
Appendix 8.1

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*’¹. 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;

¹ 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. Bats

Preliminary Ground Level Roost Assessment

A preliminary ground-level roost assessment was carried out during daylight hours, using close focusing binoculars, to identify features with suitability for roosting bats in trees and structures. The focus area for the preliminary ground level roost assessment was the buildings/bridges and trees that were subject to proposed alteration/removal. The assessments were carried out in August and November 2020, and April and May 2022.

Trees were assessed for the presence of features with suitability for roosting bats including cavities, frost cracks, trunk and branch splits, rot holes, and hollow sections of trunk and branches. Structures

were assessed internally and externally for the presence of suitable features e.g. hanging tiles, eave gaps, soffit and fascia gaps, missing block/brickwork, junctions of beams, etc.).

Both trees and structures were assessed for evidence of use by bats, e.g. staining and splashed, bat specimens, and droppings, in the vicinity of suitable structures and trees.

The results of this assessment were used to grade trees and as having Negligible, Low, Moderate, or High suitability for roosting bats with cognisance of the Bat Conservation Trust's (BCT) Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016).

Commuting and Foraging Habitats

A site walkover was undertaken to assess the potential suitability of the proposed development site for bats, based on the presence of habitat features including old/derelict buildings within the landscape. This assessment had cognisance of the BCT guidelines (Collins, 2016), which categorises the suitability of commuting and foraging habitats into negligible, low, moderate, and high, based on a combination of habitat features, connectivity, and professional judgement. The assessments were carried as the same time as the habitat assessment.

Bat activity

Bat activity surveys were conducted within four locations throughout the proposed corridor. Four 'static' (i.e., passive/stationary/automated) full-spectrum bat detectors (Anabat Swift) were deployed to capture bat activity at four different locations, where bat activity was expected based on an initial habitat suitability assessment. The static detectors were deployed continuously from May 2021 - September 2021, in all weather conditions. The detectors were checked, data retrieved, and batteries replaced on a fortnightly basis.

The four locations (see Figure 1.1) where the static detectors were deployed were:

- Location 1: Tubber Lane (ITM 699684, 732451);
- Location 2: Clondalkin (ITM 705463, 732695);
- Location 3: South Circular Road (ITM 712424, 733875); and
- Location 4: Cabra (ITM 713605, 735888).

Emergence/re-entry

Bat emergence and re-entry surveys were carried out in June, July, September, and October 2021, and May and June 2022 using full-spectrum digital-recording bat detectors (Elekon Batlogger M2). The timing and survey effort for the emergence and re-entry surveys were completed with cognisance of the relevant guidance (Collins, 2016; Marnell *et al.*, 2022). Emergence (dusk) surveys start 15mins before sunset and finish 1.5-2hrs after sunset. Re-entry (dawn) surveys start 1.5-2hrs before sunrise and finish 15mins after sunrise.

The emergence/re-entry surveys were completed on the suitable features identified during the external structure assessment (i.e., suitable entry/exit points for bats), at three specific locations (Table 1-1 and Figure 1.1).

Table 1-1: Emergence/re-entry Survey Effort

Survey Location	Emergence (Dusk)	Re-entry (Dawn)
Phoenix Park Tunnel (north and south of tunnel)	03/06/21; 21/09/21; 05/10/21	16/07/21
Inchicore Works (turret and old signal tower)	17/06/21; 22/09/21	20/07/21
Royal Canal Bridge (north and south of tunnel)	22/06/21; 23/09/21	28/07/21
Abandoned residential building at Hazelhatch	05/05/22; 19/05/2022	02/06/2022

Incidental Bat Activity

Incidental bat activity was recorded during emergence/re-entry surveys. Observations of bats included number of bats, flight direction, and behaviour (e.g., commuting or foraging), were recorded. This activity was not associated with the features with suitability for roosting bats being assessed, were recorded.

Hibernation Assessment

An internal inspection of structures was carried out using a systematic approach to identify potential or actual bat access points and roosting places that may support hibernating bats. The focus areas for the assessment included structures that were subject to proposed alteration/removal.

The preliminary ground level roost assessment categorised the structures with potential to support bat roost features as ranging from moderate to high suitability.

The bat hibernation survey was completed using static full-spectrum bat detectors (Anabat Swift). The focus area was Phoenix Park Tunnel. Three bat detectors were deployed for a period of eight weeks between the 14th of February and the 11th of April 2022, with maintenance visits completed every two weeks. Bat detectors were placed at equal intervals within Phoenix Park Tunnel (see Table 1-2).

Table 1-2: Hibernation Survey Locations and Duration of Survey

Survey Location	Location Name	Duration of Survey
Phoenix Park Tunnel- 180m	South	14.02.2022 – 11.04.2022
Phoenix Park Tunnel- 360m	Middle	
Phoenix Park Tunnel- 575m	North	

Bat Data Analysis

Call identification

Recordings from the bat activity surveys were analysed with specialised software (Kaleidoscope Pro, Version 5.4.2) software by an experienced ecologist to confirm the bat species present.

Kaleidoscope Pro software compares the echolocation pulses to an integrated library of bat calls, and automatically identifies to species. Following the batch analysis of all calls, 10% of all *Pipistrellus* spp. calls and noise files were manually checked. All calls of *Myotis* spp., *Nyctalus* spp. and calls with no

auto-identification or with multiple bats within the same call were checked manually to confirm identification.

During manual analysis, calls were assigned to species according to their key parameters and where applicable, their peak frequency, as shown in Table 1-3 (Russ, 2021).

Table 1-3: Bat Species and their Call Frequency Parameters

Common Name	Scientific Name	Call Frequency
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	FM/qCF calls above 52 kHz
<i>Pipistrellus</i> spp.	-	FM/qCF calls between 40 and 42 kHz; and, 48 and 52 kHz
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	FM/qCF calls between 40 kHz and 48 kHz
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>	FM/qCF calls below 40 kHz
Natterer's bat	<i>Myotis nattereri</i>	FM call with wide range between 23 and 107 kHz
Daubenton's bat	<i>Myotis daubentonii</i>	FM call with wide range between 30 and 81 kHz
<i>Myotis</i> spp.	-	FM calls greater than 30 kHz
Brown Long-eared bat	<i>Plecotus auritus</i>	FM calls greater than 30 kHz with two harmonics
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	FM/CF calls at 111 kHz
Leisler's bat	<i>Nyctalus leisleri</i>	qCF calls between 23 and 28 kHz
FM – Frequency modulated call; CF – constant frequency call; qCF – quasi-constant frequency call. Bats combine variation within their echolocation pulses to create different call 'shapes'. These call shapes can be described in terms of the degree of FM, CF and qCF components they contain.		

Not all calls could be positively assigned to a species. Call frequencies and shapes can be shared by bat species within the same genus and can change according to the habitat they are flying such as open areas with no trees or structures such as moorlands, cluttered environments which contain trees, areas of scrub, or linear features such as burns and conifer plantation/woodland edge. Bats adapt their call patterns within their habitats to enable prey detection and navigation and as such, the recordings may differ in parameters. Bats were classified as *Myotis* spp. if differences in call shape and frequency between Daubenton's bats and Natterer's bats (most likely *Myotis* spp. bat to be found in the area) could not be discerned.

Bat Activity Indices

Static detectors record bats as they pass but there is no observer to record whether one bat passes a hundred times, or a hundred bats pass in succession, or the direction of flight. Therefore, to standardise the data and enable some comparison of deployment nights, the accepted approach is to use bat 'passes' as a unit of activity.

Numbers of bat 'passes' recorded are used as the standard measure to create a relative index of bat activity. A bat 'pass' was defined as a series of ≥ 2 consecutive echolocation calls having <1 second separating each call, and up to 10 seconds long (Hayes, 1997; Cook *et al.*, 2008).

For automated detector data, the index of bat activity used was the number of files recorded each night which contained bat calls, taken as the number of bat passes per night (bppn). As one file has been taken to equating to one bat pass, an average nightly activity index was calculated for each detector deployment. The Bat Activity Index (BAI) also removes any bias created by the variation in the duration of the static detector deployment periods.

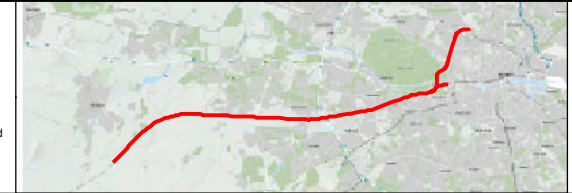
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- Redline Development Boundary
- Bat Static Locations
- Hibernation Survey



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Rev	Date	Drn	Chk'd	App'd	Description
v03	10/11/2022	NR	HF	MN	Bat survey locations and features suitable for roosting bats
v02	08/09/2022	NR	HF	MN	Bat survey locations and features suitable for roosting bats
v01	25/03/2022	NR	HF	MN	Bat survey locations and features suitable for roosting bats

Client: **Iarnród Éireann Irish Rail**

Engineering Designer: **ATKINS**

Supported by: **rps**

Date: 10/11/2022 Scale: 1:48,000 @ A3

Project Code: 5195886 Issuer: TTA

Drawn: NR Checked: HF Approved: MN

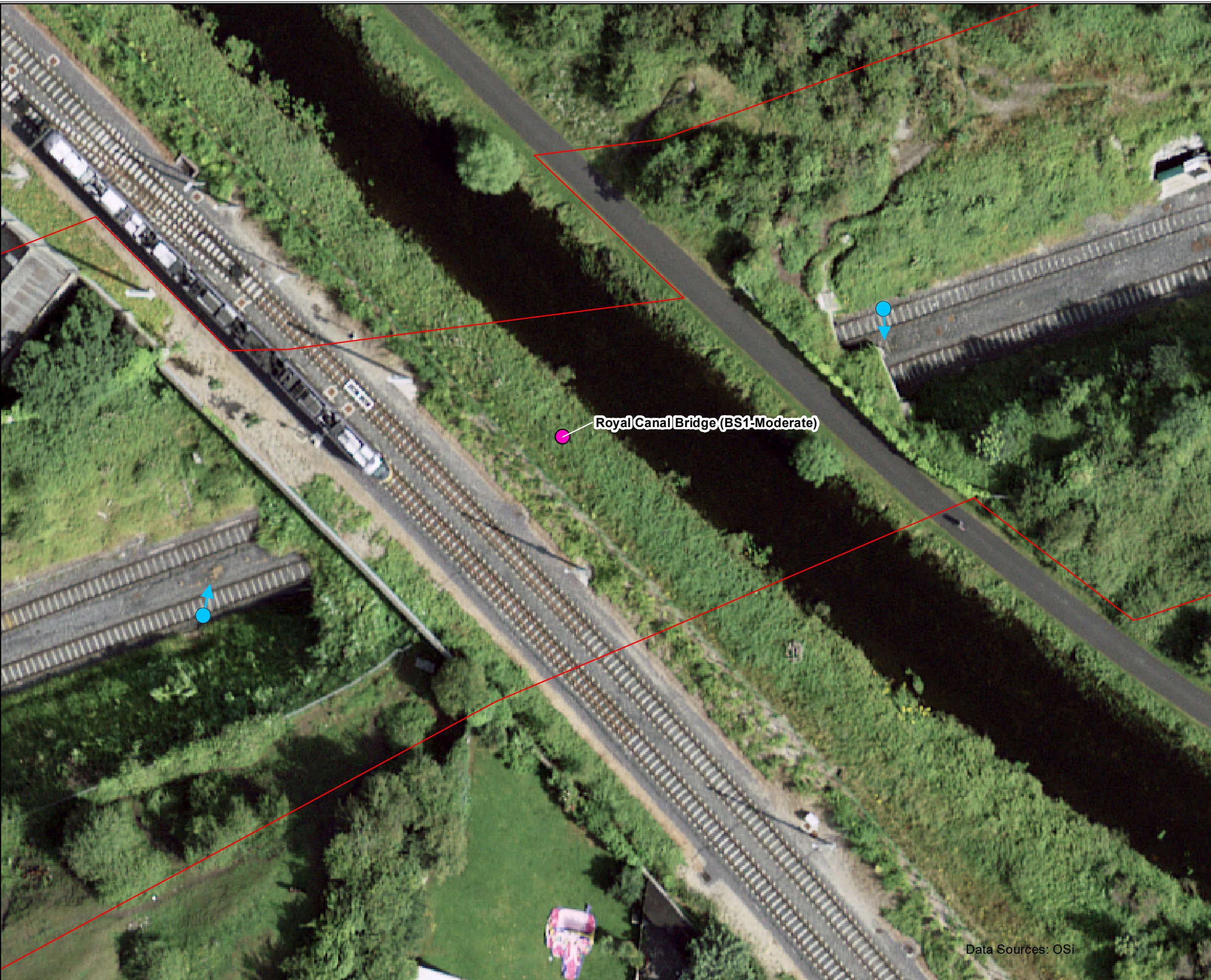
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Drawing Title	Figure 1.1: Bat survey locations and features suitable for roosting bats- Map 1 of 7		
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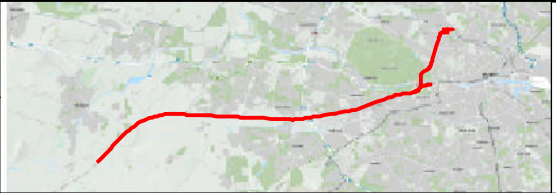
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- Surveyor Locations
- Surveyor Sightline
- Structure Locations



Data Sources: OSi

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v01	25/03/2022	NR	HF	MN	Bat survey locations and features suitable for roosting bats

Client Iarnród Éireann Irish Rail		Engineering Designer TYPESA ATKINS TUC RAIL		
Date 10/11/2022		Supported by: rps		
Scale 1:350 @ A3	Drawn NR	Checked HF	Approved MN	
Project Code 5195886	Issuer TTA	QMS Code		

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Drawing Title	Figure 1.1: Bat survey locations and features suitable for roosting bats- Map 2 of 7		
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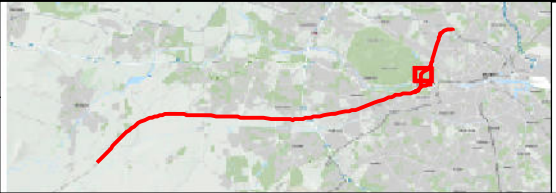
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- Redline Development Boundary
- ⬡ Bat Static Locations
- Surveyor Locations
- ➔ Surveyor Sightline
- Structure Locations



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v03	10/11/2022	NR	HF	MN	Bat survey locations and features suitable for roosting bats
v02	08/09/2022	NR	HF	MN	Bat survey locations and features suitable for roosting bats
v01	25/03/2022	NR	HF	MN	Bat survey locations and features suitable for roosting bats

Client: **Iarnród Éireann Irish Rail**

Engineering Designer: **ATKINS** (with TVPSA and RPS logos)

Date: 10/11/2022 | Scale: 1:2,300 @ A3

Project Code: 5195886 | Issuer: TTA

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OMS Code: _____

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- Structure Locations

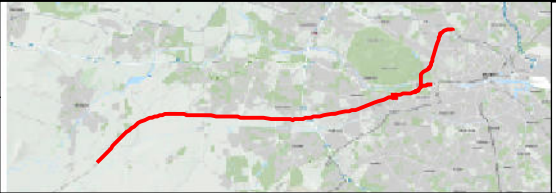
Dan Ryan's rental (truck wash facility) (BS9 - Negligible)

Data Sources: QSi



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v01	25/03/2022	NR	HF	MN	Bat survey locations and features suitable for roosting bats

Client: **Iarnród Éireann Irish Rail**

Date: 10/11/2022 Scale: 1:350 @ A3

Project Code: 5195886 Issuer: TTA

Engineering Designer: **ATKINS**

Supported by: **TYPESA** and **RPS**

Drawn: NR Checked: HF Approved: MN

OMS Code

Project Title	DART + SOUTH WEST		
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Status	S3		

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Legend

- Redline Development Boundary
- Surveyor Locations
- Surveyor Sightline
- Structure Locations

Inchicore old signal tower (BS3-Moderate)

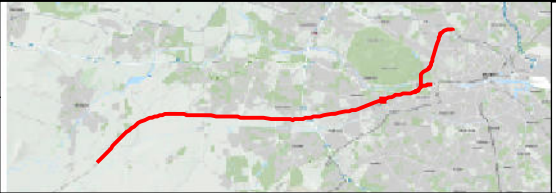
Inchicore turret (BS4-Moderate)

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v01	25/03/2022	NR	HF	MN	Bat survey locations and features suitable for roosting bats

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Project Code: 5195886 Issuer: TTA

Engineering Designer: **ATKINS**

Supported by: **rps**

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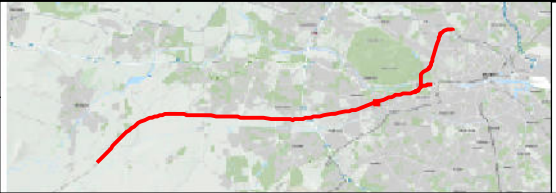
- Redline Development Boundary
- Structure Locations



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v01	25/03/2022	NR	HF	MN	Bat survey locations and features suitable for roosting bats

Client

Date: 10/11/2022
Project Code: 5195886

Engineering Designer

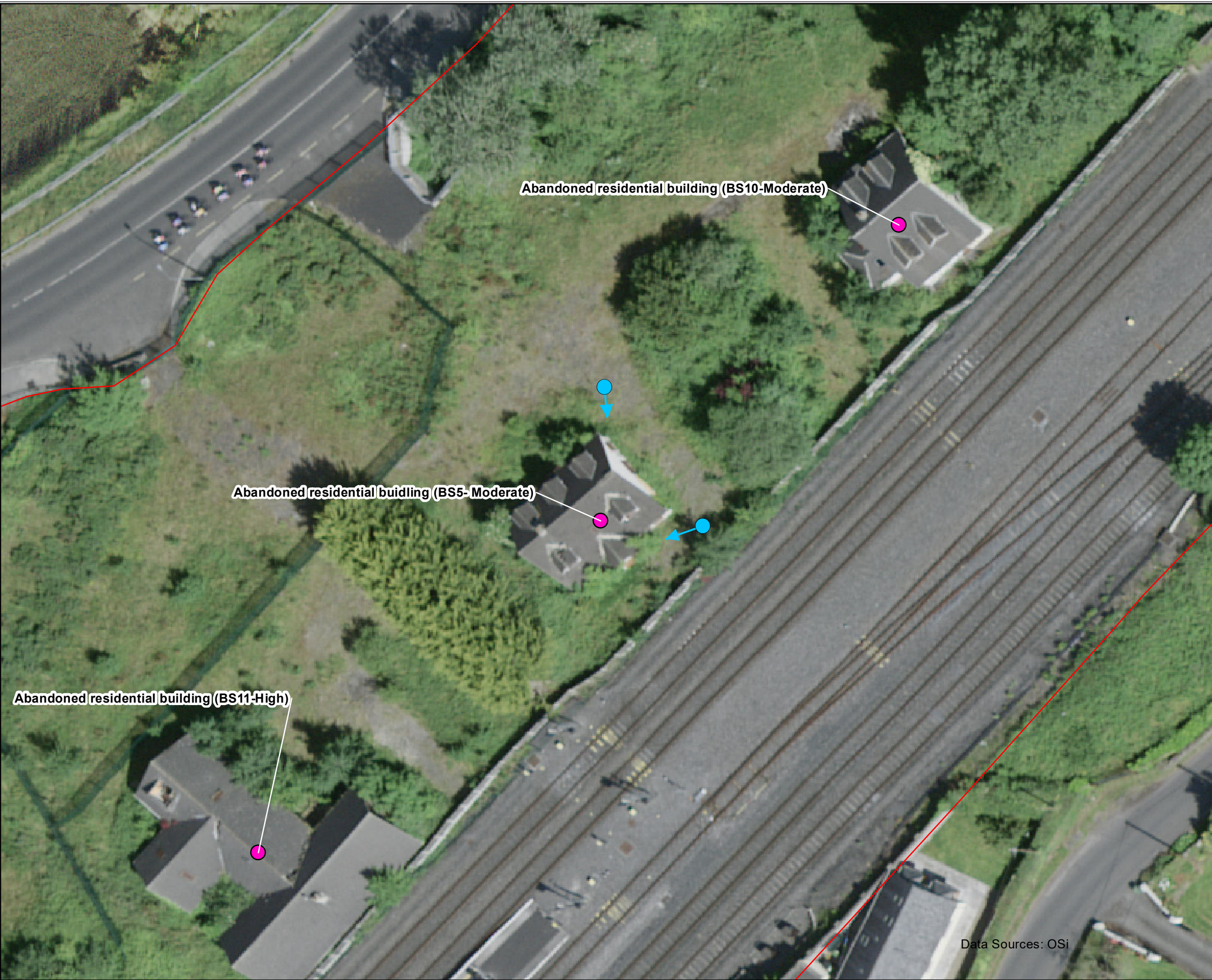
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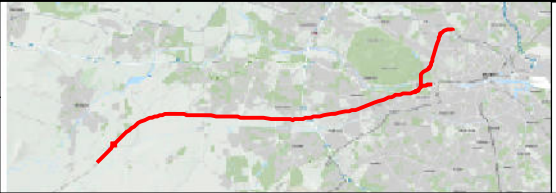
- Redline Development Boundary
- Surveyor Locations
- Surveyor Sightline
- Structure Locations



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v01	25/03/2022	NR	HF	MN	Bat survey locations and features suitable for roosting bats

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1.1.2.2. Badger

The European badger (*Meles meles*) survey methodology focussed on signs of badger activity, including the presence of setts, foraging evidence, access runs, tracks, prints, and scatt, with cognisance of relevant guidance (Scottish Badgers, 2018; Harris *et al.*, 1989; NRA, 2008; NRA, 2005). Where setts were discovered, usage of potential sett entrances and likely direction of tunnelling was also recorded. The footprint of the proposed Project was assessed and distances of up to 150m from the footprint were surveyed, where access was possible.

The site was systematically searched for evidence of badger on several occasions in: August and November 2020; April, May, June, August, and September 2021; and April and May 2022.

1.1.2.3. Otter

Watercourses, drainage ditches and wetland habitats within the proposed Project footprint were assessed for otter (*Lutra lutra*). The survey methodology had regard for guidance from the NRA (2006) and included searches for breeding or resting sites within riparian habitats up to 150m of the footprint of the proposed Project, where access was possible. Evidence of otter including spraints, footprints, or feeding remains were recorded.

Watercourses, drainage ditches and wetland habitats were systematically searched for evidence of badger in August 2021. The Royal Canal, within the Zol of the proposed works on the Royal Canal bridge (OBO8) were completed in April 2022.

1.1.2.4. Breeding Birds

Breeding birds were assessed using timed Vantage Point (VP) surveys at location identified during the initial site assessment. The VP surveys were completed from publicly accessible bridges over the railway (both pedestrian and mixed use) and required the surveyor to record all bird species encountered within the survey area and immediate environs, including those in flight over the site. A breeding categorisation and activity was assigned to each species encountered (Table 1-4). Where a species was encountered within suitable nesting habitat but was known with a high degree of certainty not to have bred within the survey area, the species was categorised as a non-breeder.

The survey was completed for a 15-minute period on one side of the bridge (i.e. looking up track) before switching to the other side of the bridge (i.e. looking down track) to complete another 15-minute assessment. Surveys were completed during favourable conditions between 05:30 and 11:00 in March, April, and May 2021. VP surveys were completed at the following locations:

- VP1: Le Fanu Road rail bridge (OBC7)²;
- VP2: Memorial Road (R839) rail bridge (OBC3);
- VP3: Aughrim St (R806) rail bridge (OBO4);
- VP4: Glasnevin cemetery carpark rail bridge (OBO10);
- VP5: Fassauga Ave Bridge (OBO7); and

² VP1 Le Fanu Road was surveyed only in March 2021 and then discontinued as it had severely restricted views.

- VP6: Inchicore Works footbridge (OBC5)³.

Table 1-4: Breeding Category and Activity

Breeding Categories	Activity ⁴
Non-breeder (N)	Flying over (F) Migrant (M) Summering non-breeder (U)
Possible breeder (Po)	Observed in suitable nesting habitat (H) Singing male (S)
Probable breeder (Pr)	Pair in suitable nesting habitat (P) Permanent territory (T) Courtship and display (D) Visiting probable nest site (N) Agitated behaviour (A) Brood patch of incubating bird (I) Nest building or excavating nest-hole (B)
Confirmed breeder (Br)	Distraction-display or injury feigning (DD) Used nest or eggshells found from current season (UN) Recently fledged young or downy young (FL) Adults entering or leaving nest-site indicating occupied nest (ON) Adult carrying faecal sac or food for young (FF) Nest containing eggs (NE) Nest with young seen or heard (NY)

1.1.2.5. 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 9th 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

³ VP6 Inchicore Works footbridge was surveyed in April and May 2021 only.

⁴ Only the highest level of breeding evidence was recorded for each species during each survey. The breeding evidence increases from the top to the bottom of the list of activities.

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 1-5).

Table 1-5: 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 1-6.

Table 1-6: 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

1.1.2.6. Fish

On the 9th 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 ≥ 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 ≤ 25 mg/l (annual average).

1.1.2.7. Other Protected and Notable Species

During biodiversity surveys of the site of the proposed Project, the potential was also noted for habitats of other protected terrestrial mammal species to occur including European hedgehog (*Erinaceus europaeus*), Irish stoat (*Mustela erminea hibernica*), pygmy shrew (*Sorex minutus*), red squirrel (*Sciurus vulgaris*), Irish hare (*Lepus timidus hibernicus*), and common lizard (*Zootoca vivipara*).

1.1.2.8. 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. Desk Study

1.2.1.1. Designated Sites

Designated sites for nature conservation within the biodiversity study area are detailed in Table 1-7.

Table 1-7: Relevant designated sites for nature conservation and their interest features

Designated Site (code), and Conservation Objectives Version	Closest Distance (km) to Proposed Project	Relevant Qualifying Interest/Special Conservation Interest (*Priority SAC Habitat) or Ecological Features of Interest
International Sites (SAC, cSAC, SPA, pSPA, RAMSAR, Bioserve)		
Rye Water Valley/Carton SAC [001398] , COs - Specific Version 1.0 [22/12/21] (NPWS, 2021a)	2.9km north west	<ul style="list-style-type: none"> Narrow-mouthed whorl snail <i>Vertigo angustior</i> [1014] Desmoulin's whorl snail <i>Vertigo moulinsiana</i> [1016] Petrifying springs with tufa formation (Cratoneurion)* [7220]
Dublin Bay Biosphere Reserve	3.2km east	<ul style="list-style-type: none"> The biosphere reserve is significant from a conservation perspective since it supports well-developed salt marshes and dune systems displaying all stages of development from the earliest phase of colonization to stable and full maturity. The area is also important for nesting and wintering waterfowls. It qualifies for international importance as the numbers of three species exceed the international threshold –light-bellied Brent goose <i>Branta bernicla hrota</i>, black-tailed godwit <i>Limosa limosa</i> and bar-tailed godwit <i>Limosa lapponica</i>.
South Dublin Bay SAC [IE 000210] , COs - Specific Version 1.0 [22/08/13]. (NPWS, 2013a)	5.6km north east	<ul style="list-style-type: none"> Mudflats and sandflats not covered by seawater at low tide [1140]
South Dublin Bay and River Tolka Estuary SPA [004024] , COs - Specific Version 1.0 [09/03/15] (NPWS, 2015a)	5.6km east	<ul style="list-style-type: none"> Light-bellied Brent goose <i>Branta bernicla hrota</i> [A046] Oystercatcher <i>Haematopus ostralegus</i> [A130] Ringed plover <i>Charadrius hiaticula</i> [A137] Grey plover <i>Pluvialis squatarola</i> [A141] Knot <i>Calidris canutus</i> [A143] Sanderling <i>Calidris alba</i> [A144] Dunlin <i>Calidris alpina</i> [A149] Bar-tailed godwit <i>Limosa lapponica</i> [A157] Redshank <i>Tringa tetanus</i> [A162] Black-headed gull <i>Chroicocephalus ridibundus</i> [A179] Roseate tern <i>Sterna dougallii</i> [A192] Common tern <i>Sterna hirundo</i> [A193] Arctic tern <i>Sterna paradisaea</i> [A194] Wetlands [A999]
North Dublin Bay SAC [IE000206] , COs - Specific Version 1.0 [06/11/13]. (NPWS, 2013b)	6.3km east	<ul style="list-style-type: none"> Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] <i>Salicornia</i> and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Petalwort <i>Petalophyllum ralfsii</i> [1395] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes)* [2130] Humid dune slacks [2190]

Designated Site (code), and Conservation Objectives Version	Closest Distance (km) to Proposed Project	Relevant Qualifying Interest/Special Conservation Interest (*Priority SAC Habitat) or Ecological Features of Interest
Sandymount Strand/Tolka Estuary [Ramsar site 832]	6.5km south east	<ul style="list-style-type: none"> An intertidal system supporting a large bed of eelgrass <i>Zostera noltii</i> with extensive areas of sandflats. The site is important for various species of waterbirds, supporting internationally important numbers of Brent geese and large numbers of roosting gulls and terns. Various species of annelids, bivalves and small gastropods occur. Bait-digging is a regular activity on the sandy flats.
North Bull Island SPA [004006], COs - Specific Version 1.0 [09/03/15] (NPWS, 2015b)	7km east	<ul style="list-style-type: none"> Light-bellied Brent goose <i>Branta bernicla hrota</i> [A046] Shelduck <i>Tadorna tadorna</i> [A048] Teal <i>Anas crecca</i> [A052] Pintail <i>Anas acuta</i> [A054] Shoveler <i>Anas clypeata</i> [A056] Oystercatcher <i>Haematopus ostralegus</i> [A130] Golden plover <i>Pluvialis apricaria</i> [A140] Grey plover <i>Pluvialis squatarola</i> [A141] Knot <i>Calidris canutus</i> [A143] Sanderling <i>Calidris alba</i> [A144] Dunlin <i>Calidris alpina</i> [A149] Black-tailed godwit <i>Limosa limosa</i> [A156] Bar-tailed godwit <i>Limosa lapponica</i> [A157] Curlew <i>Numenius arquata</i> [A160] Redshank <i>Tringa tetanus</i> [A162] Turnstone <i>Arenaria interpres</i> [A169] Black-headed gull <i>Chroicocephalus ridibundus</i> [A179] Wetlands [A999]
North Bull Island [Ramsar site 406]	7km east	<ul style="list-style-type: none"> A small island built up over 200 years against a harbour wall and the adjoining foreshore of sandy beaches, saltmarshes and mudflats. The site is unique in Ireland because it supports well-developed saltmarsh and dune systems displaying all stages of development from the earliest phase of colonization to full maturity. The site supports five protected or threatened plant species and nationally important populations of three insect species. The area is important for nesting <i>Sterna albifrons</i> (80 pairs, or about 30% of the Irish population) and for numerous species of wintering waterbirds. Human activities include bait digging.
Glenasmole Valley SAC [001209], COs - Specific Version 1.0 [10/12/21] (NPWS, 2021b)	8.4km south	<ul style="list-style-type: none"> Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco Brometalia</i>) (* important orchid sites)* [6210] <i>Molinia</i> meadows on calcareous, peaty, or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [6410] Petrifying springs with tufa formation (<i>Cratoneurion</i>)* [7220]
Baldoyle Bay SAC [000199], COs - Specific Version 1.0 [19/11/12]. (NPWS, 2012)	10km north east	<ul style="list-style-type: none"> Mudflats and sandflats not covered by seawater at low tide [1140] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]
Baldoyle Bay SPA [004016], COs - Specific Version 1.0 [27/02/13] (NPWS, 2013c)	10.9km north east	<ul style="list-style-type: none"> Brent goose <i>Branta bernicla hrota</i> [A046] Shelduck <i>Tadorna tadorna</i> [A048] Ringed plover <i>Charadrius hiaticula</i> [A137] Golden plover <i>Pluvialis apricaria</i> [A140] Grey plover <i>Pluvialis squatarola</i> [A141] Bar-tailed godwit <i>Limosa lapponica</i> [A157] Wetlands [A999]

Designated Site (code), and Conservation Objectives Version	Closest Distance (km) to Proposed Project	Relevant Qualifying Interest/Special Conservation Interest (*Priority SAC Habitat) or Ecological Features of Interest
Baldoyle Bay [Ramsar site 413]	10.9km north east	<ul style="list-style-type: none"> A tidal embayment separated from the sea by a major sand dune system. Vast mudflats are exposed at low tide and there are extensive beds of <i>Spartina</i>. The site is internationally important for the wintering goose <i>Branta bernicla hrota</i>, and nationally important numbers of various species of waterbirds use the site. Human activities include bait digging, shooting, and low levels of recreational boating and fishing.
Wicklow Mountains SAC [002122], COs - Specific Version 1.0 [31/07/17]. (NPWS, 2017a)	11.7km southeast	<ul style="list-style-type: none"> Otter <i>Lutra lutra</i> [1355] Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [3110] Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletalia uniflorae</i> and/or <i>Isoeto-Nanojuncetalia</i> [3130] Natural dystrophic lakes and ponds [3160] Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Calaminarian grasslands of the <i>Violetalia calaminariae</i> [6130] Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* [6230] Blanket bogs (* if active bog) [7130] Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110] Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220] Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]
Wicklow Mountains SPA [004040], COs - Generic Version 8.0 [23/03/21] (NPWS, 2021c)	11.7km south east	<ul style="list-style-type: none"> Merlin <i>Falco columbarius</i> [A098] Peregrine <i>Falco peregrinus</i> [A103]
Malahide Estuary SAC [000205], COs - Specific Version 1.0 [27/05/13]. (NPWS, 2013d)	12km north east	<ul style="list-style-type: none"> Mudflats and sandflats not covered by seawater at low tide [1140] <i>Salicornia</i> and other annuals colonising mud and sand [1310] <i>Spartina</i> swards (<i>Spartinion maritimae</i>) [1320] Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes)* [2130]
Malahide Estuary SPA [004025], COs - Specific Version 1.0 [16/08/13] (NPWS, 2013e)	12km north east	<ul style="list-style-type: none"> Great crested grebe <i>Podiceps cristatus</i> [A005] Brent goose <i>Branta bernicla hrota</i> [A046] Shelduck <i>Tadorna tadorna</i> [A048] Pintail <i>Anas acuta</i> [A054] Goldeneye <i>Bucephala clangula</i> [A067] Red-breasted merganser <i>Mergus serrator</i> [A069] Oystercatcher <i>Haematopus ostralegus</i> [A130] Golden plover <i>Pluvialis apricaria</i> [A140] Grey plover <i>Pluvialis squatarola</i> [A141] Knot <i>Calidris canutus</i> [A143] Dunlin <i>Calidris alpina</i> [A149]

Designated Site (code), and Conservation Objectives Version	Closest Distance (km) to Proposed Project	Relevant Qualifying Interest/Special Conservation Interest (*Priority SAC Habitat) or Ecological Features of Interest
		<ul style="list-style-type: none"> Black-tailed godwit <i>Limosa limosa</i> [A156] Bar-tailed godwit <i>Limosa lapponica</i> [A157] Redshank <i>Tringa tetanus</i> [A162] Wetlands [A999]
Broadmeadow Estuary [Ramsar site 833]	12km north east	<ul style="list-style-type: none"> An estuary cut off from the sea by a large sand spit. The site includes well-developed saltmarshes, salt meadows, rocky shores, a well-developed outer dune ridge and sand mudflats exposed at low tide. Vegetation consists of a large bed of eelgrass (<i>Zostera noltii</i> and <i>Z. angustifolium</i>) and extensive mats of green algae (<i>Enteromorpha</i> spp., <i>Ulva lactuca</i>). The estuary is an important wintering site for numerous species of waterbirds. The Brent goose population is of international importance. The high numbers of diving birds reflects the lagoon-type nature of the inner estuary. Human activities include water sports. There is a marina and some housing.
Howth Head SAC [IE000202], COs - Specific Version 1.0 [06/12/16]. (NPWS, 2016)	12km east	<ul style="list-style-type: none"> Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] European dry heaths [4030]
Rockabill to Dalkey Island SAC [003000], COs - Specific Version 1.0 [07/05/13]. (NPWS, 2013f)	12.3km east	<ul style="list-style-type: none"> Reefs [1170] Harbour porpoise <i>Phocoena phocoena</i> [1351]
Red Bog, Kildare SAC [000397], COs - Specific Version 1.0 [17/07/19]. (NPWS, 2019b)	12.4km south west	<ul style="list-style-type: none"> Transition mires and quaking bogs [7140]
Ireland's Eye SPA [004117], COs - Generic Version 8.0 [23/03/21] (NPWS, 2021d)	14.2km east	<ul style="list-style-type: none"> Cormorant <i>Phalacrocorax carbo</i> [A017] Herring gull <i>Larus argentatus</i> [A184] Kittiwake <i>Rissa tridactyla</i> [A188] Guillemot <i>Uria aalge</i> [A199] Razorbill <i>Alca torda</i> [A200]
Ireland's Eye SAC [002193], COs - Specific Version 1.0 [27/01/17]. (NPWS, 2017b)	14.3km north east	<ul style="list-style-type: none"> Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]
Howth Head Coast SPA [004113], COs - Generic Version 8.0 [23/03/21] (NPWS, 2021e)	14.6km east	<ul style="list-style-type: none"> Kittiwake <i>Rissa tridactyla</i> [A188]
Poulaphouca Reservoir SPA [004063], COs - Generic Version 8.0 [23/03/21] (NPWS, 2021f)	14.6km south	<ul style="list-style-type: none"> Greylag goose <i>Anser anser</i> [A043] Lesser black-backed gull <i>Larus fuscus</i> [A183]

Designated Site (code), and Conservation Objectives Version	Closest Distance (km) to Proposed Project	Relevant Qualifying Interest/Special Conservation Interest (*Priority SAC Habitat) or Ecological Features of Interest
Dalkey Islands SPA [004172] , COs - Generic Version 7.0 [23/03/21] (NPWS, 2021g)	15km southeast	<ul style="list-style-type: none"> Roseate tern <i>Sterna dougallii</i> [A192] Common tern <i>Sterna hirundo</i> [A193] Arctic tern <i>Sterna paradisaea</i> [A194]
Mouds Bog SAC [002331] , COs - Specific Version 1.0 [20/11/15] (NPWS, 2015c)	19.9km south west	<ul style="list-style-type: none"> Active raised bogs Degraded raised bogs still capable of natural regeneration Depressions on peat substrates of the Rhynchosporion
National Sites (NHA, pNHA, National Park, Nature Reserves, Wildfowl Sanctuaries)		
Royal Canal pNHA [002103]	This site intersects the proposed Project at a railway underbridge.	<ul style="list-style-type: none"> This site comprises the central channel and the banks on either side of it. The main water supply is from Lough Owel via a feeder channel into the canal at Mullingar. A number of different habitats are found within the canal boundaries - hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The hedgerow is dominated by hawthorn <i>Crataegus monogyna</i>. Spindle <i>Euonymus europaeus</i> and guelder rose <i>Viburnum opulus</i> are present on the limestone soils of the midlands. The vegetation of the towpath is usually dominated by grass species. Otter spraints are found along the towpath, particularly where the canal passes over a river or stream. The rare and legally protected opposite-leaved pondweed <i>Groenlandia densa</i> is present at one site. A vulnerable species of stonewort, <i>Tolypella intricata</i>, is also present on the Royal Canal, the only site in Ireland where it is now found. The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than in the presence of rare species.
Grand Canal pNHA [002104]	0.5km south	<ul style="list-style-type: none"> This site comprises the canal channel and the banks on either side of it. The canal system is made up of a number of branches. A number of different habitats are found within the canal boundaries - hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The hedgerow is dominated by hawthorn <i>Crataegus monogyna</i>. Spindle <i>Euonymus europaeus</i> and guelder rose <i>Viburnum opulus</i> are present on the limestone soils of the midlands. The vegetation of the towpath is usually dominated by grass species. The aquatic flora of the canal is very diverse. The rare and legally protected opposite-leaved pondweed <i>Groenlandia densa</i> is present at a number of sites. Otter spraints are found along the towpath. Smooth newt <i>Lissotriton vulgaris</i> breeds in the ponds on the bank at Gollierstown in Co. Dublin. The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than in the presence of rare species.
Liffey Valley pNHA [000128]	2km north	<ul style="list-style-type: none"> The salmonid river meanders through low hills for much of its course through the Liffey Valley site and forms the focus for the site itself. The main terrestrial habitat included within the site is mixed deciduous woodland on fertile, limey alluvium and boulder clay, with dominant beech <i>Fagus sylvatica</i> in some areas.

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		<ul style="list-style-type: none"> Other habitat types include wet marsh, with species such as bulrush <i>Typha latifolia</i> and sweet-grass <i>Glyceria</i> spp., and rough grassland. The threatened green figwort <i>Scrophularia umbrosa</i> has been recorded at a number of points along the river. The rare and legally protected Hairy St. John's-wort <i>Hypericum hirsutum</i> and threatened yellow archangel <i>Lamiastrum galeobdolon</i> have also been recorded in the woodlands. This site is part of the Liffey Valley Special Amenity Areas Order 1990. The ecological value of this site lies in the diversity of habitats, ranging from aquatic to terrestrial.
Rye Valley/Carton pNHA [001398]	2.9km north west	<ul style="list-style-type: none"> Narrow-mouthed whorl snail <i>Vertigo angustior</i> [1014] Desmoulin's whorl snail <i>Vertigo moulinsiana</i> [1016] Petrifying springs with tufa formation (Cratoneurion)* [7220]
North Dublin Bay pNHA [000206]	3.6km east	<ul style="list-style-type: none"> Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] <i>Salicornia</i> and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Petalwort <i>Petalophyllum ralfsii</i> [1395] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes)* [2130] Humid dune slacks [2190]
Santry Demesne pNHA [000178]	4km north east	<ul style="list-style-type: none"> The site comprises the remnants of a former demesne woodland. The remaining woods are of generally good quality and include beech <i>Fagus sylvatica</i>, ash <i>Fraxinus excelsior</i> and Scots pine <i>Pinus sylvatica</i>. The woodland also has a wide range of herbaceous species including ramsons <i>Allium ursinum</i>, early dog-violet <i>Viola reichenbachiana</i> and false brome <i>Brachypodium sylvaticum</i>. The legally protected Hairy St. John's-wort <i>Hypericum hirsutum</i> was recorded here in 1991, which has only been recorded from only five counties in eastern Ireland, concentrated in the River Liffey valley. The ecological importance of this site lies in the legally protected plant species and the fact that it occurs in an area where little of the original vegetation has survived.
Dodder Valley pNHA [000991]	5.4km south	<ul style="list-style-type: none"> The vegetation consists of woodland scrub mainly of willows <i>Salix</i> spp. The understorey contains a good variety of species, including early-purple orchid <i>Orchis mascula</i> and bugle <i>Ajuga reptans</i>. Diverse wild flower meadows occur along the banks. Forty-eight bird species have been recorded in the area, including little grebe, kingfisher, dipper and grey wagtail. Part of the river bank supports a sand martin colony of up to 100 pairs. The site represents the last remaining stretch of natural river bank vegetation on the River Dodder in the built-up Greater Dublin Area.
South Dublin Bay pNHA [000210]	5.6km south east	<ul style="list-style-type: none"> Mudflats and sandflats not covered by seawater at low tide [1140]
Lugmore Glen pNHA [001212]	6.9km south	<ul style="list-style-type: none"> This site comprises of a small, wooded glen and narrow valley cut in glacial drift. A small stream also winds through the valley.

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		<ul style="list-style-type: none"> The wood is mainly comprised of dense hazel <i>Corylus avellana</i>. The rich herb layer includes species such as wood-sorrel <i>Oxalis acetosella</i>, primrose <i>Primula vulgaris</i>, honeysuckle <i>Lonicera periclymenum</i> and woodruff <i>Galium odoratum</i>. Lugmore Glen flora is notable for the presence of the rare Red Data Book species, yellow archangel <i>Lamiastrum galeobdolon</i>, which adds to the interest of the site. This site is a fine example of a wooded glen with good representation of woodland plants. This semi-natural habitat type is scarce in Co. Dublin.
North Bull Island Nature Reserve	7km east	<ul style="list-style-type: none"> The island is covered with dune grassland. An extensive salt marsh lies to the northwest and at extreme low tides there are extensive mud flats between the island and the mainland. The reserves are of international scientific importance for Brent geese and also on botanical, ornithological, zoological and geomorphological grounds.
North Bull Island Wildfowl Sanctuary [WFS-19]	7km east	<ul style="list-style-type: none"> Light-bellied Brent goose <i>Branta bernicla hrota</i> [A046] Shelduck <i>Tadorna tadorna</i> [A048] Teal <i>Anas crecca</i> [A052] Pintail <i>Anas acuta</i> [A054] Shoveler <i>Anas clypeata</i> [A056] Oystercatcher <i>Haematopus ostralegus</i> [A130] Golden plover <i>Pluvialis apricaria</i> [A140] Grey plover <i>Pluvialis squatarola</i> [A141] Knot <i>Calidris canutus</i> [A143] Sanderling <i>Calidris alba</i> [A144] Dunlin <i>Calidris alpina</i> [A149] Black-tailed godwit <i>Limosa limosa</i> [A156] Bar-tailed godwit <i>Limosa lapponica</i> [A157] Curlew <i>Numenius arquata</i> [A160] Redshank <i>Tringa tetanus</i> [A162] Turnstone <i>Arenaria interpres</i> [A169] Black-headed gull <i>Chroicocephalus ridibundus</i> [A179] Wetlands [A999]
Slade Of Saggart and Crooksling Glen pNHA [000211]	7.9km south	<ul style="list-style-type: none"> This site includes a good example of a wooded river valley and a small wetland system. The wooded area mainly consists of planted beech, ash, and oak <i>Quercus</i> spp. Other species include common dog-violet <i>Viola riviniana</i>, brooklime <i>Veronica beccabunga</i> and early marsh-orchid <i>Dactylorhiza incarnata</i>. Higher up in the valley, the vegetation becomes more natural with shrubs and trees such as guelder-rose <i>Viburnum opulus</i> and goat willow <i>Salix caprea</i>. This presence of the rare Red Data Book species, yellow archangel, adds to the interest of this site. A rare invertebrate species, the chalcid <i>Halticoptera patellana</i> (Hymenoptera) was recorded from the site in 1981, the only Irish record for this species up to at least 1989. The site is also of ornithological importance, with Brittas Ponds wildfowl sanctuary to the south. It supports a variety of species including teal, mallard, pochard and tufted duck.
Glenasmole Valley pNHA [001209]	8.4km south	<ul style="list-style-type: none"> Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia) (* important orchid sites)* [6210]

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		<ul style="list-style-type: none"> • <i>Molinia</i> meadows on calcareous, peaty, or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [6410] • Petrifying springs with tufa formation (<i>Cratoneurion</i>)* [7220]
Kilteel Wood pNHA [001394]	8.9km south	<ul style="list-style-type: none"> • This is a fine example of a largely deciduous wood. It is situated on a hill which rises to 248 m, giving it scenic value. • This small heathy wood consists mostly of oak and downy birch <i>Betula pubescens</i>. • The ground vegetation is restricted, with species such as bluebell <i>Hyacinthoides non-scripta</i>, red fescue <i>Festuca rubra</i> and creeping soft-grass <i>Holcus mollis</i>. • There is evidence of timber removal and dumping of domestic refuse. There are no signs of regeneration, which is likely due to sheep grazing.
Fitzsimon's Wood pNHA [001753]	9.5km south east	<ul style="list-style-type: none"> • This site is of ecological importance due to the presence of woodland consisting of mature birch, which is very rare in Dublin, as well as some oak, and a well-developed understorey of holly <i>Ilex aquifolium</i>.
Feltrim Hill pNHA [001208]	9.6km north east	<ul style="list-style-type: none"> • This site is a knoll-reef dating from the Carboniferous period. These reefs were formed by an accumulation of rock and organic debris. Feltrim Hill is a good example of the phenomenon and a number of fish species have been described from the lower shales. • Previously known to contain two rare plant species; spring squill <i>Scilla verna</i> and long-stalked crane's-bill <i>Geranium columbinum</i>. • Quarrying has now removed the greater part of the limestone structure at Feltrim Hill and only marginal exposures remain. Despite this, the site is still valuable as a geological education site.
Baldoyle Bay pNHA [000199]	10km north east	<ul style="list-style-type: none"> • Mudflats and sandflats not covered by seawater at low tide [1140] • <i>Salicornia</i> and other annuals colonising mud and sand [1310] • Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330] • Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]
Sluice River Marsh pNHA [001763]	10.7km north east	<ul style="list-style-type: none"> • This site is a relatively intact freshwater marsh and is designated mainly for its botanical interest. • Wet marsh species include yellow flag <i>Iris pseudacorus</i>, bulrush <i>Typha latifolia</i> and the uncommon brackish water-crowfoot <i>Ranunculus baudotii</i> and duckweed <i>Lemna</i> spp. Drier marsh areas include marsh bedstraw <i>Galium palustre</i>, water mint <i>Mentha aquatica</i> and sedges. • Species such as silverweed <i>Galium palustre</i>, soft rush <i>Juncus effusus</i> and creeping bentgrass <i>Agrostis stolonifera</i> occur in the wet grassland around the marsh. Wet woodland and scrub comprised mainly of willows, alder <i>Alnus glutinosa</i> and downy birch occurs on the west side of the side. • Mallard, snipe, grey heron, moorhen and reed bunting have been recorded on the marsh and grey heron nests nearby.
Baldoyle Estuary Nature Reserve	11km north east	<ul style="list-style-type: none"> • Baldoyle is of international importance as a wintering area for Brent geese. Wading birds that winter at Baldoyle include black-tailed godwits, redshanks and curlews. When the tide comes in, fish enter the estuary and become prey for diving birds like the great-crested grebe and the red-breasted merganser.
Malahide Estuary pNHA [000205]	12km north east	<ul style="list-style-type: none"> • Mudflats and sandflats not covered by seawater at low tide [1140] • <i>Salicornia</i> and other annuals colonising mud and sand [1310] • <i>Spartina</i> swards (<i>Spartinion maritimae</i>) [1320] • Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330] • Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]

Designated Site (code), and Conservation Objectives Version	Closest Distance (km) to Proposed Project	Relevant Qualifying Interest/Special Conservation Interest (*Priority SAC Habitat) or Ecological Features of Interest
		<ul style="list-style-type: none"> Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes)* [2130]
Howth Head pNHA [000202]	12km east	<ul style="list-style-type: none"> Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] European dry heaths [4030]
Red Bog, Kildare pNHA [000397]	12.4km south west	<ul style="list-style-type: none"> Transition mires and quaking bogs [7140]
Dalkey Coastal Zone And Killiney Hill pNHA [002106]	13km south east	<ul style="list-style-type: none"> This site represents a fine example of a coastal system with a range of habitats from the sub-littoral to coastal heath. The flora is well developed and includes some scarce species. Dalkey Sound is especially noteworthy for the occurrence of coastal invertebrates including squat lobsters <i>Galathea</i> spp., swimming crabs <i>Portunus</i> spp. and the crawfish <i>Palinurus vulgaris</i>. Some rare European species which occur are members of the Order Nudibranchia and the spiny starfish <i>Marthasterias glacialis</i>. The islands are important bird sites with many species, such as herring gulls, shelduck, fulmar, mallard, oystercatcher and various tern species nesting and roosting on them.
Donadea Wood pNHA [001391]	13km west	<ul style="list-style-type: none"> This site has been planted with a mix of deciduous and coniferous trees, including ash, cherry <i>Prunus</i> spp. and sycamore <i>Acer pseudoplatanus</i>. The ground flora is species poor and poorly developed. Species include common dog-violet, ground-ivy <i>Glechoma hederacea</i> and wood avens <i>Geum urbanum</i>. The site is notable for the presence of two rare species of Myxomycete fungus, namely <i>Diderma chondrioderma</i> and <i>Licea testudinacea</i>, the latter of which has only been recorded in one other Irish site.
Liffey at Osberstown pNHA [001395]	14.2km south west	<ul style="list-style-type: none"> The site is a good example of riverside vegetation, with remnants or regeneration of woodland. Two scarce plants dark-leaved willow (<i>Salix myrsinifolia</i>) and variegated horsetail (<i>Equisetum variegatum</i>) are present. Plants found on the riverbank include hemlock water-dropwort (<i>Oenanthe crocata</i>), cow parsley (<i>Anthriscus sylvestris</i>) and water mint (<i>Mentha aquatica</i>).
Ireland's Eye pNHA [000203]	14.3km north east	<ul style="list-style-type: none"> Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]
Poulaphouca Reservoir pNHA [004063]	14.6km south	<ul style="list-style-type: none"> Greylag goose <i>Anser anser</i> [A043] Lesser black-backed gull <i>Larus fuscus</i> [A183]
Liffey Valley Meander Belt pNHA [000393]	20.6km south west	<ul style="list-style-type: none"> A rare Ash wood with marshy areas, uncommon for the county. Other tree species include beech (<i>Fagus sylvatica</i>), Sycamore (<i>Acer pseudoplatanus</i>), hawthorn (<i>Crataegus monogyna</i>), elder (<i>Sambucus nigra</i>) and alder (<i>Alnus glutinosa</i>). Herbs of the grazed woodland include: Sanicle (<i>Sanicula europaea</i>), Pignut (<i>Conopodium majus</i>), Bugle (<i>Ajuga reptans</i>), Red Campion (<i>Silene dioica</i>), Wood Speedwell (<i>Veronica montana</i>), False Brome (<i>Brachypodium sylvaticum</i>) and remote sedge (<i>Carex remota</i>).
Newtown marshes pNHA	24km south west	<ul style="list-style-type: none"> The site consists of a series of marshes and ponds within an area of calcareous eskers.

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[001759]		<ul style="list-style-type: none"> The wetlands vary from areas of permanent open water to damp rush (<i>Juncus spp.</i>). Wet grassland occurs around some of the pools and marshes. The area is important ornithologically as it holds and breeding colony of Black-headed Gulls.
Curragh Kildare pNHA [000392]	25km south west	<ul style="list-style-type: none"> The site is of considerable-natural heritage significance, for the diversity of habitats, plants, fungi and animals that it supports. It is unusual in an Irish, European and even global context being an extensive open plain area of lowland acid grassland, succeeding to dry heath in places. Dry heath (<i>Ulex</i> formation) covers 10-20% of the site and is associated mainly with the undulating hills within the site. It supports the Annex I specie golden plover. Lapwing also occur regularly on the site. Irish hare, the red data book species is also plentiful on the site.
Hollywood Glen pNHA [002053]	27.5km south west	<ul style="list-style-type: none"> The site is a good example of Hazel coppice with a well-developed ground flora including bluebell (<i>Hyacinthoides non-scripta</i>), Pignut (<i>Conopodium majus</i>), Great Wood-rush (<i>Luzula sylvatica</i>), Wood-sorrel (<i>Oxalis acetosella</i>) and wood anemone (<i>Anemone nemorosa</i>). Peregrine Falcon, an Annex I species breeds withing the site.
Ballinagee Wood pNHA [001750]	28.8km south	<ul style="list-style-type: none"> Semi-natural remnant of a much larger deciduous forest with luxuriant growth of bryophytes and lichens. Tree canopy of sessile oak (<i>Quercus petraea</i>), downy birch (<i>Betula pubescens</i>) and Rowan (<i>Sorbus aucuparia</i>). Shrub and herb layer of bilberry (<i>Vaccinium myrtillus</i>), bracken (<i>Pteridium aquilinum</i>), honeysuckle (<i>Lonicera periclymenum</i>), bluebell (<i>Hyacinthoides non-scripta</i>) and wood-sorrel (<i>Oxalis acetosella</i>). Presence of saxicolous lichens <i>Hypotrachyna laevigata</i> and <i>Sphaerophorus globosus</i>.

1.2.1.2. Data Search

Relevant species data returned from the NBDC data search are detailed in Table 1-8 and Table 1-9.

Table 1-8: Protected, rare, and threatened plants and animals returned from NBDC data search

Species Name	Legislative Protection*	Red List Status (Gilbert <i>et al.</i> , 2021)	Record Count	Date of Last Record	Habitat Preferences (Birds ⁵ ; All Remaining ⁶)
Birds					
Barn owl <i>Tyto alba</i>	-	Red Listed	27	01/09/2021	Scarce resident mainly in central and southern Ireland. Breeds in ruined buildings, such as castles and to a lesser extent in outbuildings (barns/sheds).
Barn swallow <i>Hirundo rustica</i>	-	Amber Listed	114	01/05/2021	Common summer visitor throughout Ireland from mid-March to late-September. Swallows spend the winter in southern Africa, migrating across the Mediterranean Sea and the Sahara Desert in spring and autumn.
Barnacle goose <i>Branta leucopsis</i>	✓ _{a, d}	Amber Listed	1	15/02/2015	Local winter visitor from Greenland, occurring in Ireland between October & April. Mostly on remote islands in the northwest Ireland where it is relatively free from disturbance. Highly gregarious.
Black guillemot <i>Cephus grylle</i>	-	Amber Listed	20	16/05/2019	Resident along all Irish coasts. Nests amongst boulders at the base of cliffs, also in rock crevices and in man-made structures, such as piers. Will nest singularly and in loose colonies. Winters in the vicinity of its breeding sites and can be seen inshore throughout the year.
Black-headed gull <i>Larus ridibundus</i>	✓ _d	Amber Listed	131	21/05/2020	Resident along all Irish coasts, wintering inland also. Breeding nests on the ground in wetland areas, (i.e. bogs, marshes, man-made lakes. Widespread across agricultural fields, and urban areas).
Black-legged kittiwake <i>Rissa tridactyla</i>	✓ _d	Red Listed	4	01/03/2018	Summer visitor to steep coastal cliffs along all Irish coasts. Disperses to the open ocean in winter and less frequently seen. Breeds on steep sea cliffs where it builds a nesting platform on the most vertical and sometimes improbably steep areas. Will occasionally use man-made structures such as old buildings.
Brent goose <i>Branta bernicla</i>	-	Amber Listed	37	07/04/2021	Winter migrant from high-Arctic Canada. Most occur in Ireland between October and April. This

⁵ Available online at <https://birdwatchireland.ie/irelands-birds/list-of-irelands-birds/>. Accessed January 2022.

⁶ Available online at <https://species.biodiversityireland.ie/>. Accessed January 2022.

Species Name	Legislative Protection*	Red List Status (Gilbert <i>et al.</i> , 2021)	Record Count	Date of Last Record	Habitat Preferences (Birds ⁵ ; All Remaining ⁶)
					population winters almost entirely in Ireland, with small numbers in parts of Britain and France. Mostly found on coastal estuaries during the autumn and early winter, and also on grasslands from mid-winter, until departure for the breeding grounds begins in late April.
Common coot <i>Fulica atra</i>	✓ _d	Amber Listed	92	20/08/2021	Resident at ponds and lakes throughout Ireland. Wintering in lakes, coastal estuaries and river systems.
Common kestrel <i>Falco tinnunculus</i>	-	Red Listed	58	15/01/2020	Widespread resident throughout Ireland. Nests in trees, buildings or in cracks in cliffs. Will use old crow's nests. Found in wide variety of open habitats including coasts, moor land, farmland, wetlands, roadside verges and town parks.
Common kingfisher <i>Alcedo atthis</i>	✓ _{a, d}	Amber Listed	60	01/05/2021	Resident on Irish streams, rivers and canals. Wintering in lakes and coasts during extended poor weather.
Common linnet <i>Carduelis cannabina</i>	-	Amber Listed	71	12/02/2020	Widespread resident throughout Ireland. Breed in a variety of habitats, including rough grassland, uplands and in coastal areas with gorse.
Common snipe <i>Gallinago gallinago</i>	-	Red Listed	25	28/01/2017	Summer and winter visitor to Ireland. They forage across a variety of wetland and damp habitats. Nests on the ground, usually concealed in a grassy tussock, in or near wet or boggy terrain.
Common starling <i>Sturnus vulgaris</i>	-	Amber Listed	229	06/03/2021	Widespread garden bird, Irish resident. Foraging in grassland in parks, gardens and farmland, and trees. Also found in urban environments as well as woodland and farmland.
Common swift <i>Apus apus</i>	-	Red Listed	75	31/05/2021	Common summer visitor throughout Ireland. Nests in small recesses in buildings, both occupied and derelict. Less frequently in holes in trees or caves in uplands or coastal areas.
Eurasian curlew <i>Numenius arquata</i>	✓ _d	Red Listed	26	09/07/2021	Winter visitor to Irish wetlands. Breeding throughout Ireland in floodplains, bog lands, meadows, rough pasture and heather.
Eurasian oystercatcher <i>Haematopus ostralegus</i>	✓ _d	Red Listed	16	31/08/2017	Resident & winter visitor (from Iceland and the Faeroes) - largest numbers in Ireland between September & March. Use all coastal habitats, and particularly favour open sandy coasts.

Species Name	Legislative Protection*	Red List Status (Gilbert <i>et al.</i> , 2021)	Record Count	Date of Last Record	Habitat Preferences (Birds ⁵ ; All Remaining ⁶)
Eurasian teal <i>Anas crecca</i>	✓ _d	Amber Listed	20	26/02/2017	Resident & winter migrant. Wetland preferences in covered freshwater lakes, pools and small upland streams away from the coast. Wintering in coastal lagoons and estuaries and inland marshes, lakes, ponds and turloughs.
Eurasian tree sparrow <i>Passer montanus</i>	-	Amber Listed	32	03/03/2018	Local resident in the east of Ireland, scarce along the south and west coasts. Largely associated with cereal production. Nests in cavity in building, especially under eaves or holes formed by missing brickwork
Great cormorant <i>Phalacrocorax carbo</i>	✓ _d	Amber Listed	53	17/07/2021	Irish resident either at sea or on inland lakes and rivers. Breeds in colonies mainly around the coast of Ireland, with some birds breeding inland.
Greater scaup <i>Aythya marila</i>	✓ _d	Red Listed	6	27/10/2017	Winter visitor to coastal estuaries and bays, on brackish lagoons and in shallow marine waters, usually less than 10 m in depth. Does not breed in Ireland.
Grey heron <i>Ardea cinerea</i>	✓ _d	-	160	23/08/2021	Common resident at wetlands, estuaries and along rivers throughout Ireland.
Greylag goose <i>Anser anser</i>	✓ _d	Amber Listed	2	15/01/2020	Winter migrant, with Icelandic birds between November & April. Feral birds are present year-round. The Icelandic population winters in Scotland and Ireland, occurring mostly at coastal sites. Highly gregarious.
Herring gull <i>Larus argentatus</i>	✓ _d	Amber Listed	198	16/07/2020	Resident along all Irish coasts, breeding inland also. Widespread distribution.
House martin <i>Delichon urbicum</i>	-	Amber Listed	54	01/05/2021	Common summer visitor throughout Ireland from mid-March to late-September. Winters in tropical Africa.
House sparrow <i>Passer domesticus</i>	-	Amber Listed	164	06/03/2021	Resident. One of Ireland's Top 20 most widespread garden birds. Undertakes only minor movements during the year.
Lesser black-backed gull <i>Larus fuscus</i>	✓ _d	Amber Listed	43	01/05/2021	Summer populations are distributed across the Irish coastline including offshore islands, islands in inland lakes, sand dunes and coastal cliffs. Winter visitors to more inland lakes
Little egret <i>Egretta garzetta</i>	✓ _a	-	36	22/10/2018	Resident along coasts and rivers throughout Ireland. A variety of wetland habitats are used including shallow lakes, riverbanks, lagoons, coastal estuaries and rocky shoreline.

Species Name	Legislative Protection*	Red List Status (Gilbert <i>et al.</i> , 2021)	Record Count	Date of Last Record	Habitat Preferences (Birds ⁵ ; All Remaining ⁶)
Little grebe <i>Tachybaptus ruficollis</i>	✓ _d	-	95	20/08/2021	Resident on vegetated ponds and lakes throughout Ireland. Wintering habitat extends to include ephemeral wetlands and are often encountered on sheltered coasts, estuaries and coastal lakes and lagoons.
Mallard <i>Anas platyrhynchos</i>	✓ _d	Amber Listed	199	01/05/2021	Resident across all wetland habitats in Ireland.
Merlin <i>Falco columbarius</i>	✓ _{a, d}	Amber Listed	6	09/03/2014	Local summer visitor to uplands throughout Ireland. Widespread winter visitor at lowland sites from October to April. Much more widely distributed in the winter, than in the breeding season. Merlin's move away from high ground at this time of the year and can often be seen on the coast, where concentrations of other birds are attractive as prey species.
Mew gull <i>Larus canus</i>	✓ _d	Amber Listed	37	28/07/2019	Widespread across Irish coastland. Nests on the ground in a wide variety of situations, including, islands, cliffs and shingle banks. Breeds on the coast and inland lakes in the west of Ireland.
Mute swan <i>Cygnus olor</i>	-	Amber Listed	154	21/04/2021	Resident at wetlands throughout Ireland.
Northern wheatear <i>Oenanthe oenanthe</i>	-	Amber Listed	8	11/08/2021	Widespread summer visitor to uplands and scrubland throughout Ireland, from mid-March to early-October. Common passage migrant to all coasts in spring and autumn. Winters in southern Africa. Has one of the longest migration routes of any songbird. Birds breeding in north-eastern Canada fly almost non-stop across the northern Atlantic to Iberia and North Africa.
Peregrine falcon <i>Falco peregrinus</i>	✓ _{a, d}	-	25	16/09/2017	Widespread resident in Ireland favouring coastal sites and cities with high vantage points.
Red kite <i>Milvus milvus</i>	✓ _a	Red Listed	1	02/09/2016	Reintroduced in 2011, Resident, roaming but not wide-ranging. Roaming further afield in winter, turning up in Western counties.
Redwing <i>Turdus iliacus</i>	-	Red Listed	49	11/02/2021	Common winter visitor to Ireland with birds from the Iceland and Scandinavia, from October to March. Favours open fields in lowland areas but tends to avoid urban areas. Does not breed in Ireland.
Sand martin <i>Riparia riparia</i>	-	Amber Listed	35	22/08/2021	Widespread summer visitor throughout Ireland. Breed in

Species Name	Legislative Protection*	Red List Status (Gilbert <i>et al.</i> , 2021)	Record Count	Date of Last Record	Habitat Preferences (Birds ⁵ ; All Remaining ⁶)
					burrows dug into river banks or quarries.
Sky lark <i>Alauda arvensis</i>	-	Amber Listed	45	21/05/2020	Common resident throughout Ireland in uplands and areas of farmland, especially cereal. Breeds in a variety of habitats including cultivated areas, ungrazed grasslands and upland heaths. Winters in flocks on stubble fields, grasslands and coastal areas.
Spotted flycatcher <i>Muscicapa striat</i>	-	Amber Listed	21	23/08/2021	A widespread summer visitor to broadleaf woodlands, well-vegetated hedgerows, parks and gardens.
Stock pigeon <i>Columba oenas</i>	-	Red Listed	29	17/08/2021	A widespread resident throughout Ireland favouring areas of cereal cultivation. Breeds in lowlands of eastern and southern Ireland, almost invariably near agricultural areas, especially cereal. Nests in holes in trees.
Tufted duck <i>Aythya fuligula</i>	✓ _d	Amber Listed	92	20/08/2021	Resident & winter visitor. Preference for large open lakes in lowland areas for breeding, where nests are built in waterside vegetation. Also seen on town lakes, canals and slow-moving rivers.
Willow warbler <i>Phylloscopus trochilus</i>	-	Amber Listed	48	05/08/2019	A common summer visitor from April to September. One of the commonest breeding birds in Ireland (about 1 million pairs), with the highest densities in stands of willows along the edges of bogs and marshes. Less frequently in hedgerows, forests and well-vegetated gardens.
Yellowhammer <i>Emberiza citrinella</i>	-	Red Listed	44	10/06/2021	Declining resident mainly in the east and south of Ireland. Strongly linked with the cultivation of cereals.
Terrestrial mammals					
Brown long-eared bat <i>Plecotus auratus</i>	✓ _{c, e}	-	43	25/05/2020	Prefers to forage in parkland, open deciduous and coniferous woodland, orchards and gardens. They are frequently found in older buildings, in lofts, barns, stables etc. Usually, they cluster along the ridge beam or next to a chimney. The species also makes use of trees as summer roosts and colonise bat boxes readily.
Common pipistrelle <i>Pipistrellus sensu stricto</i>	✓ _{c, e}	-	1	25/05/2020	Highly adaptable species foraging along linear landscape features such as hedgerows and tree lines as well as within woodland and parkland. Roosting in old and

Species Name	Legislative Protection*	Red List Status (Gilbert <i>et al.</i> , 2021)	Record Count	Date of Last Record	Habitat Preferences (Birds ⁵ ; All Remaining ⁶)
					modern structures in addition to trees and bat boxes.
Daubenton's bat <i>Myotis daubentonii</i>	✓ _{c, e}	-	239	25/05/2020	Calm, slow-moving water is chosen by Daubenton's bat as it makes it easier for it to locate insects on the surface. Sometimes forages in woodland, away from water. Habitats include but are not necessarily limited to; Semi-natural woodland, highly modified non-native woodland, Building and artificial surfaces, Lakes and Ponds, Watercourses.
Eurasian badger <i>Meles meles</i>	✓ _e	-	95	01/09/2020	Varied habitats including grassland, woodland and Bog often near hedgerows or treelines and streams.
Eurasian pygmy shrew <i>Sorex minutus</i>	✓ _e	-	7	01/09/2020	Prefers relatively damp areas with dense vegetation at ground level, and it occurs in a wide variety of habitats including swamps, grasslands, heaths, sand dunes, woodland edge, rocky areas, shrubland, and montane forests. It feeds on invertebrates.
Eurasian red squirrel <i>Sciurus vulgaris</i>	✓ _e	Near Threatened	13	21/04/2017	Conifer-dominated woodland with a mixture of age classes and species together with some berry-bearing shrubs to ensure a continuous food supply.
European otter <i>Lutra lutra</i>	✓ _{b, c, e}	Near Threatened	31	16/07/2018	Lakes and Ponds, watercourses, riparian woodland, estuaries, sea inlets and bays, saltmarshes, swamps.
Irish hare <i>Lepus timidus</i> subsp. <i>Hibernicus</i>	✓ _e	-	15	07/01/2018	Varied habitat preferences including bog, moor, heath, marsh, and pastoral farmland (Reid <i>et al.</i> , 2007).
Irish stoat <i>Mustela erminea</i> subsp. <i>hibernica</i>	✓ _e	-	4	26/02/2016	They can be found in woodlands, hedgerows, marsh, heather, lowland farms, moorland, coastal areas and on small mountains. They have a particular preference for open woodlands and rocky scrub covered areas or if found on agricultural lands they will be located near any stone walls, ditches or hedgerows.
Lesser noctule <i>Nyctalus leisleri</i>	✓ _{c, e}	Near Threatened	110	08/06/2020	Woodland species but it is also to be found in parkland, along treelines, pasture and riparian habitats, over lakes, beaches and dunes and above streetlights in urban areas. Not as dependent on linear features like hedgerows as our other bat species.
Nathusius's pipistrelle <i>Pipistrellus nathusii</i>	✓ _{c, e}	-	7	25/05/2020	Roosts are always within 2km of water. Emerge very soon after dusk to feed on flies, midges,

Species Name	Legislative Protection*	Red List Status (Gilbert <i>et al.</i> , 2021)	Record Count	Date of Last Record	Habitat Preferences (Birds ⁵ ; All Remaining ⁶)
					mosquitoes etc. along woodland or parkland edges.
Natterer's bat <i>Myotis nattereri</i>	✓ _{c, e}	-	11	25/05/2020	Found in woodlands (deciduous and coniferous), along tree lines and hedgerows, in pasture and over water including white water rapids where it hunts higher than Daubenton's bat. Hibernation in underground sites such as caves, souterrains, mines and tunnels where it crawls into cracks and crevices as well as hanging in the open. Summer roost sites are usually in very old stone-built buildings, trees or bat or bird boxes and individual animals are sometimes encountered beneath stone bridges.
Pine marten <i>Martes martes</i>	✓ _e	-	6	06/07/2017	Habitat specialists and require forest or scrub cover to exist in a landscape. In the west of Ireland they may have adapted to relatively open habitats due to historical clearance of woodland habitat.
Pipistrelle <i>Pipistrellus pipistrellus sensu lato</i>	✓ _{c, e}	-	96	06/05/2014	Highly adaptable species foraging along linear landscape features such as hedgerows and tree lines as well as within woodland and parkland. Roosting in old and modern structures in addition to trees and bat boxes.
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	✓ _{c, e}	-	89	25/05/2020	As with the common pipistrelle, the Soprano forages along linear landscape features such as hedgerows and tree lines as well as within woodland. Notable preference for riparian habitats and has adapted to modern dwellings. The species is loyal to its roost site and returns year after year.
West European hedgehog <i>Erinaceus europaeus</i>	✓ _e	-	109	28/12/2020	It is considered to be present in all lowland habitats where there is sufficient food to eat and ground cover for nesting, and commonest where grassland abuts mixed woodland and scrub. It appears to avoid coniferous woodland, blanket bog and other wet areas.
Whiskered bat/Brandt's bat <i>Myotis mystacinus/brandtii</i>	✓ _{c, e}	-	1	25/05/2020	Open meadows and open landscape often near water.
Marine Mammals					
Common dolphin <i>Delphinus delphis</i>	✓ _{c, e}	-	1	28/11/2018	Found in open marine habitats, from tropical to temperate cool waters. In Irish waters the species is less associated with the deeper

Species Name	Legislative Protection*	Red List Status (Gilbert <i>et al.</i> , 2021)	Record Count	Date of Last Record	Habitat Preferences (Birds ⁵ ; All Remaining ⁶)
					waters over the continental slope than with the continental shelf.
Grey seal <i>Halichoerus grypus</i>	✓ _{b, e}	-	1	11/02/2012	Occurs around all Irish coasts. This species forages at sea, within the continental shelf boundary. Haul-out sites in the breeding season will most often be onto shores of islands or onto remote mainland shores. In Britain and Ireland breeding sites are above high-water mark.
Amphibians					
Common frog <i>Rana temporaria</i>	✓ _e	-	145	28/08/2020	Native to Ireland. Uses a broad habitat range including lakes and ponds, grassland and marsh, wet heath, peatlands, woodland and scrub, dune slacks, machair, and riparian habitats.
Smooth newt <i>Lissotriton vulgaris</i>	✓ _e	-	20	15/06/2020	Native to Ireland. Like the common frog, smooth newts may colonise garden ponds during the breeding season. Outside of the breeding season, newts come onto land and are often found in damp places, frequently underneath logs and debris in the summer months.
Invertebrates					
Freshwater white-clawed crayfish <i>Austroptamobius pallipes</i>	✓ _{b, e}	-	17	02/09/2016	Found in rivers, streams and lakes in Ireland particularly in those with a calcareous influence. Necessity for refuges whether this be vegetation, boulders or man-made features. Hard substrates were found to be preferable to muddy substrates.
Marsh fritillary <i>Euphydryas aurinia</i>	-	Vulnerable	12	10/06/2019	Found on wet grasslands, coastal grey dunes, machair and cutover bog. Roosting adults may sometimes be found on flowerheads. They bask and feed on various flowers, but especially on Meadow Thistle. Broad habitat usage.
Small heath <i>Coenonympha pamphilus</i>	-	Near Threatened	10	21/06/2020	Generalist, found on unimproved dry grassland, coastal grey dunes and machair. Adults favour areas of grassland with low sward height and abundant flowers and isolated scrub. Roosting adults are occasionally found on flowerheads.
Wood white <i>Leptidea sp.</i>	-	Near Threatened	40	01/06/2020	Specialist on grassy forest clearings and limestone pavement. In dull weather adults may be found resting on flowerheads.
Scarce blue-tailed damselfly <i>Ischnura pumilio</i>	-	Vulnerable	3	04/07/2017	Found mainly in seepages and flushes in heaths and bogs, in quarries, dune slacks, and shores

Species Name	Legislative Protection*	Red List Status (Gilbert <i>et al.</i> , 2021)	Record Count	Date of Last Record	Habitat Preferences (Birds ⁵ ; All Remaining ⁶)
					of large lakes. Prefers slow-moving or still waters. Habitats usually lack an abundance of vegetation, but emergent, soft-stemmed plants are needed when females lay their eggs.
<i>Andrena</i> (Melandrena) <i>nigroaenea</i>	-	Vulnerable	17	31/03/2021	Not common. Known from various habitats including parks and gardens.
Field cuckoo bee <i>Bombus</i> (Psithyrus) <i>campestris</i>	-	Vulnerable	4	20/07/2018	Not common. Known from a range of habitat types.
Gooden's nomad bee <i>Nomada goodeniana</i>	-	Endangered	6	21/04/2021	Found in a range of habitat types.
Large red tailed bumble bee <i>Bombus</i> (Melanobombus) <i>lapidarius</i>	-	Near Threatened	241	24/07/2021	Found in a wide range of habitats, including parks and gardens. Has declined from the agricultural landscape.
<i>Megachile</i> (Delomegachile) <i>willughbiella</i>	-	Near Threatened	28	17/07/2021	Not common. Known from a range of locations including parks and gardens.
<i>Megachile</i> (Megachile) <i>centuncularis</i>	-	Near Threatened	13	22/06/2021	Not common. Majority of known populations are from parks and gardens.
Moss Carder-bee <i>Bombus</i> (Thoracombus) <i>muscorum</i>	-	Near Threatened	116	06/05/2021	Found in a range of flower-rich habitats, including parks and gardens.
English chrysalis snail <i>Leiostyla</i> (Leiostyla) <i>anglica</i>	-	Vulnerable	7	18/05/2012	Lives in wet, shaded habitats on neutral to base-rich soils and is usually found attached to twigs or larger branches on the ground. This is not a species which climbs on trees or walls (Anderson, 1997).
Lake orb mussel <i>Musculium lacustre</i>	-	Vulnerable	7	18/05/2012	A species mainly of small, temporary or 'poor' habitats where few other species are present. Occasional in sandpits and areas subject to seasonal flooding around large lakes (Anderson, 2016).
Flora					
Betony <i>Stachys officinalis</i>	-	Near Threatened	1	18/05/2012	Best found in grassy banks, in woodland and hedgerows mainly in Counties Kerry and Wexford. ⁷
Green figwort <i>Scrophularia umbrosa</i>	-	Near Threatened	10	22/07/2020	A rhizomatous perennial herb which grows on fertile soils by streams and rivers, and in damp woodland, in both open and shaded places. Generally lowland. ⁸

⁷ Wildflowers of Ireland - Information on Betony. Available at: http://www.wildflowersofireland.net/plant_detail.php?id_flower=563&wildflower=Betony Accessed 20/01/2022

⁸ Online Atlas of the British and Irish Flora. *Scrophularia umbrosa*. Available at: <https://www.brc.ac.uk/plantatlas/plant/scrophularia-umbrosa> Accessed 20/01/2022

Species Name	Legislative Protection*	Red List Status (Gilbert <i>et al.</i> , 2021)	Record Count	Date of Last Record	Habitat Preferences (Birds ⁵ ; All Remaining ⁶)
Hairy St John's-wort <i>Hypericum hirsutum</i>	✓ _f	Vulnerable	10	11/09/2021	Woodland, scrub and rough grassland and railway verges. ⁹
Hairy violet <i>Viola hirta</i>	✓ _f	Vulnerable	1	18/05/2012	Open woods and other well wooded areas, railway verges, coppices, scrub and grassland, usually on calcareous soils. ¹⁰
Meadow crane's-bill <i>Geranium pratense</i>	-	Vulnerable	1	20/07/2020	Edges of permanent pastures, beside hedgerows and on roadside verges are the kinds of places it has escaped chemical herbicides and still thrives. This chalk-loving wildflower is also found on scrubby downland. ¹¹
Slender thistle <i>Carduus tenuiflorus</i>	-	Near Threatened	2	06/08/2020	Sandy banks and dry ground; occasional in centre and south-east Ireland, rare elsewhere; declining (Parnell and Curtis, 2012).
Tufted feathermoss <i>Scleropodium cespitans</i>	-	Near Threatened	1	06/09/2012	Most often found by lowland streams and rivers, normally where there is occasional flooding, on the roots and trunks of trees, and on rocks and boulders, often in a bed of silt. ¹²

* Legislative Protection: a = Annex I Birds Directive, b = Annex II Habitats Directive, c = Annex IV Habitats Directive, d = Special Conservation Interest bird species (within Special Protection Area (SPA)), e = Wildlife Act (excluding birds); f = Flora (Protection) Order 2022.

⁹ NatureSpot – Hairy St John's-wort – *Hypericum hirsutum*. Available at: <https://www.naturespot.org.uk/species/hairy-st-johns-wort> Accessed 20/01/2022

¹⁰ Nature Spot. Hairy Violet - *Viola hirta*. Available at: <https://www.naturespot.org.uk/species/hairy-violet> Accessed 20/01/2022

¹¹First Nature. *Geranium pratense* - Meadow cranesbill. Available at: <https://www.first-nature.com/flowers/geranium-pratense.php> Accessed 20/01/2022

¹² NatureSpot. Tufted Feather-moss – *Scleropodium cespitans*. Available at: <https://www.naturespot.org.uk/species/tufted-feather-moss#:~:text=Scleropodium%20cespitans%20typically%20grows%20in.1%20t%20%20cm%20long>. Accessed 20/01/2022

Table 1-9: Third scheduled invasive alien plants and animals returned from NBDC data search

Species Name	Record Count	Date of Last Record
Invasive alien plants*		
American skunk-cabbage (<i>Lysichiton americanus</i>)	2	29/03/2019
Brazilian giant-rhubarb (<i>Gunnera manicata</i>)	2	29/03/2019
(<i>Fallopia japonica</i>) x <i>sachalinensis</i> = F. x <i>bohemica</i>	4	17/06/2015
Giant hogweed (<i>Heracleum mantegazzianum</i>)	163	26/04/2021
Giant knotweed (<i>Fallopia sachalinensis</i>)	3	03/08/2017
Giant-rhubarb (<i>Gunnera tinctoria</i>)	2	28/06/2020
Indian balsam (<i>Impatiens glandulifera</i>)	152	11/09/2021
Japanese knotweed (<i>Fallopia japonica</i>)	139	01/05/2021
Nuttall's waterweed (<i>Elodea nuttallii</i>)	32	18/07/2020
Spanish bluebell (<i>Hyacinthoides hispanica</i>)	3	06/05/2018
Three-cornered garlic (<i>Allium triquetrum</i>)	22	21/05/2021
Invasive alien animals*		
Roach (<i>Rutilus rutilus</i>)	2	19/05/2012
Harlequin ladybird (<i>Harmonia axyridis</i>)	39	02/12/2021
American mink (<i>Mustela vison</i>)	9	02/08/2018
Eastern grey squirrel (<i>Sciurus carolinensis</i>)	143	01/09/2020
Fallow deer (<i>Dama dama</i>)	10	16/09/2018
Greylag goose (<i>Anser anser</i>)	2	15/01/2020
* Third schedule of the European Communities (Birds and Natural Habitats Regulations) 2011, as amended		

1.2.1.3. Bat Habitat Suitability

A bat habitat suitability index (ranging from 0-100) identifies the proposed Project is within a suitability index area ranging from 18.33-29.78 for all bat species combined (Table 1-10). The highest suitability index scores were recorded for common pipistrelle (Zone D - River Liffey Bridge to Glasnevin Junction), Leisler's bat (Zone B, C and D- River Liffey Bridge to Glasnevin Junction and Park West & Cherry Orchard Station to Heuston Station) and brown long-eared bat (Zone D).

Table 1-10: Suitability Index for Different Bat Species (as per Lundy *et al.*, 2011)

Bat Scientific Name (Common Name)	Suitability Index (Mean (min-max))			
	Zone A: Hazelhatch to Park West	Zone B and C: Park West to Heuston Station	Zone D: Heuston Station to Glasnevin	Overall Route
All Bats	18.75 (18.33-18.89)	22.60 (18.33-23.67)	27.81 (23.67-29.78)	24.70 (18.33-29.78)
Soprano pipistrelle (<i>Pipistrellus pygmaeus</i>)	30 (29-33)	34.6 (33-35)	35.91 (35-37)	34.4 (29-37)
Brown long-eared bat (<i>Plecotus auritus</i>)	18.5 (17-23)	27 (23-28)	40.73 (28-44)	32.85 (17-44)
Common pipistrelle (<i>Pipistrellus pipistrellus</i>)	37.75 (31-40)	37.4 (31-39)	43.55 (39-47)	40.85 (31-47)
Lesser horseshoe bat (<i>Rhinolophus hipposideros</i>)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
Leisler's bat (<i>Nyctalus leisleri</i>)	34 (33-37)	41 (37-42)	42.45 (41-44)	40.4 (33-44)
Whiskered bat (<i>Myotis mystacinus</i>)	11.5 (11-13)	18.6 (13-20)	20.91 (19-23)	18.45 (11-23)
Daubenton's bat (<i>Myotis daubentonii</i>)	9.5 (9-11)	16.6 (11-18)	23.45 (18-29)	18.95 (9-29)
Nathusius's pipistrelle (<i>Pipistrellus nathusii</i>)	14.5 (10-16)	14 (10-15)	12.27 (5-19)	13.15 (5-19)
Natterer's bat (<i>Myotis nattereri</i>)	13 (7-15)	14.2 (7-16)	31 (16-39)	23.2 (7-39)

1.2.2. Field Study

1.2.2.1. Habitats

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

1.2.2.1.1. 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 1.2.2.1.2).

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 1.2.2.1.2) 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 1.2.2.1.1.

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 1.2.2.1.1.

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 1-11). 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 its tributary), Coneyburrow_09 and the Lucan stream (see Table 1-11). 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 1-11: 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	<p>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 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</p>

Site ID.	Waterbody	Biotic Index	EPA Quality Status	WFD Status (EPA, 2018)	Results Description
					<p>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 (<i>Alainites muticus</i>, <i>Glossosomatidae</i> and <i>Limnephilidae</i>). One Class E was recorded (<i>Tubificidae</i>). 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 overhanging trees and cobbles/boulders. DO levels were below the recommended limit for salmonids at 8.23mg/l.</p> <p>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</p>

Site ID.	Waterbody	Biotic Index	EPA Quality Status	WFD Status (EPA, 2018)	Results Description
					<p>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 (<i>Sericostomatidae</i> and <i>Alainites muticus</i>) and one common throughout the sample (<i>Glossosomatidae</i>). <i>Baetis Rhodani</i> (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 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 (<i>Limnephilidae</i> and <i>Baetis muticus</i>). No one taxa was dominant and no Class A taxa were recorded. One Class E was also present but was not dominant (<i>Tubificidae</i>). A Q3 was assigned (moderate). In 2018, the EPA categorised this watercourse as 'unassigned'.</p>

Site ID.	Waterbody	Biotic Index	EPA Quality Status	WFD Status (EPA, 2018)	Results Description
					<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 are present and the reach surveyed lacks suitable hiding places for adults. A habitat rating of Poor was assigned.</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. overhanging banks, and detritus). High levels of siltation provide poor conditions and low turbidity increases when kicked. A habitat rating of None was assigned.</p>
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 taxon 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</p>

Site ID.	Waterbody	Biotic Index	EPA Quality Status	WFD Status (EPA, 2018)	Results Description
					<p>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> <p>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.</p>
*Expert judgement (Accessed from: https://data.gov.ie/dataset/wfd-river-waterbody-status-2013-2018)					

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.

1.2.2.1.2. 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 1.2.2.1.1).

BL2 Earth banks

Description as per Zone A (see section 1.2.2.1.1).

BL3 Buildings and artificial surfaces

Description as per Zone A (see section 1.2.2.1.1).

Disturbed Ground

ED1 Exposed gravel

Description as per Zone A (see section 1.2.2.1.1).

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 1.2.2.1.1.

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 1.2.2.1.1.

Watercourses

FW4 Drainage ditches

See section 1.2.2.1.1.

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.

1.2.2.1.3. 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 1.2.2.1.1).

BL2 Earth banks

Description as per Zone A (see section 1.2.2.1.1).

BL3 Buildings and artificial surfaces Description as per Zone A (see section 1.2.2.1.1).Disturbed Ground

ED1 Exposed gravel

Description as per Zone A (see section 1.2.2.1.1).**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 1.2.2.1.2), 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 Fassauga 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 1.2.2.1.2), 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 1.2.2.1.1.

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.

1.2.2.2. Invasive Alien Plant Species

Invasive alien plant species recorded during the field study are detailed in Table 1-12 and shown in Volume 3A of the EIAR.

Table 1-12: 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.
	712852, 734071	IAPS-16	One of several stands southwest of the River Liffey bridge crossing.

Species	Location (ITM)	Map Code	Description
Spanish bluebell <i>Hyacinthoides hispanica</i>	712560, 733902	IAPS-17	0.5 m x0.5 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.


1.2.2.3. Fauna Species



1.2.2.3.1. Bats

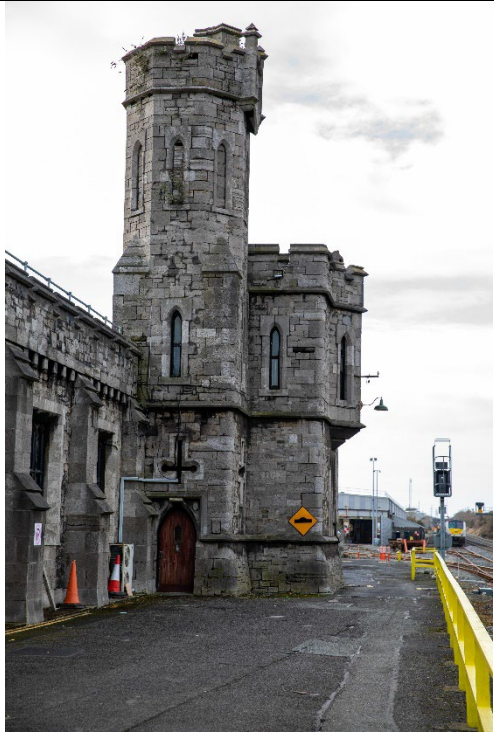

Preliminary Ground Level Roost Assessment



The preliminary ground level roost assessments identified seven structures with features suitable for roosting bats (Figure 1.1). The visual assessment categorised the structures with potential to support bat roost features as ranging from moderate to high suitability (Table 1-13).



Table 1-13: Features suitable for Roosting Bats identified during the Preliminary Ground Level Roost Assessment



Map Code	Structure name/tree species	Grid Reference (ITM)	Feature Location and Description	Suitability
BS1	Royal Canal rail bridge (OBO8)	714055, 736772	<p>Internal</p> <ul style="list-style-type: none"> Missing brickwork throughout <p>External</p> <ul style="list-style-type: none"> No evidence or potential for bats. 	Moderate
BS2	Phoenix Park Tunnel	712977, 734752	<p>Internal</p> <ul style="list-style-type: none"> Missing brickwork throughout. <p>External</p> <ul style="list-style-type: none"> No evidence or potential for bats. 	High

Map Code	Structure name/tree species	Grid Reference (ITM)	Feature Location and Description	Suitability
				
BS3	Inchicore Works Turret	711136, 733518	<p>Internal</p> <ul style="list-style-type: none"> Access was limited owing to safety constraints. <p>External</p> <ul style="list-style-type: none"> Gaps in boarded windows and some gaps in external brick work. 	Moderate
BS4	Inchicore Works Old Signal Tower	711114, 733533	<p>Internal</p> <ul style="list-style-type: none"> Access was limited owing to safety constraints. <p>External</p> <ul style="list-style-type: none"> Gap in window and open brickwork at highest part of tower. 	Moderate

Map Code	Structure name/tree species	Grid Reference (ITM)	Feature Location and Description	Suitability
				
BS5	Abandoned residential building	698522, 731461	<p>Internal</p> <ul style="list-style-type: none"> Internal inspection found no signs of bats in most rooms. Butterfly wings found in one ground floor room. <p>External</p> <ul style="list-style-type: none"> Missing roof tiles throughout south side of house with some larger open sections. Upturned flashing on western dormer. Missing ridge tiles on east end of ridge. Missing edge strips on south side of house. 	High
BS6	Existing Shunter room	710798, 733399	<p>Internal</p> <ul style="list-style-type: none"> No evidence of bats. <p>External</p> <ul style="list-style-type: none"> Gaps in fascia board but cobwebs present. 	Negligible

Map Code	Structure name/tree species	Grid Reference (ITM)	Feature Location and Description	Suitability
				
BS7	Existing Fuel room	710812, 733406	<p>Internal</p> <ul style="list-style-type: none"> Internal inspection found no evidence of bats. No potential for roosting bats. <p>External</p> <ul style="list-style-type: none"> External inspection found no evidence of bats. No potential for roosting bats. 	Negligible
BS8	Maintenance shed and plant room	710860, 733423	<p>Internal</p> <ul style="list-style-type: none"> Internal inspection found no evidence of bats. No potential for roosting bats. <p>External</p> <ul style="list-style-type: none"> Structure has new roof/fascia/soffit since January 2021. No evidence of bats. No potential for roosting bats. 	Negligible

Map Code	Structure name/tree species	Grid Reference (ITM)	Feature Location and Description	Suitability
				
BS9	Dan Ryan's rental (truck wash facility)	711663, 733706	<p>Internal</p> <ul style="list-style-type: none"> Internal inspection found no evidence of bats. No potential for roosting bats. <p>External</p> <ul style="list-style-type: none"> Some staining on stonework and droppings but most likely from birds. No potential roosting features identified. 	Negligible
BS10	Abandoned residential building	698545, 731499	<p>External</p> <ul style="list-style-type: none"> Numerous roof tiles broken or missing, northwest facing. Gap present between flashing and tiles on front of house. Gaps under soffit on the north of the house. 	Moderate

Map Code	Structure name/tree species	Grid Reference (ITM)	Feature Location and Description	Suitability
				
BS11	Abandoned residential building	698508, 731440	<p>External</p> <ul style="list-style-type: none"> • Gaps between roof tiling and soffit (x3), on the north and east sides of the house. • Missing glass in window frame near front door to the east side of the house. • Missing roof tiles on west side of house with some larger open sections. • Missing glass on large window frame on roof on west side of the house. 	High

Bat Activity

The static detector survey nights per month and per location are detailed in Table 1-14. Detectors were deployed and recording for a minimum of 68 nights (South Circular Road) and maximum of 119 nights (Tubber Lane) between May and September 2021.

A total of six species of bat species (Leisler's bat, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle, brown long-eared, and Daubenton's) were identified foraging and/or commuting in the vicinity of the static detector deployment locations. In addition, unidentified *Myotis* species and *Pipistrellus* species were also recorded (Table 1-15 - Table 1-18).

Bat Passes Per Night (BPPN) are detailed in Figure 1.2.

Table 1-14: Static Detector Deployment per Location

Location	Number of nights deployed per month					Total night deployed
	May	June	July	August	September	
Tubber Lane	17	29	30	30	13	119
Clondalkin	17	29	28	21	8	103
South Circular Road	4	28	20	13	3	68
Cabra	17	14	22	21	0	74

Table 1-15: Tubber Lane: Number of Passes per Species

Species	May	June	July	August	September	Total (%)
<i>Myotis</i> species	2	7	1	2	0	12 (0.3)
Leisler's bat	67	1102	649	496	214	2528 (62.1)
Nathusius' pipistrelle	0	7	5	0	1	13 (0.3)
Common pipistrelle	47	578	324	148	149	1246 (30.6)
Soprano Pipistrelle	12	89	52	43	38	234 (5.8)
<i>Pipistrellus</i> species	3	20	6	2	3	34 (0.8)
Brown long-eared bat	0	1	0	1	0	2 (0.05)
Total	131	1804	1037	692	405	4069

Table 1-16: Clondalkin: Number of Passes per Species

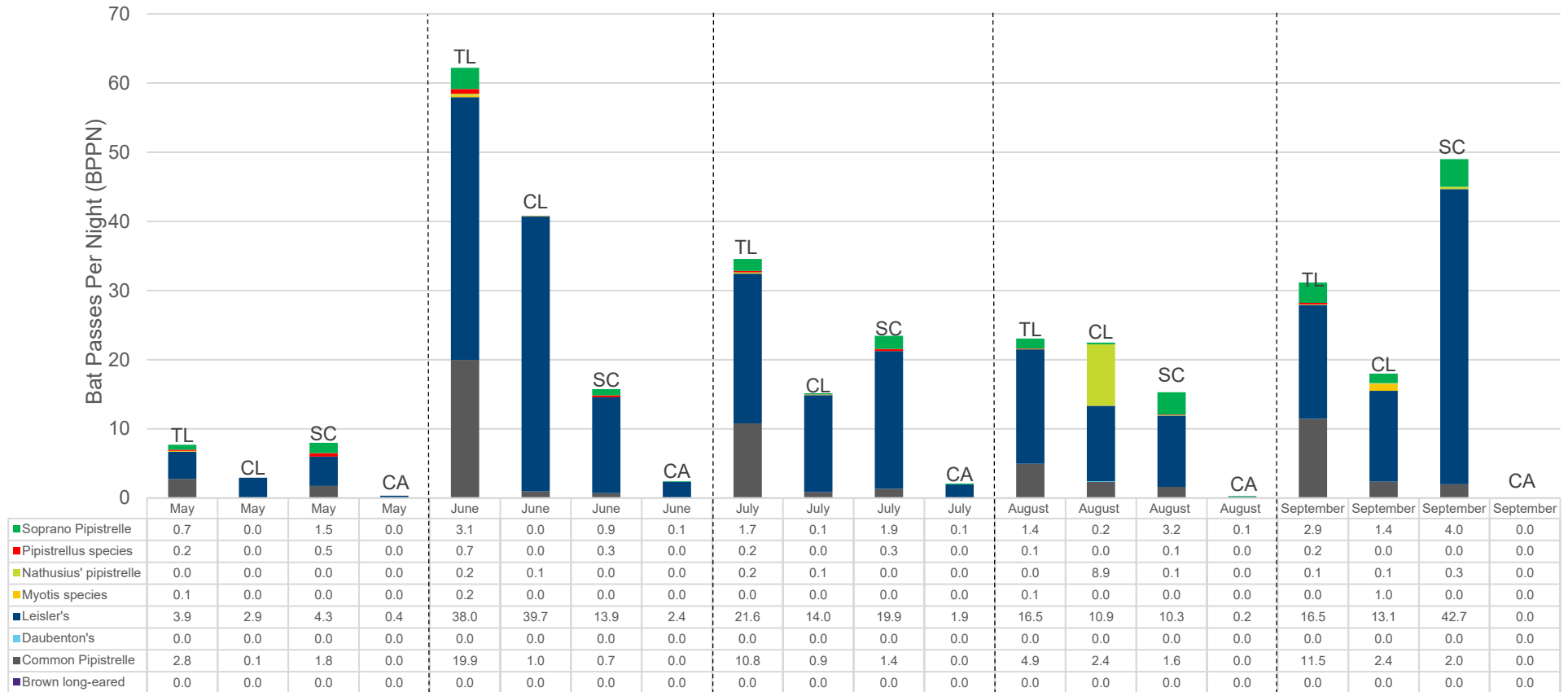
Species	May	June	July	August	September	Total (%)
Daubenton's bat	0	0	0	1	0	1 (0.04)
<i>Myotis</i> species	0	0	0	1	8	9 (0.4)
Leisler's bat	49	1152	393	229	105	1928 (84.8)
Nathusius' pipistrelle	0	2	2	186	1	191 (8.4)
Common pipistrelle	1	28	24	50	19	122 (5.4)
Soprano Pipistrelle	0	1	4	5	11	21 (0.9)
<i>Pipistrellus</i> species	0	1	1	0	0	2 (0.09)
Total	50	1184	424	472	144	2274

Table 1-17: South Circular Road: Number of Passes per Species

Species	May	June	July	August	September	Total (%)
Leisler's bat	17	388	398	134	128	1065 (82.7)
Nathusius' pipistrelle	0	0	0	1	1	2 (0.2)
Common pipistrelle	7	20	27	21	6	81 (6.3)
Soprano pipistrelle	6	25	38	42	12	123 (9.5)
<i>Pipistrellus</i> species	2	8	6	1	0	17 (1.3)
Total	32	441	469	199	147	1288

Table 1-18: Cabra: Number of Passes per Species

Species	May	June	July	August	September	Total (%)
Leisler's bat	6	33	42	4	0	85 (92.4)
Common pipistrelle	0	0	1	0	0	1 (1.1)
Soprano Pipistrelle	0	1	3	2	0	6 (6.5)
Total	6	34	46	6	0	92



TL=Tubber Lane; CL=Clondalkin; SC=South Circular Road; CA=Cabra

Figure 1.2: Bat passes per night (BPPN) by month and location

Emergence re-entry survey

The dates, timing, and weather conditions for the emergency/re-entry surveys are detailed in Table 1-19. No bats were recorded emerging or re-entering from surveyed structures identified as have moderate or high suitability for roosting bats.

Table 1-19: Dates, Timings and Weather Conditions for Bat Activity Transect Surveys

Date (Location)	Sunset/sunrise time	Start time of survey	End time of survey	Cloud cover (%)	Precipitation	Wind (0-7)	Temperature (°C)
03/06/21 (PPT – north end)	21:45	21:30	23:30	10	0	4	13
03/06/21 (PPT – South end)	21:45	21:30	23:45	10	0	3-4	15
16/07/21 (PPT – north end)	05:16	03:16	04:45	25	0	0	17
15/07/21 (PPT – South end)	05:16	03:16	04:52	60	0	1	17
21/09/21 (PPT – north end)	19:25	19:17	21:25	98	0	3	-
21/09/21 (PPT – South end)	19:25	19:10	21:25	98	0	5	18
05/10/21 (PPT – north end)	18:51	18:36	20:51	85	0	2	12
05/10/21 (PPT – South end)	18:51	18:36	20:51	60	0	4-5	16
17/06/21 (Inchicore – signal box)	21:56	21:41	23:26	80	0	3	15
17/06/21 (Inchicore – turret)	21:56	21:41	23:26	90	0	0	15
20/07/21 (Inchicore – signal box)	05:23	03:23	04:53	0	0	0	20
20/07/21 (Inchicore – turret)	05:23	03:23	04:55	0	0	1	19
23/09/21 (Inchicore – signal box)	19:21	19:06	21:21	85	0	3-5	19
23/09/21 (Inchicore – turret)	19:21	19:06	21:21	90	0	3	19
22/06/21 (RCB – North)	21:57	21:42	23:57	80	Light	3	13
22/06/21 (RCB – South)	21:57	21:42	23:57	98	Light	3-4	16
28/07/21 (RCB – North)	05:35	03:35	05:53	20	0	0	12
28/07/21 (RCB – South)	05:35	03:35	04:50	100	0	2	14

Date (Location)	Sunset/sunrise time	Start time of survey	End time of survey	Cloud cover (%)	Precipitation	Wind (0-7)	Temperature (°C)
22/09/21 (RCB – East)	19:08	19:08	21:23	65	0	4	18
22/06/21 (RCB – West)	19:23	19:14	21:23	60	0	3-4	18

Incidental Bat Activity

During the emergence and re-entry surveys, incidental bat activity was recorded (see Table 1-20 to Table 1-23)

Table 1-20: Inchicore Works (Turret and Old Signal Tower) (BS3 and BS4) – Incidental Bat Activity Recorded during Emergence re-entry Surveys

Date	Surveyor Location	Time	Frequency	Species	Description
17/06/2021	Turret	22:25	45	Common pipistrelle	Heard and seen, flying west along front of building
20/07/2021	Turret	03:24	24.8	Leisler's bat	Heard not seen
20/07/2021	Turret	03:37	54.8	Unknown	Heard not seen
20/07/2021	Turret	03:40	46.9	Unknown	Heard not seen
20/07/2021	Turret	03:40	49.1	Pipistrelle sp.	Heard not seen
20/07/2021	Turret	03:58	24.0	Leisler's bat	Heard not seen
20/07/2021	Signal box	03:37	51	Common pipistrelle	Flying SW over main building
20/07/2021	Signal box	03:39	46.5	Common pipistrelle	Flying SW over main building
20/07/2021	Signal box	03:40	45	Common pipistrelle	Flying SW over main building
23/09/2021	Turret	20:05	31.5	Brown long-eared bat	Heard not seen

Table 1-21: Phoenix Park Tunnel (BS2) - Incidental Bat Activity Recorded During Emergence re-entry Surveys

Date	Surveyor Location	Time	Frequency	Species	Description
03/06/2021	North	21:34	24	Leisler's bat	Potentially not a bat, incorrect sound
03/06/2021	North	22:23	24	Leisler's bat	Potentially not a bat, incorrect sound
03/06/2021	North	22:39	48-50	Common pipistrelle	One flew in behind surveyor but flew back out again, flying in front of tunnel
03/06/2021	North	22:46	45.5	Common pipistrelle	-
03/06/2021	North	23:00	25.5	Leisler's bat	-
03/06/2021	North	23:05	22.5	Leisler's bat	-
03/06/2021	North	23:10	22.5	Leisler's bat	-
03/06/2021	South	22:15	49	Pipistrelle sp.	Outside tunnel at Liffey bridge. Commuting

Date	Surveyor Location	Time	Frequency	Species	Description
03/06/2021	South	22:15	49	Pipistrelle sp.	Flying south, not from tunnel. Commuting
03/06/2021	South	22:30	43	Unknown	Flying north, up and over tunnel
03/06/2021	South	22:47	-	Unknown	Not out of tunnel
03/06/2021	South	23:13	43	Pipistrelle sp.	Outside of tunnel. Commuting
15/07/2021	South	03:36	57	Soprano pipistrelle	Heard not seen
15/07/2021	South	03:52	57	Soprano pipistrelle	Heard not seen
15/07/2021	South	04:06	52.5	Soprano pipistrelle	Heard not seen
16/07/2021	North	03:22	47.5	Pipistrelle sp.	Flying into and out of tunnel
16/07/2021	North	03:22	51	Pipistrelle sp.	Flying into and out of tunnel
16/07/2021	North	03:30	24.8	Unknown	Flying into and out of tunnel
16/07/2021	North	03:30	45.8	Unknown	Heard not seen
16/07/2021	North	03:30	48	Unknown	Heard not seen
16/07/2021	North	03:30	50.2	Unknown	Flew into tunnel
16/07/2021	North	03:31	54.4	Myotis sp.	-
16/07/2021	North	03:33	45.8	Common pipistrelle	Heard not seen
16/07/2021	North	03:33	24	Unknown	Heard not seen
16/07/2021	North	03:44	46.5	Unknown	Into tunnel
16/07/2021	North	03:45	49.5	Unknown	Into tunnel
16/07/2021	North	03:45	51	Unknown	-
16/07/2021	North	03:47	57	Myotis sp.	-
16/07/2021	North	03:47	48.4	Unknown	Flew into tunnel
16/07/2021	North	03:47	54	Unknown	Flew into tunnel
16/07/2021	North	03:48	48	Pipistrelle sp.	Flew into tunnel
16/07/2021	North	03:48	47.2	Pipistrelle sp.	Flew into tunnel
16/07/2021	North	03:49	52.5	Common pipistrelle	Flew into tunnel
16/07/2021	North	03:49	47.2	Common pipistrelle	Flew into tunnel
16/07/2021	North	03:49	46.5	Common pipistrelle	Flew into tunnel
16/07/2021	North	03:50	48.4	Pipistrelle sp.	-
16/07/2021	North	03:50	51.8	Unknown	-
16/07/2021	North	03:51	55.5	Myotis sp.	Flying in and out of tunnel
16/07/2021	North	03:52	47.2	Pipistrelle sp.	-
16/07/2021	North	03:52	48	Pipistrelle sp.	Flying out and around tunnel entrance
16/07/2021	North	03:53	54	Myotis sp.	-
16/07/2021	North	03:54	49.5	Unknown	Flying into tunnel
16/07/2021	North	03:54	58.5	Myotis sp.	-
16/07/2021	North	03:54	49.5	Unknown	Out of tunnel
16/07/2021	North	03:54	49.5	Pipistrelle sp.	-
16/07/2021	North	03:56	52.5	Pipistrelle sp.	Into tunnel
16/07/2021	North	03:56	55.5	Myotis sp.	-
16/07/2021	North	03:57	48	Common pipistrelle	-
16/07/2021	North	03:57	94.5	Pipistrelle sp.	In and out of tunnel

Date	Surveyor Location	Time	Frequency	Species	Description
16/07/2021	North	03:59	52.5	Unknown	Out and in of tunnel
16/07/2021	North	03:59	49.5	Pipistrelle sp.	In and out of tunnel
16/07/2021	North	03:59	63	Myotis sp.	-
16/07/2021	North	04:00	48	Unknown	Fly into tunnel
16/07/2021	North	04:00	51	Unknown	-
16/07/2021	North	04:00	49.5	Common pipistrelle	-
16/07/2021	North	04:01	48	Pipistrelle sp.	Out + in
16/07/2021	North	04:02	51	Common pipistrelle	Out + in
16/07/2021	North	04:02	52.5	Pipistrelle sp.	In
16/07/2021	North	04:05	55.5	Myotis sp.	In + out
16/07/2021	North	04:05	48	Common pipistrelle	In + out
16/07/2021	North	04:06	24.8	Unknown	-
16/07/2021	North	04:06	45	Common pipistrelle	-
16/07/2021	North	04:09	24	Nyctaloid sp.	-
16/07/2021	North	04:19	54	Unknown	-
16/07/2021	North	04:19	48	Unknown	-
16/07/2021	North	04:20	51.4	Unknown	-
16/07/2021	North	04:20	48	Common pipistrelle	Flew into tunnel
16/07/2021	North	04:20	51	Pipistrelle sp.	Flew into tunnel
16/07/2021	North	04:21	49.5	Pipistrelle sp.	-
16/07/2021	North	04:22	48	Common pipistrelle	In + out
16/07/2021	North	04:22	54	Unknown	-
16/07/2021	North	04:22	57	Unknown	-
16/07/2021	North	04:22	51	Pipistrelle sp.	Out + in
16/07/2021	North	04:25	49.5	Unknown	-
16/07/2021	North	04:26	88.5	Unknown	Flying around entrance, in + out
16/07/2021	North	04:26	49.5	Pipistrelle sp.	Flying around entrance, in + out
16/07/2021	North	04:27	54	Unknown	Flying around entrance, in + out
16/07/2021	North	04:28	46.5	Common pipistrelle	In + out
16/07/2021	North	04:29	48	Pipistrelle sp.	Flying around outside + into tunnel
16/07/2021	North	04:29	51	Unknown	-
16/07/2021	North	04:30	48	Common pipistrelle	-
16/07/2021	North	04:31	48	Pipistrelle sp.	-
16/07/2021	North	04:31	58.5	Myotis sp.	-
16/07/2021	North	04:31	54	Unknown	-
16/07/2021	North	04:31	46.5	Common pipistrelle	-
16/07/2021	North	04:33	52	Myotis sp.	-
16/07/2021	North	04:33	48	Common pipistrelle	Flying around entrance
16/07/2021	North	04:33	51	Pipistrelle sp.	-
16/07/2021	North	04:34	49.5	Common pipistrelle	-
16/07/2021	North	04:34	46.5	Unknown	-
16/07/2021	North	04:35	51	Unknown	Out + in + out

Date	Surveyor Location	Time	Frequency	Species	Description
16/07/2021	North	04:37	51	Common pipistrelle	Flying around entrance. Possibly feeding
16/07/2021	North	04:38	48	Common pipistrelle	-
16/07/2021	North	04:39	51	Common pipistrelle	In + out
16/07/2021	North	04:40	49.5	Common pipistrelle	In + out
16/07/2021	North	04:43	58.5	Unknown	In + out
16/07/2021	North	04:44	52.5	Pipistrelle sp.	In + out
21/09/2021	North	19:43	52.5	Pipistrelle sp.	-
21/09/2021	North	19:43	48.0	Pipistrelle sp.	-
21/09/2021	North	19:43	46.5	Unknown	-
21/09/2021	North	19:45	43.5	Unknown	-
21/09/2021	North	19:50	49.5	Myotis sp.	-
05/10/2021	North	18:48	25.5	Leisler's bat	Heard not seen
05/10/2021	North	19:19	24	Leisler's bat	Heard not seen
05/10/2021	North	19:26	49.5	Common pipistrelle	Flew into tunnel and then back out again and up above tunnel

Table 1-22: Royal Canal Rail Bridge (BS1) - Incidental Bat Activity Recorded During Emergence re-entry Surveys

Date	Surveyor Location	Time	Frequency	Species	Description
22/06/21	North	21:51	22.5	Leisler's bat	Heard not seen
22/06/21	North	22:19	22.5	Leisler's bat	Heard not seen
22/06/21	North	22:32	22.5	Leisler's bat	Heard not seen
22/06/21	South	21:53	19.5	Unknown	Not likely, no observation
22/06/21	South	22:19	22.5	Leisler's bat	Not observed at roost
28/07/21	North	04:28	45	Common pipistrelle	Heard not seen
28/07/21	North	03:59	46	Common pipistrelle	Heard not seen
28/07/21	South	03:37	43.5	Common pipistrelle	Heard not seen
28/07/21	South	03:54	49.5	Soprano pipistrelle	Flying over SW over bridge
22/09/21	East	20:09	52.5	Unknown	Flying outside tunnel for a few minutes. Flew in but was not observed flying out

Table 1-23: Abandoned Residential Building (BS5) - Incidental Bat Activity Recorded during Emergence re-entry Surveys

Date	Surveyor Location	Time	Frequency	Species	Description
05/05/22	North east and south east of building	20:48 – 23:05	-	Unknown	Several unidentified bats observed flying overhead and around nearby trees. No bats observed emerging from building.
19/05/22	South east	22:05	44.6	Common pipistrelle	Heard not seen

Date	Surveyor Location	Time	Frequency	Species	Description
19/05/22	North east	22:05	45.8	Common pipistrelle	Seen and heard flying overhead but not emerging from building
19/05/22	South east	22:05	26.2	Leisler's bat	Heard not seen
19/05/22	South east	22:11	23.6	Leisler's bat	Heard not seen
19/05/22	North east	22:25	25.9	Leisler's bat	Seen and heard flying directly above building
19/05/22	South east	22:25	27.4	Leisler's bat	Heard not seen
19/05/22	North east	22:26	46.5	Common pipistrelle	Seen and heard flying adjacent to building
19/05/22	South east	22:26	46.5	Common pipistrelle	Seen and heard flying eastwards on north facing side of house
19/05/22	South east	22:30	23.2	Unknown	Heard not seen
19/05/22	South east	22:31	22.9	Leisler's bat	Heard not seen
19/05/22	South east	23:08	58.1	Pipistrelle sp.	Flew from direction of feature. Not certain if emergence or not.
02/06/2022	South east	04:02	46.5	Common pipistrelle	Heard not seen
02/06/2022	South east	04:17	22.5	Leisler's bat	Heard not seen

Hibernation Assessment

One species of bat (brown long-eared bat (*Plecotus auratus*)) was recorded twice during the hibernation survey period (Table 1-24).

Table 1-24: Bat hibernation assessment - static Bat Detector Results

Location Name	Scientific Name (Common Name)	Date Recorded	Time Recorded (hour:minute:second)	No. of Passes
Phoenix Park Tunnel North	Brown long-eared bat (<i>Plecotus auratus</i>)	22.02.2022	00:48:46	1
Phoenix Park Tunnel Middle	Brown long-eared bat (<i>Plecotus auratus</i>)	22.02.2022	00:47:04	1

1.2.2.3.2. Badger

The assessment identified seven locations with evidence of use by badger, see Table 1-25 and Figure 1.3.

Table 1-25: Evidence of Badger Recorded During the Field Surveys

Evidence type	Location (ITM)	Description
Scat	713338, 734997	Single scat recorded
Scat	713354, 735066	Single scat recorded
Scat and potential trail	713406, 735146	Suggestion of a trail cutting on both sides of track, with disturbed vegetation.
Latrines with scat	713423, 735254	Two large well defined latrines deposits on north west side of track.



Evidence type	Location (ITM)	Description
Scat	704562, 732720	Old badger scat on station platform. South side. Nearby access gate would not prohibit badger activity.
Scat	701981, 732844	Two old scats on platform. Gated access would not preclude badger accessing area.
Scat	698528, 731468	Single scat recorded



Legend

Redline Development Boundary

Badger Evidence

- Latrines with scat
- Scat
- Scat and potential trail



Data source: OSi

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Rev	Date	Dm	Chk'd	App'd	Description
v04	21/12/2022	NR	HF	MN	Badger Evidence
v03	11/11/2022	NR	HF	MN	Badger Evidence
v02	08/09/2022	NR	HF	MN	Badger Evidence
v01	31/05/2022	NR	HF	MN	Badger Evidence

Client: **Iarnród Éireann Irish Rail**

Date: 21/12/2022 Scale: 1:2,500 @ A4

Project Code: 5195886 Issuer: TTA OMS Code

Engineering Designer: **ATKINS** (Member of the SNC-Lavalin Group) Supported by: **rps**

Drawn	Checked	Approved
NR	HF	MN

Project Title: **DART + SOUTH WEST**


Drawing Title: **Figure 1.3: Badger Evidence Map 1 of 4**

Drawing File Name: **DP-04-23-DWG-EV-TTA-23763** Version: v04 Status: S3


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Legend

 Redline Development Boundary

Badger Evidence

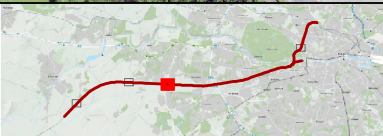
 Scat

Data source: OSI



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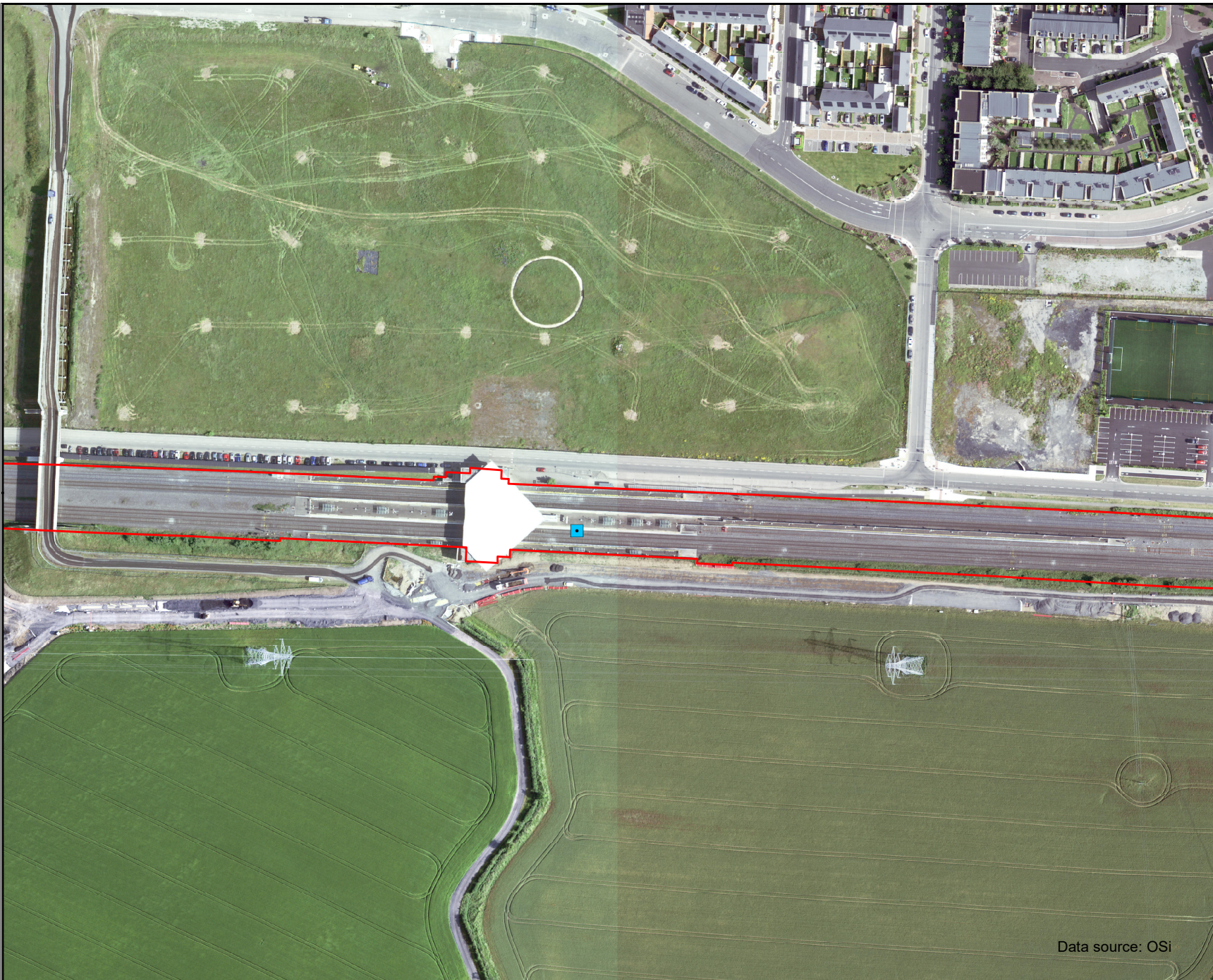


Rev	Date	Dm	Chk'd	App'd	Description
v04	21/12/2022	NR	HF	MN	Badger Evidence
v03	11/11/2022	NR	HF	MN	Badger Evidence
v02	08/09/2022	NR	HF	MN	Badger Evidence
v01	31/05/2022	NR	HF	MN	Badger Evidence


Client		Engineering Designer	
			
Date	Scale	Drawn	Checked
21/12/2022	1:2,500 @ A4	NR	HF
Project Code	Issuer	OMS Code	
5195886	TTA		
Supported by:		Approved	
 		MN	

Project Title	DART + SOUTH WEST		
Drawing Title	Figure 1.3: Badger Evidence Map 2 of 4		
Drawing File Name	DP-04-23-DWG-EV-TTA-23763	Version	Status
		v04	S3


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Legend

 Redline Development Boundary

Badger Evidence

 Scat





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Rev	Date	Dm	Chk'd	App'd	Description
v04	21/12/2022	NR	HF	MN	Badger Evidence
v03	11/11/2022	NR	HF	MN	Badger Evidence
v02	08/09/2022	NR	HF	MN	Badger Evidence
v01	31/05/2022	NR	HF	MN	Badger Evidence

Client		Engineering Designer	
			
Date 21/12/2022		Scale 1:2,500 @ A4	
Project Code 5195886		Issuer TTA	
		OMS Code	
		Drawn NR	
		Checked HF	
		Approved MN	

Project Title		DART + SOUTH WEST	
Drawing Title		Figure 1.3: Badger Evidence Map 3 of 4	
Drawing File Name	DP-04-23-DWG-EV-TTA-23763	Version	v04
Status	S3		

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Legend

Redline Development Boundary

Badger Evidence

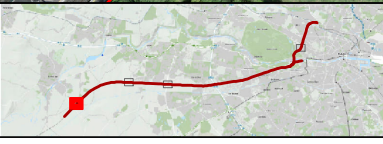
Scat

Data source: OSI



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Rev	Date	Dm	Chk'd	App'd	Description
v04	21/12/2022	NR	HF	MN	Badger Evidence
v03	11/11/2022	NR	HF	MN	Badger Evidence
v02	08/09/2022	NR	HF	MN	Badger Evidence
v01	31/05/2022	NR	HF	MN	Badger Evidence

Client		Engineering Designer							
Date	21/12/2022	Scale	1:2,500 @ A4	Drawn	NR	Checked	HF	Approved	MN
Project Code	5195886	Issuer	TTA	QMS Code					

Project Title	DART + SOUTH WEST				
Drawing Title	Figure 1.3: Badger Evidence Map 4 of 4				
Drawing File Name	DP-04-23-DWG-EV-TTA-23763	Version	v04	Status	S3

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1.2.2.3.3. Birds

The breeding bird surveys were completed in March, April, and May 2021 during favourable conditions (Table 1-26).

A total of 32 bird species were recorded during the survey. Of these, 12 species are considered of ‘Amber’ conservation concern, and one species is considered of ‘Red’ conservation concern (Table 1-27). 24 species were considered to be probable or confirmed breeders with the study area, eight of which are of ‘Amber’ conservation concern (greenfinch, linnet, herring gull, house martin, house sparrow, starling, robin and willow warbler). Three species were considered to be possible breeders, one of which was of ‘Amber’ conservation concern (sparrowhawk). Four species were considered to be non-breeders, two of which were of ‘Amber’ conservation concern (black-headed gull and swallow) and one of which was of ‘Red’ conservation concern (swift).

Table 1-26: Breeding bird survey timing and weather conditions

Survey Date	Start time	Survey Conditions			
		Cloud	Wind	Visibility	Precipitation
26 th March 2021	06:20	4/8	Force 2	>2km	None
16 th April 2021	06:10	2/8	Force 3	>2km	None
11 th May 2021	05:30	2/8	Force 2-3	>2km	None

Table 1-27: Breeding bird survey results and conservation status

BTO Code	Species	Approx. no of breeding pairs						Highest breeding evidence recorded***	Conservation status****
		VP1 Le Fanu Road*	VP2 Memorial Road	VP3 Aughrim Street	VP4 Glasnevin Cemetery	VP5 Fassauga Avenue	VP6 Inchicore Works footbridge**		
B.	Blackbird <i>Turdus merula</i>	1	4	3	3	4	2	Confirmed breeder (FF)	Green
BH	Black-headed gull <i>Chroicocephalus ridibundus</i>	0	0	0	0	0	0	Non-breeder (F)	Amber, AEWA
BT	Blue tit <i>Cyanistes caeruleus</i>	1	1	2	2	1	1	Probable breeder (A)	Green
BF	Bullfinch <i>Pyrrhula pyrrhula</i>	0	0	0	1	0	0	Probable breeder (P)	Green
CH	Chaffinch <i>Fringilla coelebs</i>	2	2	2	3	2	1	Probable breeder (T)	Green
CC	Chiffchaff <i>Phylloscopus collybita</i>	1	0	1	2	1	0	Possible breeder (S)	Green
CT	Coaltit <i>Periparus ater</i>	1	0	0	1	0	0	Probable breeder (T)	Green
CD	Collared Dove <i>Streptopelia decaocto</i>	0	1	0	1	1	2	Probable breeder (P)	Green
D.	Dunnock <i>Prunella modularis</i>	1	1	1	2	1	1	Probable breeder (P)	Green
FP	Feral pigeon <i>Columba livia domestica</i>	0	0	0	0	0	3	Probable breeder (N)	Green
GT	Great tit <i>Parus major</i>	1	3	2	2	1	1	Probable breeder (A)	Green
GR	Greenfinch <i>Chloris chloris</i>	0	1	0	1	0	0	Probable breeder (T)	Amber
HG	Herring Gull <i>Larus argentatus</i>	0	0	0	0	0	2	Probable breeder (T)	Amber
HC	Hooded crow <i>Corvus cornix</i>	0	1	0	1	0	1	Confirmed breeder (NY)	Green
HM	House Martin <i>Delichon urbicum</i>	0	0	0	0	0	2	Probable breeder (N)	Amber
HS	House Sparrow <i>Passer domesticus</i>	3	3	0	2	0	5	Confirmed breeder (FL)	Amber
JD	Jackdaw <i>Corvus monedula</i>	0	0	0	0	0	0	Non-breeder (F)	Green
LB	Lesser Black-Backed gull <i>Larus fuscus</i>	0	0	0	0	0	0	Non-breeder (F)	Amber, AEWA
LI	Linnet <i>Linaria cannabina</i>	0	0	0	0	1	0	Probable breeder (N)	Amber
MG	Magpie <i>Pica pica</i>	0	1	1	1	2	0	Probable breeder (A)	Green

BTO Code	Species	Approx. no of breeding pairs						Highest breeding evidence recorded***	Conservation status****
		VP1 Le Fanu Road*	VP2 Memorial Road	VP3 Aughrim Street	VP4 Glasnevin Cemetery	VP5 Fassaugh Avenue	VP6 Inchicore Works footbridge**		
PW	Pied wagtail <i>Motacilla alba</i>	0	2	1	1	1	1	Confirmed breeder (FL)	Green
R.	Robin <i>Erithacus rubecula</i>	1	2	1	3	2	3	Confirmed breeder (FF)	Amber
RO	Rook <i>Corvus frugilegus</i>	0	0	0	0	0	0	Non-breeder (F)	Green
ST	Song thrush <i>Turdus philomelos</i>	0	1	1	1	0	1	Probable breeder (A)	Green
SH	Sparrowhawk <i>Accipiter nisus</i>	0	1	0	0	0	0	Possible breeder (F)	Amber
SG	Starling <i>Sturnus vulgaris</i>	1	0	2	0	0	2	Confirmed breeder (FF)	Amber
SL	Swallow <i>Hirundo rustica</i>	0	0	0	0	0	0	Non-breeder (F)	Amber
SI	Swift <i>Apus apus</i>	0	0	0	0	0	0	Non-breeder (F)	Red
TC	Treecreeper <i>Certhia familiaris</i>	0	0	1	0	0	0	Possible breeder (H)	Green
WW	Willow warbler <i>Phylloscopus trochilus</i>	0	0	3	2	0	1	Probable breeder (P)	Amber
WP	Woodpigeon <i>Columba palumbus</i>	0	1	1	2	0	1	Confirmed breeder (ON)	Green
WR	Wren <i>Troglodytes troglodytes</i>	1	2	2	2	2	1	Confirmed breeder (ON)	Green

* Le Fanu Road was surveyed only in March 2021 and then discontinued as it had severely restricted views.

** Inchicore Works footbridge was surveyed in April and May only.

*** Breeding evidence activities: FF=Adult carrying faecal sac or food for young; NY=Nest with young seen or heard; FL=Recently fledged young or downy young; ON=Adults entering or leaving nest-site indicating occupied nest; F=Flying over; A=Agitated behaviour; P=Pair in suitable nesting habitat; T=Permanent territory; N=Visiting probable nest site; S=Singing male; H=Observed in suitable nesting habitat.

**** Conservation status follows Gilbert *et al.* (2021) for Red, Amber, and Green status. Bird species included within the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) are indicated here also.

1.2.2.3.4. Freshwater Aquatic Invertebrates and Fish

A total of six sites within four watercourses were assessed for freshwater aquatic invertebrate potential (Figure 1.4). Field sheets from the freshwater aquatic survey are detailed in Table 1-28 to Table 1-33.

Table 1-28: 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.				
Macroinvertebrate list			EPA Sensitivity Group		Abundance
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
Lymea peregra			D		Few
Hydroptilidae			B		Few
Tubificidae			E		Few
Limnephilidae			B		Few
Total No. of Taxa = 14					
Q-value = Q3					
Fisheries Habitat: Summary					
Salmonids- 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.					
Lamprey- 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.					
Crayfish- 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.					

Table 1-29: 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.				
Macroinvertebrate list			EPA Sensitivity Group	Abundance	
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	
Total No. of Taxa = 18					
Q-value = Q2-3					
Fisheries Habitat: Summary					
Salmonids- 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.					
Lamprey- 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.					
Crayfish- 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 1-30: 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 1-31: 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 sift 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.				
Macroinvertebrate list		EPA Sensitivity Group		Abundance	
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	
Total No. of Taxa = 17					
Q- value = Q3					
Fisheries Habitat: Summary					
<p>Salmonid- 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 is 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.</p>					

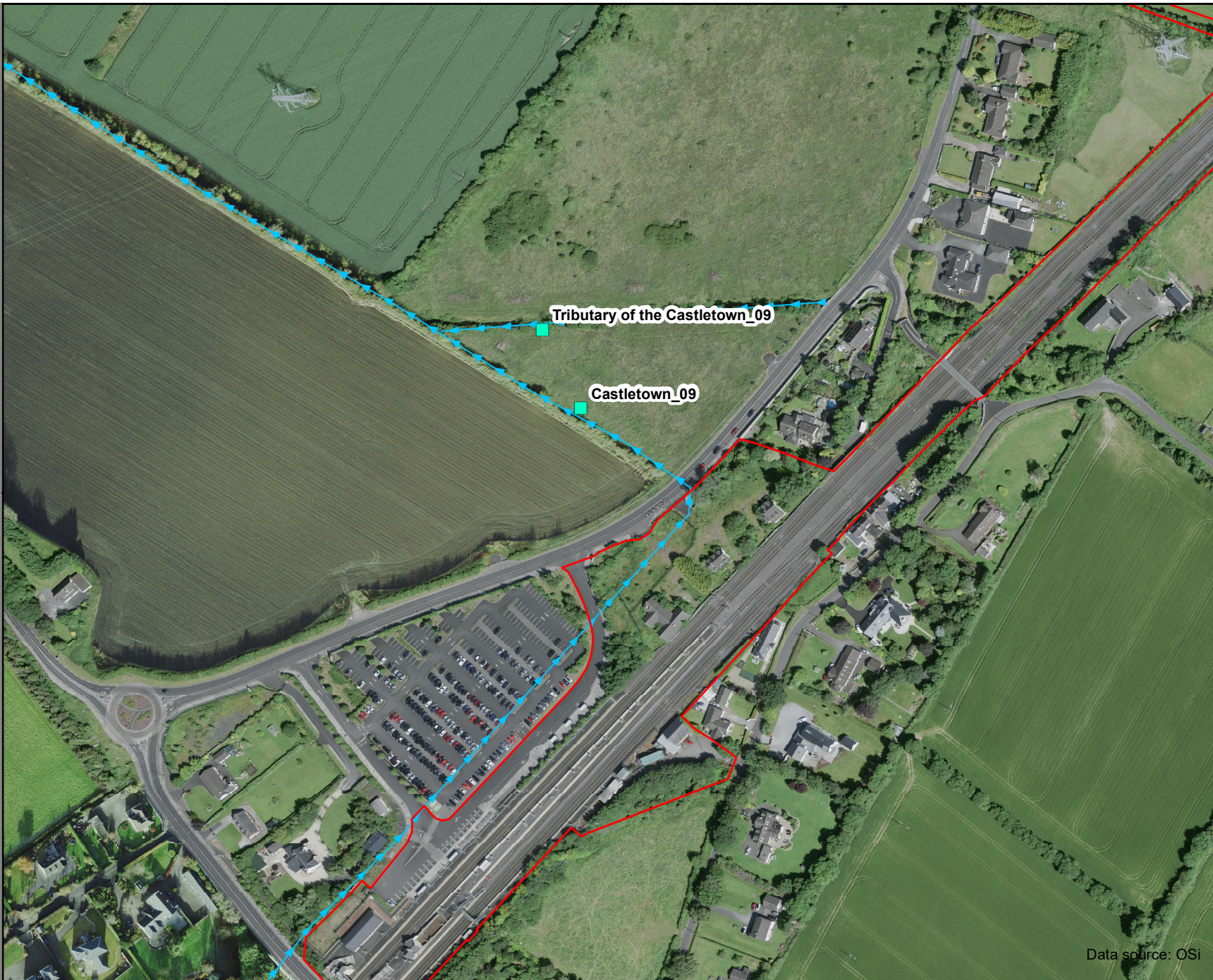
Lamprey- silt dominant, no sand available for eggs to adhere, no clean spawning gravels, some areas of slow flow/backwater, areas of mud/silty bed material in margins for burrowing but not common. Low and slow water depth. Barriers to migration present for adults, river was straightened historically 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 1-32: 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		
Total No. of Taxa = 12					
Q- value = Q3					
Fisheries Habitat: Summary					
Salmonids- 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.					
Lamprey- 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.					
Crayfish- 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 1-33: 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
Potamopygus			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
Total No. of Taxa = 12					
Q- value = Q3					
Fisheries Habitat: Summary					
Salmonids- 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.					
Lamprey- 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.					
Crayfish- 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.					



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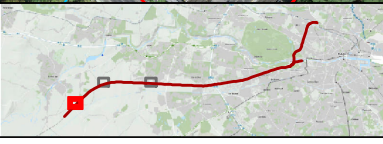
- Redline Development Boundary
- Aquatic Survey Locations
- Rivers



Data source: OSi

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Rev	Date	Dm	Chk'd	App'd	Description
v03	21/12/2022	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

Client		Engineering Designer	
Supported by:			
Date	21/12/2022	Scale	1:3,000 @ A4
Project Code	5195886	Drawn	NR
Issuer	TTA	Checked	HF
		Approved	MN
		QMS Code	

Project Title	DART + SOUTH WEST		
Drawing Title	Figure 1.4: Aquatic Survey Locations		
	Map 1 of 3		
Drawing File Name	DP-04-23-DWG-EV-TTA-23765	Version	v03
		Status	S3

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Legend

- Redline Development Boundary
- Aquatic Survey Locations
- Rivers

Coneyburrow_09

Data source: OSI



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Rev	Date	Dm	Chk'd	App'd	Description
v03	21/12/2022	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

Client		Engineering Designer							
Date	21/12/2022	Scale	1:3,000 @ A4	Drawn	NR	Checked	HF	Approved	MN
Project Code	5195886	Issuer	TTA	QMS Code					

Project Title	DART + SOUTH WEST		
Drawing Title	Figure 1.4: Aquatic Survey Locations		
	Map 2 of 3		
Drawing File Name	DP-04-23-DWG-EV-TTA-23765	Version	v03
Status	S3		

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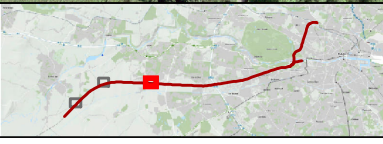
- Redline Development Boundary
- Aquatic Survey Locations
- Rivers



Data source: OSi

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Rev	Date	Dm	Chk'd	App'd	Description
v03	21/12/2022	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

Client		Engineering Designer	
Date	21/12/2022	Scale	1:3,000 @ A4
Project Code	5195886	Drawn	NR
	TTA	Checked	HF
		Approved	MN
		QMS Code	

Project Title	DART + SOUTH WEST		
Drawing Title	Figure 1.4: Aquatic Survey Locations		
	Map 3 of 3		
Drawing File Name	DP-04-23-DWG-EV-TTA-23765	Version	v03
		Status	S3

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1.2.3. Important Ecological Features

A summary evaluation of ecological features within the Zol of the proposed Project is detailed in Table 1-34.

Table 1-34: Summary Valuation of Ecological Features within the Zol of the proposed Project

Category	Ecological Features	Highest ecological valuation within Zol of proposed Project	Potentially affected by the Proposed Project	Important Ecological Features (Scoped into impact assessment)
Designated Sites for Nature Conservation	Rye Water Valley/Carton SAC (site code 001398)	International	No. Direct or indirect effects to this site are not predicted, as: <ul style="list-style-type: none"> The pathway to connectivity is upstream via a tributary of the River Liffey; and The site is not dependent on this upstream pathway. 	No
	South Dublin Bay SAC (site code 000210), South Dublin Bay and River Tolka Estuary SPA (site code 004024), North Dublin Bay SAC (site code 000206)	International	Yes. Potential indirect effects to these sites have been identified, as: <ul style="list-style-type: none"> A pathway for water pollution via the River Liffey is present. 	Yes
	Sandymount Strand/Tolka Estuary Ramsar (site 832), Dublin Bay Biosphere Reserve.	International	Yes. Potential indirect effects to these sites have been identified, as: <ul style="list-style-type: none"> A pathway for water pollution via the River Liffey is present. 	Yes
	Mouds Bog SAC [002331], North Bull Island SPA [004006], North Bull Island [Ramsar site 406], Glenasmole Valley SAC [001209], Baldoyle Bay SAC [000199], Baldoyle Bay SPA [004016], Baldoyle Bay [Ramsar site 413], Wicklow Mountains SAC [002122], Wicklow Mountains SPA [004040], Malahide Estuary SPA [004025], Broadmeadow Estuary [Ramsar site 833], Howth Head SAC [IE000202], Rockabill to Dalkey Island SAC [003000], Red Bog, Kildare SAC [000397], Ireland's Eye SPA [004117], Howth Head Coast SPA	International	No. Direct or indirect effects to these sites are not predicted, as: <ul style="list-style-type: none"> No pathway or connectivity within the Zol of the proposed Project has been identified. 	No

Category	Ecological Features	Highest ecological valuation within Zol of proposed Project	Potentially affected by the Proposed Project	Important Ecological Features (Scoped into impact assessment)
	[004113], Poulaphouca Reservoir SPA [004063], Dalkey Islands SPA [004172],			
	Royal Canal pNHA (site 002103)	National	Yes. Potential indirect effects to this site have been identified, as: <ul style="list-style-type: none"> A pathway for disturbance via noise, vibration and human presence is present. 	Yes
	Grand Canal pNHA (site 002104),	National	No. Direct or indirect effects to this site are not predicted, as: <ul style="list-style-type: none"> No pathway or connectivity within the Zol of the proposed Project has been identified. 	No
	Rye Water Valley/Carton pNHA (site 001398),	National	No. Direct or indirect effects to this site are not predicted, as: <ul style="list-style-type: none"> The pathway to connectivity is upstream via a tributary of the River Liffey; and The site is not dependent on this upstream pathway. 	No
	North Dublin Bay pNHA (site 000206), South Dublin Bay pNHA (site 000210)	National	Yes. Potential indirect effects to these sites have been identified, as: <ul style="list-style-type: none"> A pathway for water pollution via the River Liffey is present. 	Yes

Category	Ecological Features	Highest ecological valuation within Zol of proposed Project	Potentially affected by the Proposed Project	Important Ecological Features (Scoped into impact assessment)
	<p>Liffey Valley pNHA (site 000128), Santry Demesne pNHA (site 000178), Dodder Valley pNHA (site 000991), Lugmore Glen pNHA [001212], North Bull Island Nature Reserve, North Bull Island Wildfowl Sanctuary [WFS-19], Slade Of Saggart And Crooksling Glen pNHA [000211], Glenasmole Valley pNHA [001209], Killeel Wood pNHA [001394], Fitzsimon's Wood pNHA [001753], Feltrim Hill pNHA [001208], Baldoyle Bay pNHA [000199], Sluice River Marsh pNHA [001763], Baldoyle Estuary Nature Reserve, Malahide Estuary pNHA [000205], Howth Head pNHA [000202], Red Bog, Kildare pNHA [000397], Dalkey Coastal Zone And Killiney Hill pNHA [002106], Donadea Wood pNHA [001391], Ireland's Eye pNHA [000203], Poulaphouca Reservoir pNHA [004063], Ballinagee Wood pNHA [001750], Hollywood Glen pNHA [002053], Newtown marshes pNHA [001759], Liffey Valley Meander Belt pNHA [000393], Curragh Kildare pNHA [000392], Liffey at Osberstown pNHA [001395].</p>	National (Outside Zol)	<p>No. Direct or indirect effects to these sites are not predicted, as:</p> <ul style="list-style-type: none"> No pathway or connectivity within the Zol of the proposed Project has been identified. 	No
Habitats and Flora	<p>Zone A (Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station):</p> <ul style="list-style-type: none"> Hedgerows (WL1) Dry meadow and grassy verges (GS2) Eroding rivers (FW1) Depositing rivers (FW2) 	Local (lower) for both individual habitats and collectively.	<p>Yes. Potential direct and indirect effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; Disturbance from noise, vibration, lighting, and human presence; Pollution to water, air, and/or soil; and Spread of invasive alien species 	No.

Category	Ecological Features	Highest ecological valuation within ZoI of proposed Project	Potentially affected by the Proposed Project	Important Ecological Features (Scoped into impact assessment)
			Although potential direct and indirect effects have been identified the ecological features are valued as Local (lower) value and are not considered an IEF.	
	<p>Zone B and C (Park West & Cherry Orchard Station to Heuston Station)</p> <ul style="list-style-type: none"> Neutral grassland (GS1); Dry meadow and grassy verges (GS2) Matrix of scrub (WS1) and grassy verge (GS2); Scrub (WS1); Hedgerow (WL1), and Treeline (WL2) 	Local (higher)	<p>Yes. Potential direct and indirect effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; Disturbance from noise, vibration, lighting, and human presence; Pollution to water, air, and/or soil; and Spread of invasive alien species <p>Although individual habitats are deemed to be of Local (lower) value individually, collectively they have been valued as Local (higher) due to the corridor they provide in an urban setting.</p>	Yes
	<p>Zone D (River Liffey Bridge to Glasnevin Junction):</p> <ul style="list-style-type: none"> Neutral grassland (GS1); Matrix of scrub (WS1) and grassy verge (GS2); Hedgerow (WL1) Canal (FW3) Estuary (CW2) 			Yes
	<p>Other habitats not included above:</p> <ul style="list-style-type: none"> Arable crop (BC1) Stone walls and other stonework (BL1) Earth banks (BL2) Buildings and artificial surfaces (BL3) Exposed gravel (ED1) Spoil and bare ground (ED2) 	Local (lower)	<p>Yes. Potential direct and indirect effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; Disturbance from noise, vibration, lighting, and human presence; Pollution to water, air, and/or soil; and Spread of invasive alien species 	No

Category	Ecological Features	Highest ecological valuation within Zol of proposed Project	Potentially affected by the Proposed Project	Important Ecological Features (Scoped into impact assessment)
	<ul style="list-style-type: none"> Recolonising bare ground (ED3) Recolonising bare ground; GS2 Dry meadows and grassy verges (ED3); (GS2) Artificial underground habitat (EU2) Artificial Ponds (FL8) Drainage ditches (FW4) Improved agricultural grassland (GA1) Amenity grassland (improved) (GA2) Marsh (GM1) Wet grassland (GS4) Scrub and WD1 (Mixed) broadleaved woodland (WS1; WD1) (Mixed) broadleaved woodland (WD1) Immature woodland (WS2) 		Although potential direct and indirect effects have been identified the ecological features are valued as Local (lower) value and are not considered an IEF.	
Fauna	Bats (roosting)	Local (higher)/unknown	<p>Yes. Potential direct and indirect effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; and, Disturbance from noise, vibration, lighting, and human presence; <p>In establishing the baseline for roosting bats within the Zol of the proposed Project it was not possible to assess structures and trees within private residential ownership (i.e. areas adjoining the rail line along Clover Hill Rd, Cherry Orchard; Kylemore Dr, Kylemore; and Landen Rd, Decies/Kilmainham).</p>	Yes
	Bats (commuting and foraging)	Local (higher)	Yes. Potential direct and indirect effects to these features have been identified, as:	Yes

Category	Ecological Features	Highest ecological valuation within Zol of proposed Project	Potentially affected by the Proposed Project	Important Ecological Features (Scoped into impact assessment)
			<ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; and, Disturbance from noise, vibration, lighting, and human presence; 	
	Bats (hibernating)	Local (higher)	<p>Yes. Potential direct and indirect effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; and, Disturbance from noise, vibration, lighting, and human presence; 	Yes
	Badger (breeding, commuting, and foraging)	Local (higher)	<p>Yes. Potential direct and indirect effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; and, Disturbance from noise, vibration, lighting, and human presence; <p>In establishing the baseline for badger within the Zol of the proposed Project it was not possible to assess back gardens within private residential ownership (i.e. areas adjoining the rail line along Clover Hill Rd, Cherry Orchard; Kylemore Dr, Kylemore; and Landen Rd, Decies/Kilmainham). It was also not possible to assess areas of land adjoining the rail line, outside of IE ownership, between Parkwest and Cherry Orchard station and Hazelhatch Station.</p>	Yes
	Otter (breeding, commuting, and foraging)	-	<p>No. Direct or indirect effects to this feature are not predicted, as:</p> <ul style="list-style-type: none"> No pathway or connectivity within the Zol of the proposed Project has been identified. 	No
	Other protected mammals (hedgehog, pygmy shrew, pine marten, Irish stoat, red squirrel, Irish hare, and deer species)	Local (lower)	<p>Yes. Indirect effects to this feature are predicted, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; and, Disturbance from noise, vibration, lighting, and human presence; <p>Although records of these species were returned from the data search, no evidence was recorded during the field</p>	No

Category	Ecological Features	Highest ecological valuation within Zol of proposed Project	Potentially affected by the Proposed Project	Important Ecological Features (Scoped into impact assessment)
			surveys. These ecological features are valued as Local (lower) value and are not considered an IEF.	
	Birds (breeding)	Local (higher)	Yes. Potential direct and indirect effects to these features have been identified, as: <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; and, Disturbance from noise, vibration, lighting, and human presence. 	Yes
	Birds (commuting and foraging)	Local (higher)	Yes. Potential direct and indirect effects to these features have been identified, as: <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; and, Disturbance from noise, vibration, lighting, and human presence. 	Yes
	Amphibians (common frog and smooth newt) and Reptiles (common lizard)	Local (lower)	Yes. Indirect effects to these features are predicted, as: <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; and, Although records of these species were returned from the data search or suitable habitat was present, no evidence was recorded during the field surveys. These ecological features are valued as Local (lower) value and are not considered an IEF.	No
	Invertebrates (freshwater pearl mussel)	-	No. Direct or indirect effects to these sites are not predicted, as: <ul style="list-style-type: none"> No pathway or connectivity within the Zol of the proposed Project has been identified. 	No
	Invertebrates (white-clawed crayfish)	Local (lower)	Yes. Potential indirect effects to these features have been identified, as: <ul style="list-style-type: none"> Pollution to water, air, and/or soil. Although records of these species were returned from the data search and the field surveys, this ecological feature is valued as Local (lower) value and is not considered an IEF.	No

Category	Ecological Features	Highest ecological valuation within Zol of proposed Project	Potentially affected by the Proposed Project	Important Ecological Features (Scoped into impact assessment)
	Invertebrates (terrestrial)	Local (lower)	<p>Yes. Potential direct and indirect effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration; and, Disturbance from noise, vibration, lighting, and human presence. <p>It is assumed that the proposed Project site is suitable for foraging and nesting behaviour for a wide range of common terrestrial invertebrates.</p> <p>Although records of these species were returned from the data search and field survey, and suitable habitat was present, these ecological features are valued as Local (lower) value and are not considered an IEF.</p> <p>The loss of foraging resource for other species, e.g. badger, birds, and bats, will be addressed separately.</p>	No
	Fish (including lamprey, Atlantic salmon, and trout)	Local (lower)	<p>Yes. Potential indirect effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Pollution to water, air, and/or soil. <p>Although records of these species were returned from the data search and the field surveys, this ecological feature is valued as Local (lower) value and is not considered an IEF.</p>	No

1.3. Geographical Context and Ecological Evaluation

The table below outlines the geographic scales used to inform the valuation of IEFs (which is adapted from the National Roads Authority Guidelines (NRA, 2009)) and is used to inform the sensitivity of the ecological receptors in biodiversity study area.

Ecological Valuation
<p>International importance:</p> <ul style="list-style-type: none"> • 'European Site', including Special Areas of Conservation (SAC) and candidate SACs, Sites of Community Importance, SPAs or proposed SPAs (pSPAs). • Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). • Features essential to maintaining the coherence of the Natura 2000 Network¹³ • Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. • Resident or regularly occurring populations (assessed to be important at the national level)¹⁴ of the following: <ul style="list-style-type: none"> – Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or – Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. • Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). • World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). • Biosphere Reserve (UNESCO Man & The Biosphere Programme). • Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). • Sites hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). • Biogenetic Reserve under the Council of Europe. • European Diploma Site under the Council of Europe. • Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations 1988 (S.I. No. 293 of 1988)¹⁵.
<p>National importance:</p> <ul style="list-style-type: none"> • Site designated or proposed as an Natural Heritage Area/proposed NHA. • Statutory Nature Reserve. • Refuge for Fauna and Flora protected under the Wildlife Acts 1976-2012. • Undesignated site fulfilling the criteria for designation as an NHA; a Statutory Nature Reserve; a Refuge for Fauna and Flora protected under the Wildlife Acts 1976-2012; and/or a National Park. • Resident or regularly occurring populations (assessed to be important at the national level)¹⁶ of the following: <ul style="list-style-type: none"> – Species protected under the Wildlife Acts; and/or – Species listed on the relevant Red Data list. • Site containing 'viable areas'¹⁷ of the habitat types listed in Annex I of the Habitats Directive.
<p>County importance:</p> <ul style="list-style-type: none"> • Area of Special Amenity¹⁸ • Area subject to a Tree Preservation Order. • Area of High Amenity, or equivalent, designated under the County Development Plan (CDP).

¹³ See Articles 3 and 10 of the Habitats Directive

¹⁴ It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

¹⁵ Note that such waters are designated based on these waters' capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*).

¹⁶ It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

¹⁷ A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

¹⁸ It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.

- Resident or regularly occurring populations (assessed to be important at the county level)¹⁹ of the following:
 - species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
 - species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
 - species protected under the Wildlife Acts; and/or
 - species listed on the relevant Red Data list.
- Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or national importance.
- County important populations of species or viable areas of semi-natural habitats or natural heritage features identified in the National or Local Biodiversity Action Plan (BAP)²⁰, if this has been prepared.
- Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.
- Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Local importance (higher value):

- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared.
- Resident or regularly occurring populations (assessed to be important at the local level)²¹ of the following:
 - species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
 - species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
 - species protected under the Wildlife Acts; and/or
 - species listed on the relevant Red Data list.
- Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality.
- Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

Local importance (lower value):

- Sites containing small areas of semi-natural habitats that are of limited local importance for wildlife.
- Sites or features containing non-native species that are of some importance in maintaining habitat links .

¹⁹ It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

²⁰ BAP: Biodiversity Action Plan

²¹ It is suggested that, in general, 1% of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

1.4. Scoping of Impacts

The installation of electrified overhead line equipment (OHLE) for the proposed Project will result in the emission of electromagnetic fields (EMFs). These EMFs are assessed for their potential to impact on biodiversity. Ecological features considered most likely to be affected by EMFs are bats and birds, due to their use of the earth's magnetic field for orientation and navigation (Wiltschko and Wiltschko, 1972; Holland *et al.*, 2006).

To date, limited experimental studies have been carried out on the effects of EMFs on bats and the results from these studies have been largely unclear. The majority of the relatively few published studies on this topic are laboratory based using short exposure periods and single species. Foster and Repacholi (2000) conducted a review of the published data on the environmental impacts of EMFs and concluded that '*attempts at environmental analysis of the effects of environmental EMF, with few exceptions have been scattered in focus, sporadic in publication and uneven in quality*'. Since then, and despite the obvious need for definitive studies, there has been no significant increase in the volume or quality of research in this area. Nicholls and Racey (2007) investigated the adverse effect of EMF on foraging bats and found that in habitats exposed to an EMF strength of greater than 2 v/m and less than 200 m from a radar installation, bat activity was significantly reduced in comparison to control sites. Nicholls and Racey (2009) also showed that an electromagnetic signal from a small radar unit with a fixed 'unidirectional signal' invariably reduced bat activity within 30m of the unit. While these studies show a negative association with regards to bat activity, they are not comparable with the proposed Project as they relate to radar installations as opposed to OHLE. As radar produces an EMF that is higher on the electromagnetic spectrum, these studies must be placed in the context of exposure to significantly higher levels of EMF than those that are produced from electricity networks/OHLE (Eirgrid, 2015).

The electromagnetic fields emanating from OHLE are at the 'extremely low frequency' (ELF) end of the electromagnetic spectrum. No published literature on the effects of ELF-EMFs on bats has been found. A literature review commissioned by EirGrid in 2015, to investigate the effects of high voltage transmission lines on bats in Ireland, concluded that a correlation was not identified between EMF emanating from OHLE and any negative association with bats (EirGrid, 2015). A field study comprising driven transect surveys and automated passive surveys was also conducted to investigate whether the presence and operation of OHLE affects bat activity. The study showed evidence of bat activity (including common and soprano pipistrelle, Leisler's bat and *Myotis* spp.) at all OHLE sites sampled, irrespective of line voltage. In addition, there was no sign of an increase in bat activity with increasing distance from the power line, and therefore no evidence that the OHLE are eliciting a deterrent effect on bats (EirGrid, 2015). Overall, the results from this research did not conclude any detectable negative effect of EMFs on bats.

International guidelines for limits on the levels of EMF required to protect the public and workers from established acute adverse health effects are published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The limit for static magnetic fields (up to 1Hz), stated within EU Council recommendation on the limitation of exposure of the general public to EMFs (0 Hz to 300 GHz) (1999/519/EC), is 40 mT. EMF modelling carried out for the proposed Project found that this 40mT limit

was not exceeded at any point along the line route. Furthermore, the magnetic flux density contours for the project indicate that during DC normal state with feeder wires, the maximum magnetic flux density of 65 dB μ T (which is below recommended limit of 40 mT for general public exposure) will be localised to within a few centimetres of the OHLE infrastructure. At 6 m from the centreline of the electrified tracks (i.e. horizontally from between the two tracks), the magnetic flux density decreases to 45 dB μ T. Due to the relative low levels of EMF predicted to arise from the proposed Project, this impact source on bats is scoped out of the assessment.

As with bats, scientific studies focused on the classifying the effects of EMFs on birds remains scarce, with results both inconclusive and inconsistent. Fernie and Reynolds (2005) produced a major review paper in relation to birds and EMF, resulting in the opinion that although some negative effects were observed in relation to reproduction and development, the limited number of studies combined with an inconsistency in effects observed meant that no conclusion could be determined. Prinsen *et al.* (2011) states '*it is clear the presence of electromagnetic fields influence (some) bird species, however, there is a lot of uncertainty about the nature, direction and impact of these effects*'. This concurs with a study commissioned by EirGrid in 2016 into the effects of high voltage overhead transmission lines on birds, with the conclusion stating that there is no evidence that electromagnetic radiation effects birds (EirGrid, 2016). The EMF values associated with overhead grid transmission lines are far greater than those associated with the proposed OHLE; therefore, the EMF impact source on birds arising from the proposed Project is scoped out of the assessment.

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.
- EirGrid (2015) EirGrid Evidence Based Environmental Studies Study 3: Bats. Literature review and evidence-based field study on the effects of high voltage transmission lines on bats in Ireland.
- EirGrid (2016) EirGrid Evidence Based Environmental Studies Study 5: Birds. Literature review and evidence based field study on the effects of high voltage transmission lines on birds. May 2016
- Fernie, K.J. and Reynolds, S.J. (2005) The Effects of Electromagnetic Fields from Power Lines on Avian Reproductive Biology and Physiology: A Review. *Journal of Toxicology and Environmental Health, Part B*, 8, 127-140.
- 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.

Holland, R.A., Thorup, K., Vonhof, M.J., Cochran, W.W., Wikelski, M. (2006) Bat orientation using Earth's magnetic field. *Nature*. 444:653.

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.

Marnell, F, Kelleher, C., and Mullen, E. (2022) Bat Mitigation Guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland

Nicholls, B., and Racey, P. A. (2007). Bats Avoid Radar Installations: Could Electromagnetic Fields Deter Bats from Colliding with Wind Turbines? *PLoS ONE* 2(3): e297.

Nicholls, B., and Racey, P. A. (2009). The aversive effect of electromagnetic radiation on foraging bats—a possible means of discouraging bats from approaching wind turbines. *PLoS One*, 4(7), e6246.

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.

Prinsen, H.A.M., G.C. Boere, N. Pires and J.J. Smallie (2011). Review of the conflict between migratory birds and electricity power grids in the African-Eurasian region. CMS Technical Series No. XX, AEWA Technical Series No. XX Bonn, Germany.

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.

Wilschko, W., Wilschko R. (1972) Magnetic compass of European Robins. *Science*. 176:62–64.

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.