then rough pasture. Low species richness, no class A species, no single species dominant.				
Macroinvertebrate list			EPA Sensitivity Group	Abundance	
Elmis Aenea			C	Common	
Gammarus duebeni			C	Numerous	
Potamopygrus			C	Numerous	
Seretella ignita			C	Common	
Polycentropodidae			C	Few	
Simuliidae			C	Few	
Veliidae			C	Few	
Alainites muticus			B	Few	
Assellus aquaticus			D	Few	
Tubificidae			E	Few	
Limnephilidae			B	Few	
Baetis rhodani/atlanticus			C	Few	
<b>Total No. of Taxa = 12</b>					
<b>Q- value = Q3</b>					
Fisheries Habitat: Summary					
<b>Salmonids-</b> silt is the dominant substrate, pool and riffle habitat absent, glide habitat is 100% and uniform, no signs of redds, gravel silted, DO is high (higher than site 4a), gradient less than ideal at 1%, flow velocity is slow with extreme low flows noted in sections, no holding pools found d/s for resting adults, no barriers to migration noted. Habitat not ideal for juvenile or adult salmonids, lack of suitable cover and shallow fast flowing waters.					
<b>Lamprey-</b> silt dominant, some sand available (10%) for eggs to adhere to but limited, flow velocity is slow, no clean spawning gravels available however nursing habitat along the edge of streams are available due to high proportion of silty deposits and the presence of slow flow/backwaters. No barriers to migration for adult lamprey, some suitable hiding places available.					
<b>Crayfish-</b> juvenile found during kick sample, 1.5cm in length, soft banks present for burrowing, cobbles (although largely silt), tree roots and aquatic vegetation present for cover and food sources, water very clear but silted substrate.					

# Legend

- Aquatic Survey Locations
- Redline Development Boundary
- Rivers

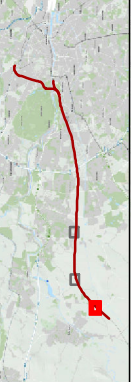


Data source: OSI

Project Title	DART + SOUTH WEST
Drawing Title	<b>Figure 8.4: Survey Locations</b> Map 1 of 3
Drawing File Name	DP-0.4.23-DWG-EV-TTA-23765
Version	v03
Status	S3

Engineering Designer	ATKINS	Approved	MN
Supported by:	TPRSA	Checked	WT
Client	Iarnród Éireann Irish Rail	Drawn	MS
Date	20/10/2022	@ A4	TTA
Scale	1:5000	Scale	
Project Code	6195886	Drawn	MS

Rev	Date	Dr.	Chk'd	App'd	Description
V03	20/10/2022	NR	HF	MN	Aquatic Survey Locations
V02	08/09/2022	NR	HF	MN	Aquatic Survey Locations
V01	01/06/2022	NR	HF	MN	Aquatic Survey Locations



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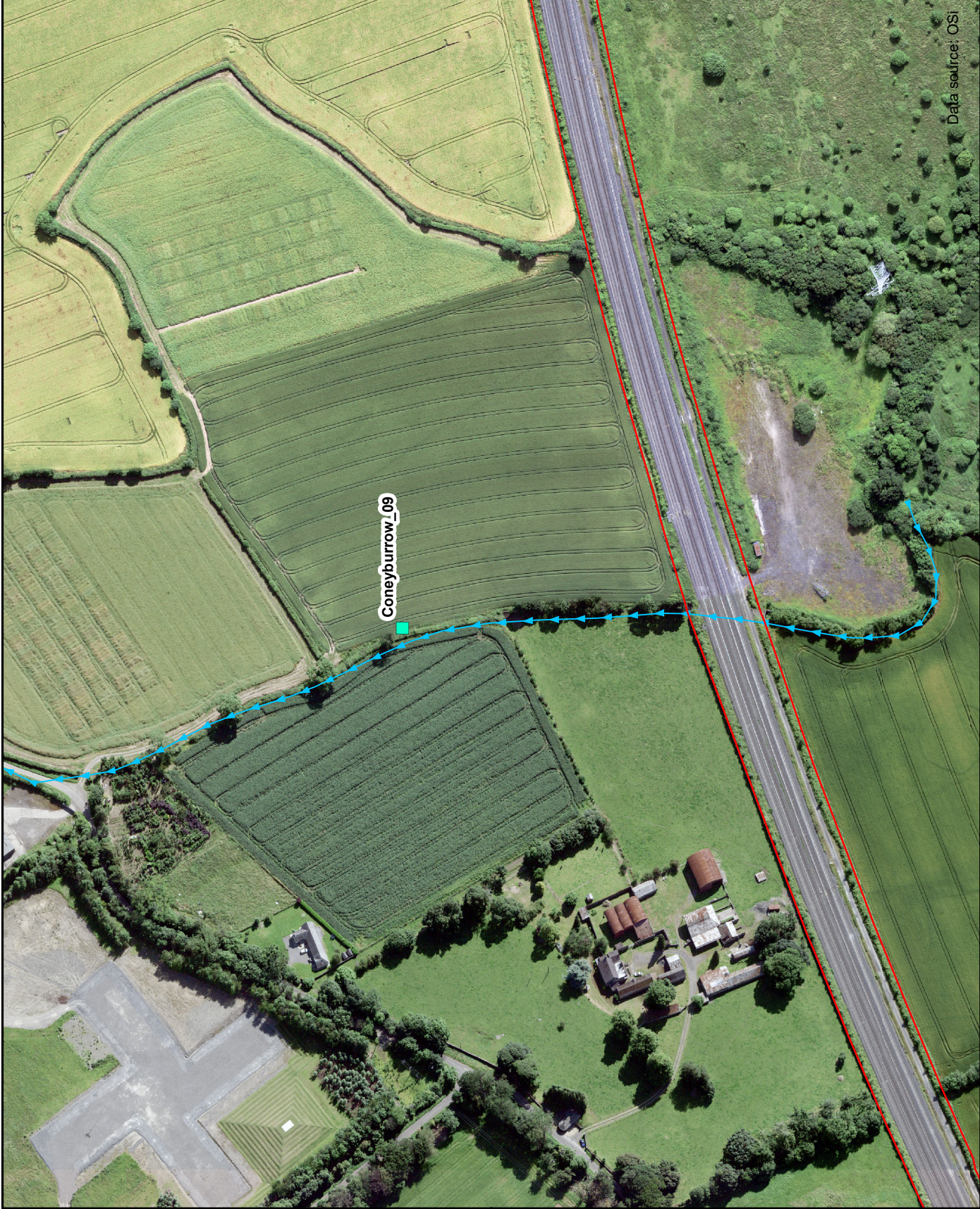
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# Legend

- Aquatic Survey Locations
- Redline Development Boundary
- > Rivers

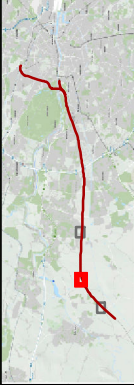


Data source: OSI

Project Title	DART + SOUTH WEST
Drawing Title	<b>Figure 8.4: Survey Locations</b> Map 2 of 3
Drawing File Name	DP-0.4.23-DWG-EV-TTA-23765
Version	v03
Status	S3

Engineering Designer	ATKINS	Approved	MN
Checked	WT	Checked	WT
Drawn	GMG	Drawn	GMG
Scale	1:5000 @ A4	Scale	1:5000 @ A4
Project Code	5195886	Project Code	5195886
Client	Iarnród Éireann Irish Rail	Client	Iarnród Éireann Irish Rail
Date	20/10/2022	Date	20/10/2022
Project Code	5195886	Project Code	5195886

Rev	Date	Description	Drn	Chk'd	App'd
V03	20/10/2022	NR	HF	MN	MN
V02	08/09/2022	NR	HF	MN	MN
V01	01/08/2022	NR	HF	MN	MN



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# Legend

- Aquatic Survey Locations
- Redline Development Boundary
- > Rivers

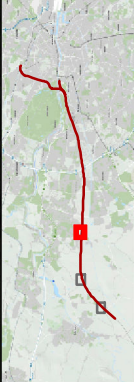


Project Title: DART + SOUTH WEST  
 Drawing Title: **Figure 8.4: Survey Locations**  
**Map 3 of 3**  
 Drawing File Name: DP-0.4.23-DWG-EV-TTA-23765  
 Version: v03  
 Status: S3

Engineering Designer: **ATKINS**  
 Approved: **MN**  
 Supported by: **TPRSA**  
 Checked: **HT**  
 Drawn: **MB**  
 Scale: 1:5000  
 Date: 20/10/2022  
 Project Code: 6195886  
 Client: **Jamrod Éireann Irish Rail**  
 TTA

Rev	Date	Drn	Chk'd	App'd	Description
V03	20/10/2022	NR	HF	MN	Aquatic Survey Locations
V02	08/09/2022	NR	HF	MN	Aquatic Survey Locations
V01	01/06/2022	NR	HF	MN	Aquatic Survey Locations

**DART+ South West**  
 2040  
 NTA  
 European Union



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## References

- Anderson, R. (1997) An annotated list of the land and freshwater Mollusca of Northern Ireland. Environment and Heritage Service Research & Development Series. Available at: <http://www.habitas.org.uk/priority/species.asp?item=6680> Accessed 20/01/2022
- Anderson, R., (2016) *Musculium lacustre* (O. F. Müller 1774). [In] MolluscIreland. Available at: <http://www.habitas.org.uk/molluscireland/species.asp?ID=119> Accessed 20/01/2022
- Atherton, A., Bosanquet, S., & Lawley, M. (Eds.) (2010) Mosses and Liverworts of Britain and Ireland. British Bryological Society, Cardiff.
- Bjorn, T.C., & Reiser, D.W. (1991) Habitat requirements of salmonids in streams. In: Meehan WR (Ed). Influences of forest management on salmonid fishes & their habitats. American Fisheries Society, Bethesda.
- Cocchiglia, L., Curran, S., Hannigan, E., Purcell, P. J., & Kelly-Quinn, M. (2012) Evaluation of the effects of fine sediment inputs from stream culverts on brown trout egg survival through field and laboratory assessments. *Inland Waters*, 2(1), 47-58.
- Collins, J. (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines. 3rd edition. Bat Conservation Trust, London.
- Cook J, McCarthy A, Holloway S and Oliver G. (2008) Survey Guidance for Assessing Bat Activity at Proposed On-shore Wind Farms. *In Practice* 62, 24-27.
- Fossitt, J.A. (2000) A Guide to Habitats in Ireland. Heritage Council, Kilkenny.
- Foster, K. R., and Repacholi, M. H. (2000). Environmental impacts of electromagnetic fields from major electrical technologies. Geneva: WHO.
- Gilbert, G., Stanbury, A., Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020 –2026. *Irish Birds*, 43, 1–22.
- Harris, S., Cresswell, P., & Jefferies, D. (1989) Surveying Badgers. Mammal Society, London.
- Hayes, J. P. (1997) Temporal variation in activity of bats and the design of echolocation- monitoring studies. *Journal of Mammalogy* 78: 514–524.
- 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.
- Kelly-Quinn, M., Bradley, C., Dodkins, I., Harrington, T.J., Ní Chathain, B., O'Connor, M., Rippey, B. & Trigg, D. (2005) Water Framework Directive Characterisation of Reference Conditions and Testing of

Typology of Rivers (2002-W-LS-7). Final Report for the Environmental Protection Agency, Ireland, 1-49.

Lockhart, N., Hodgetts, N., & Holyoak, D. (2012) Ireland Red List No.8: Bryophytes. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Lundy, M.G., Aughney, T., Montgomery, W.I., & Roche, N., (2011) Landscape conservation for Irish bats & species-specific roosting characteristics. Bat Conservation Ireland

Maitland, P.S. (2003) Ecology of the river, brook and sea lamprey: *Lampetra fluviatilis*, *Lampetra planeri* and *Petromyzon marinus*. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

NPWS (2012) Conservation Objectives: Baldoyle Bay SAC 000199. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013a) Conservation Objectives: South Dublin Bay SAC 000210. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013b) Conservation Objectives: North Dublin Bay SAC 000206. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013c) Conservation Objectives: Baldoyle Bay SPA 004016. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013d) Conservation Objectives: Malahide Estuary SAC 000205. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013e) Conservation Objectives: Malahide Estuary SPA 004025. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013f) Conservation Objectives: Rockabill to Dalkey Island SAC 003000. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2015a) Conservation Objectives: South Dublin Bay and River Tolka Estuary SPA 004024. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2015b) Conservation Objectives: North Bull Island SPA 004006. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2015c) Conservation Objectives: Mouds Bog SAC 002331. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2016) Conservation Objectives: Howth Head SAC 000202. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

NPWS (2017a) Conservation Objectives: Wicklow Mountains SAC 002122. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

NPWS (2017b) Conservation Objectives: Ireland's Eye SAC 002193. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

NPWS (2019b) Conservation Objectives: Red Bog, Kildare SAC 000397. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

NPWS (2021a) Conservation Objectives: Rye Water Valley/Carton SAC 001398. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

NPWS (2021b) Conservation Objectives: Glenasmole Valley SAC 001209. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

NPWS (2021c) Conservation objectives for Wicklow Mountains SPA [004040]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NPWS (2021d) Conservation objectives for Ireland's Eye SPA [004117]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NPWS (2021e) Conservation objectives for Howth Head Coast SPA [004113]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NPWS (2021f) Conservation objectives for Poulaphouca Reservoir SPA [004063]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NPWS (2021g) Conservation objectives for Dalkey Islands SPA [004172]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NRA (2005) Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes. National Roads Authority.

NRA (2006) Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes. National Roads Authority.

NRA (2008) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. National Roads Authority.

NRA (2009) Guidelines for Assessment of Ecological Impacts of National Roads Schemes. National Roads Authority.

Parnell, J., & Curtis, T. (2012) Webb's An Irish Flora, eight edition. Cork University Press: Ireland.

Peay, S. (2002) Guidance on Habitat for White-clawed Crayfish and its Restoration. English Nature and the Environment Agency.

Peay, S. (2003) Monitoring the white-clawed crayfish *Austropotamobius pallipes*. Conserving Natura 2000 Rivers Monitoring Series No. 1, English Nature, Peterborough.

Reid, N., Montgomery, I., Marnell, F., and Jeffrey, R. (2007) Status of Hares in Ireland. Irish Wildlife Manuals, Report 30.

Russ, J. (2021) Bat Calls of Britain and Europe: A Guide to Species Identification. Pelagic Publishing: UK.

Ryan, A., Reynolds K, O'Suilleabhain L. and Kennedy B. (2015) Guidance on Application and the Use of the SSRS in Enforcement of Urban Waste Water Discharge Authorisations in Ireland. Environmental Protection Agency, Office of Environmental Assessment, Castlebar, Co. Mayo

Scottish Badgers (2018) Surveying for Badgers: Good Practice Guidelines. Version 1.

Smith, G.F., O'Donoghue, P., O'Hora, K., & Delaney, E. (2011) Best Practice Guidance for Habitat Survey and Mapping. Heritage Council, Kilkenny.

Stace, C.A. (2019) New Flora of the British Isles. Fourth Edition.

Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M., & Wright, M. (2016) Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.